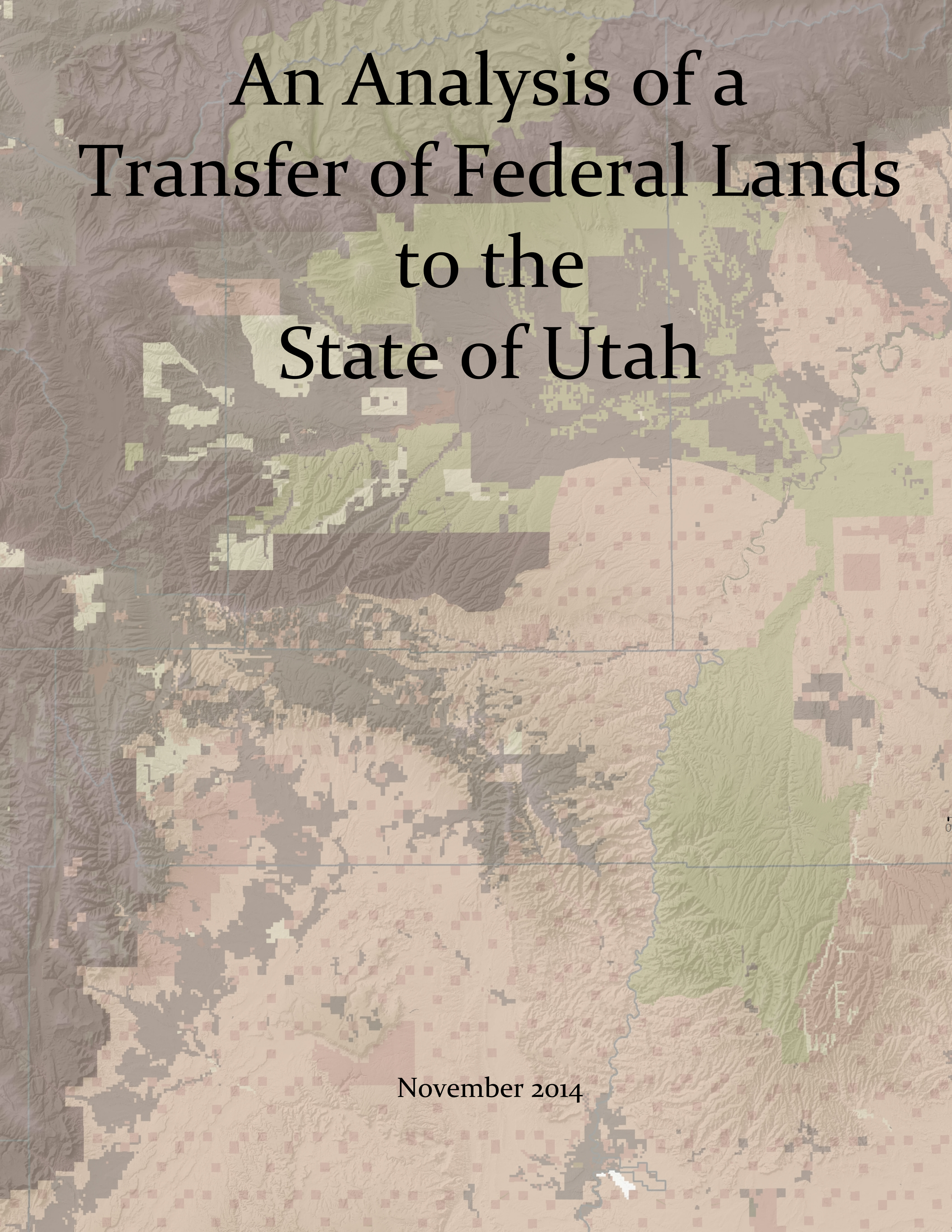

An Analysis of a Transfer of Federal Lands to the State of Utah

November 2014

AN ANALYSIS OF A TRANSFER OF FEDERAL LANDS TO THE STATE OF UTAH

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Summary

Utah H.B. 148 seeks the transfer of title to 31.2 million acres of land currently managed by the federal government to the state of Utah. This accounts for more than 60 percent of the state's land area, or five times the amount of land the state currently owns and manages. A land transfer of this magnitude would be a major shift in the current economic structure of Utah.

In light of this, H.B. 142 was enacted in 2013 to require a study and economic analysis of the proposed land transfer. This study responds to portions of Section 63J-4-606 of that bill. In particular, it provides information about the current uses of land, the economic effects and non-economic benefits of those uses, and the ramifications and impacts to the state assuming the lands are transferred. It also describes the programs and budgets of, and revenues generated by, the federal agencies that now manage the lands identified in H.B. 148.

Additionally, the research included here describes how public lands contribute to the economic growth of local economies and the quality of life of Utah citizens. Finally, the research team was asked to estimate the potential costs of managing the transferred lands, identify state agencies that could manage portions of those lands, and develop a method to estimate potential revenue streams that could be used to offset the land management costs.

This study has been a collaborative effort between three state universities: the University of Utah, Bureau of Economic and Business Research; Utah State University; and Weber State University.

Key Findings

Utah is a state rich in land resources, most of which are owned and managed by federal agencies. Like many other western states, land ownership in Utah is characterized by a high level of federally controlled land intermingled with state and privately owned lands.

The state's land ownership legacy derives from federal land policies enacted shortly after the Revolutionary War which changed and evolved as the federal government acquired, disposed of and eventually retained its lands. Currently, federal agencies manage 64.5 percent of Utah's 54.3 million acres. Most of this land is under the jurisdiction of two agencies—the Bureau of Land Management (BLM) and the U.S. Forest Service. H.B. 148 aims to transfer these acres (excluding the acres designated as wilderness) to the state of Utah. Also included in the land transfer are acres under the jurisdiction of the U.S. Fish and Wildlife Service and the Utah portion of the Glen Canyon Recreation Area, which is part of the National Park Service.

The largest federal land manager is the BLM, which manages 22.8 million acres of primarily rangelands, employs 774 FTEs, and spends on average about $120 million annually to manage its lands. The Forest Service is the second key land management agency, overseeing 8.15 million acres of national forests in the state. The Forest Service employs more than 1,000 people and spends an estimated $107 million to manage the forests. Both the BLM and Forest Service maintain regional offices in Utah. The BLM Utah headquarters are in Salt Lake City while the Forest Service Region 4 headquarters are in Ogden. BLM Utah's headquarters office oversees the agency's activities in Utah. The Region 4 headquarters operations oversee the entire Intermountain Region, which includes other states.

With 112,696 acres under its jurisdiction in Utah, the U.S. Fish and Wildlife Service (FWS) has a much smaller land presence than either the BLM or Forest Service. Most of the FWS lands are tied to fish hatcheries and wildlife refuges. The cost to manage those operations requires 35 people and almost $4.6 million; this represents a fraction of the agency's activities in the state. The FWS is primarily a regulatory agency, not a land management agency.

Finally, the National Park Service (NPS) manages the Glen Canyon National Recreation Area, which covers 1.2 million acres in Utah and Arizona—most of this is in Utah. Allocating spending on a per-acre basis, the NPS spends about $16 million annually to operate the Utah portion of Glen Canyon.

All totaled, 31.2 million acres would transfer from federal management to state ownership. In 2012, the federal agencies listed here (excluding the NPS) employed more than 2,100 people and spent a collective $247 million to manage the lands proposed in H.B. 148. This translates to about $8 per acre.

Economic Impacts of Federal Agency Operations

The operational spending of federal agencies has an economic impact on the state of Utah. The federal wages and spending are important to the state because they are injections of outside money into the Utah economy. The operational purchases of the BLM, Forest Service and FWS support almost 5,000 jobs in Utah and generate $236.2 million in earnings for Utah residents. The contribution to Utah's gross state product is almost $200 million. Tax revenues include $15.8 million in state revenue and $1.4 million in revenue for local governments. No one can predict how much of the current federal presence in Utah would remain when the federal estate is largely diminished. However, the immediate impact of H.B. 148 would be the loss of approximately $149.8 million in federal payroll.

Potential Land Management Costs

The cost to the state of managing the transfer lands is estimated to be $248 million by 2017—the year we assumed the state would first have control of the lands. This estimate is very close to the amount federal agencies now spend. This cost estimate does not include the federal PILT (payments in lieu of taxes) that is paid to counties to help offset foregone property tax revenues due to nontaxable federal lands within their boundaries. The state has indicated it would continue these payments, which add an additional $31.7 million, bringing the total cost of managing lands in 2017 to almost $280 million.

Almost 35 percent of the estimated direct land management cost of $248 million (cost net of PILT) is for wildfire. Addressing wildfire is a critical aspect of managing public lands in Utah. From FY2003 to FY2012, wildfire-related expenditures in Utah by the Forest Service, BLM and Forestry, Fire and State Lands averaged $85.6 million annually in inflation-adjusted 2013 dollars. The two federal agencies bore over 90 percent of these costs (91.7 percent). Fire suppression, the most unpredictable component, amounted to 39.4 percent ($33.7 million of $85.6 million).

In addition, the state would also lose access to key firefighting resources—trained personnel, a fleet of aircraft, and other equipment available from federal agencies because they manage extensive lands in the state. The state also relies on the federal government for fire dispatch center and aviation support infrastructure.

Compared with other western states, wildfire size and frequency are not unusually high in Utah. The wildfire costs are a function of Utah's arid climate, insect infestation, the spread of nonnative fire-prone vegetation, and increased development on lands at risk for wildfire.

Federal agencies are required by law to provide access to lands under their jurisdictions and to manage programs tied to those lands without adequate funding. Deferred maintenance is a continuing problem for both the BLM and Forest Service. The combined deferred maintenance backlog for both agencies is estimated to be almost $100 million. Insufficient funding contributes to these backlogs. In addition, there are abandoned mine lands. The BLM estimates there are between 8,000 and 11,000 openings on lands it manages that need to be inventoried, field validated and remediated. The agency estimates that 5 to 10 percent of these openings have associated water quality issues.

Potential Revenues

Revenues produced on public lands are significant. In 2013, a total of $331.7 million was generated on lands managed by the BLM and Forest Service in Utah. Of this, mineral lease revenue accounted for 93 percent of the total, or $308.0 million. Oil and gas royalties totaled $257 million (83 percent of all mineral lease revenue). Historically, oil and gas royalties account for the majority share of all mineral lease revenue produced on federal lands. The second largest royalty stream comes from coal. In 2013, coal royalties totaled $35.6 million, and averaged $28.6 million annually between 2003 and 2013.

Other mineral revenues produced on federal lands include lease bonus payments and rents tied to oil, gas and coal production. These totaled $9.9 million in 2013 and averaged $33.5 million annually. The volatility of lease bonus payments accounts for the large annual average.

There are also land-based revenues and receipts collected by the BLM and Forest Service. These include, among other things, recreation fees, rights-of-way rents, grazing fees and receipts from timber sales. In 2013, these totaled almost $24 million.

Of the $331.7 million in revenue generated on public lands in 2013, Utah and counties in Utah received $149.8 million, or 45.2 percent of the total. Typically, Utah receives 50 percent of the mineral lease royalties, less a small processing fee paid to the Office of Natural Resources Revenue, an office within the U.S. Department of the Interior that collects all mineral lease monies generated on federal lands. In addition to the payments noted above, counties received a total of $35.4 million in PILT in 2013.

Two primary concerns regarding the land transfer are the cost of managing the lands, and whether the state could generate enough revenue to cover that cost. The most direct and reliable source of revenue would be royalties and taxes on oil and gas production. The Utah Geological Survey has estimated that proved reserves of oil and natural gas in Utah stand at 613 million barrels of crude oil, 7.8 trillion cubic feet of natural gas, and 268 million barrels of natural gas liquids. Clearly, tapping into this resource could provide a substantial revenue stream for the state.

Several potential revenue streams to the state from oil and gas production were projected using an oil and gas forecasting model developed by the BEBR research team. Ten forecasts were produced using two different price assumptions (five forecasts under each assumption). The high price (our "Reference" price) assumed an average price per barrel for oil of $92 and gas at $5.10 per thousand cubic feet. A low price forecast assumed an average price per barrel for oil of $62 and gas at $3.30 per thousand cubic feet.

Based on our analysis, the land transfer could be profitable for the state if oil and gas prices remain stable and high and the state negotiates a change in the royalty revenue share from 50 percent to 100 percent. Under the existing mineral lease revenue sharing arrangement, Utah receives about 50 percent of all mineral lease royalties, with the federal government receiving the remainder. Four of BEBR's forecasts incorporate a change in the royalty revenue share from 50 percent to 100 percent. Although we modeled other aggressive approaches, such as increasing the royalty rate on new production and increasing the number of wells drilled by 15 percent over the baseline projection, neither of these had the same substantive effect as changing the royalty share to 100 percent on all production at the point the land transfers to the state. These revenue forecasts are shown in Summary Table 1.

Without this change, even at the higher price forecast, oil and gas revenues are not sufficient to cover the state's total land management costs for at least two years after the transfer. At the lower price forecast, without a change in the royalty revenue share, oil and gas royalties would never be sufficient to cover the state's costs. However, the state would have access to other revenue streams such as coal royalties; oil, gas and coal rents and bonus payments; and other land-based revenues. Nevertheless, it would be more prudent for the state to negotiate this change rather than gamble on oil and gas prices remaining high.

Summary Table 1
Oil and Gas Royalties and Tax Revenues
(Millions of Constant 2013 Dollars)
Estimated Land Management Costs in 2017: $280 million

	Reference Price Forecast Oil: Average $92 per barrel Gas: Average $5.10 per thousand cubic feet					Low Price Forecast Oil: Average $62 per barrel Gas: Average $3.30 per thousand cubic feet				
Year	Baseline Forecast 1	Forecast 2	Forecast 3	Forecast 4	Forecast 5	Baseline Forecast 6	Forecast 7	Forecast 8	Forecast 9	Forecast 10
2017	$226.8	$235.1	$245.4	$389.2	$422.0	$202.7	$210.7	$219.4	$346.8	$377.6
2018	$234.7	$256.3	$270.7	$405.5	$440.9	$200.4	$219.3	$230.5	$345.9	$378.2
2019	$237.2	$270.4	$287.5	$413.4	$450.3	$198.1	$225.4	$238.8	$343.7	$375.5
2020	$245.6	$290.3	$311.1	$430.7	$468.9	$195.4	$229.0	$244.2	$340.7	$371.9
2021	$262.3	$320.2	$345.6	$462.5	$501.7	$192.2	$231.7.	$248.3	$336.7	$366.5
2022	$279.4	$351.2	$381.8	$495.4	$535.6	$189.0	$231.4	$249.5	$331.9	$361.2
2023	$298.3	$385.7	$421.2	$532.0	$575.0	$185.5	$230.2	$248.8	$326.6	$355.8
2024	$318.8	$422.8	$463.2	$570.8	$617.7	$182.0	$227.4	$246.4	$321.3	$349.5
2025	$342.7	$459.5	$505.9	$616.2	$659.9	$177.9	$224.7	$243.5	$314.4	$342.7
2026	$365.0	$497.4	$547.4	$659.4	$712.4	$173.2	$221.0	$239.9	$307.2	$336.1
2027	$390.6	$537.0	$595.3	$708.5	$763.3	$169.1	$217.0	$236.1	$300.0	$329.6

Note: Revenue includes royalties, severance taxes and sales tax.
Assumptions used in these forecasts: Forecasts 2 and 7—Oil and gas royalties remain at 12.5 percent, new wells are drilled at historic levels, the state receives 50 percent of all royalties on production from existing wells (wells that were in production prior to the transfer) and 100 percent of the royalties from production on new wells (wells that are drilled after the transfer).
Forecasts 3 and 8—Oil and gas royalties remain at 12.5 percent; the number of new wells drilled increases 15 percent over the baseline estimate; the state receives 50 percent of the royalties on existing wells and 100 percent of the royalties on new wells.
Forecasts 4 and 9—Oil and gas royalties remain at 12.5 percent; the number of new wells drilled increases 15 percent over the baseline estimate; the state receives 100 percent of the royalties on existing wells and new wells.
Forecasts 5 and 10—Oil and gas royalties increase to 16.7 percent on new wells; the number of new wells drilled is 15 percent more than the baseline estimate; and Utah receives 100 percent of the royalties on production from all wells.

Currently, the state's share of federal mineral revenues are distributed to several different agencies and funds according to state law. The largest distributions go to the Utah Department of Transportation (40 percent) and the Permanent Community Impact Board (at least 32.5 percent). One use of the mineral lease revenue is to pay the state equivalent of PILT to counties that contain state lands that cannot be taxed.

Although oil and gas production may be the most direct revenue source available to the state at this time, Utah is endowed with an abundance of other natural resources as well. It contains significant supplies of energy minerals like coal and uranium; base metals such as copper, beryllium, magnesium and molybdenum; industrial minerals such as potash, salt, magnesium chloride and gilsonite; and oil shale and oil sands.

The oil shale in Utah's Uinta Basin may contain the equivalent of 1.3 trillion barrels of oil. A smaller portion of the full deposit has attributes that may eventually allow as much as 77 billion barrels of oil to be produced in an economically viable manner. In spite of the impressive numbers, oil shale has yet to prove itself as an economically viable resource given current technologies, and progress towards economic viability remains unclear. Oil shale is not the more-or-less conventional crudes historically produced in Utah and it is not the shale oil of North Dakota. Despite these limitations, production from oil shale could be a lucrative revenue source in the deep future.

Economic Impacts of Activities on Federal Lands

Public lands are used for many purposes and accessed by tens of millions of people each year. In addition to mineral and energy extraction, public lands are used for recreation (including hunting, fishing and wildlife watching), forage grazing, and timber production. These activities contribute to Utah's economic well-being by supporting jobs, generating earnings for Utah residents, and providing tax revenue for the state. In 2013, activities on federal lands supported almost 29,000 jobs in Utah, generated $1.6 billion in earnings, and contributed $3.6 billion to Utah's gross state product. The fiscal impacts included $788 million in tax revenue to state and local government agencies.

Public Lands, Recreation and Quality of Life

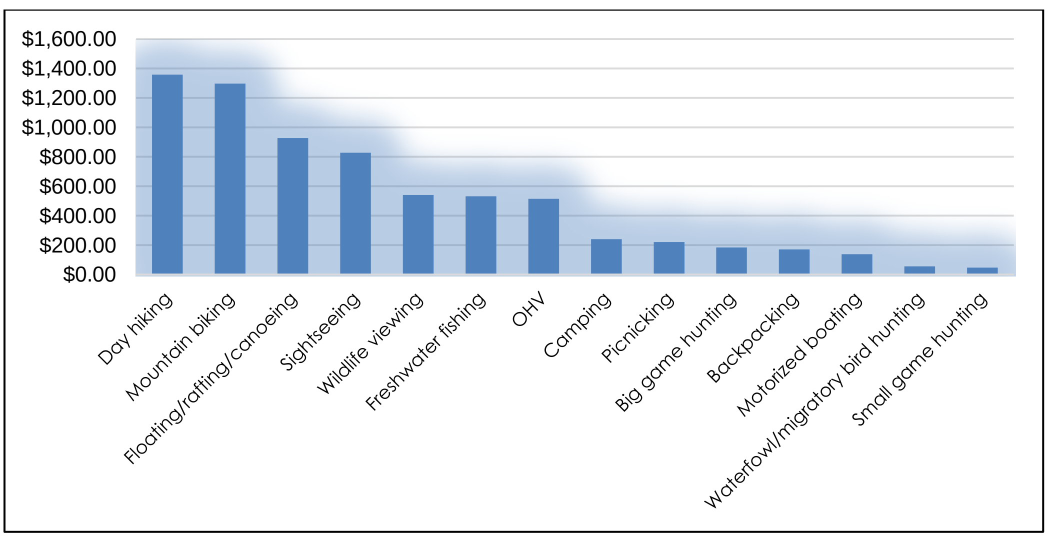
As important as public land use is in generating employment and income for Utah residents, the vast vistas offered by western landscapes and ready accessibility to public land in western communities improve the conditions for residents of those communities. Recreation activities on public lands have value far beyond market expenditures because they contribute to an improved quality of life for Utah residents. These benefits are not captured in traditional market-based measures such as jobs, income and gross state product, yet they have value. The economic value of public land is just one aspect of the total value. The opportunity to recreate and have access to lands is important even if the opportunity is not realized.

Utah's unique geography, topography, geologic features and climate are ideal for outdoor recreation. Utah residents are more than twice as likely as the national average to participate in several outdoor recreational activities. We measured the recreational benefits to Utah residents on Forest Service and BLM public lands using the benefit transfer method; recreation values from prior economic studies were used to calculate the value, or net benefit, received by Utah residents for recreating on public lands. The value estimates can be used to illustrate the importance of maintaining the quality of and access to outdoor recreation sites on public lands. This type of analysis would help public land managers, state or federal, balance competing uses of public lands so as to maximize the well-being of citizens.

The total value of recreation and travel in Utah is approximately $16.9 billion; this consists of resident and non-resident consumer spending of $9.8 billion, and an overall net benefit (over and above what consumers spend) to Utah residents of approximately $7.1 billion. The $7.1 billion figure represents the aggregate net benefit to Utah residents of 14 outdoor recreation activities that take place on Forest Service and BLM multiple-use land. Net benefit measures the amount that visitors are willing to pay over and above what they have to pay; it is akin to profit, but realized by the consumer. The net benefit to society may actually be larger if our analysis included nonresident recreational users, or if the quality of public lands used for recreation were to be improved.

Sightseeing, hiking, and camping are the three outdoor recreation activities on public lands with the greatest level of participation by Utah residents. Day hiking has the highest net benefit value (about $1.4 billion), followed by mountain biking ($1.3 billion). Outdoor recreation is part of Utah's culture and heritage, and preserving such opportunities enhances the quality of life for residents and visitors. If recreational resources were degraded, impaired or polluted, the demand for travel to recreational destinations would fall, and so would the benefits to society.

Summary Figure 1
Aggregate Net Benefits by Activity, 2012
(Millions of Dollars)



Utah residents place considerable value on public lands and resources. Surveys conducted by Utah State University in 2007 show that 82 percent of survey respondents agreed that Utah's public lands "are an important part of the culture and heritage" of their communities. The results of that same survey also show that responses vary along local contexts. Even though there may be broad-based expressions of public support for the presence and protection of public lands, perspectives regarding specific locations, management strategies, and land use patterns are quite variable, and in some cases highly contentious.

Public Lands and Economic Growth

While public lands are highly valued from a qualitative perspective, the degree to which they contribute to economic growth at the county level is not well understood. In this study, the relationship between land ownership, land use and economic growth was explored using a Regional Adjustment Model (RAM) developed by research team members at Utah State University and Weber State University. The results of that model show modest amounts of land owned by the federal government and managed for general use (also referred to as "multiple use") are associated with faster economic growth in counties, while large amounts of federal land managed for general use are associated with a "drag" on economic growth. The turning point at which the drag begins is county-specific, but overall it occurs when 40 to 45 percent of the county's land is owned and managed for general use by federal agencies. This relationship is strongest for income growth and migration and weakest for employment growth. Twenty of Utah's 29 counties exceed this threshold.

The findings also show that the amount of state-owned land managed for general use does not aid economic growth until state-owned land has reached a critical mass of about 15 percent of the county area. After that point, state management is associated with faster economic growth. Four of Utah's counties have state-owned land at a level above 15 percent.

Counties with well-developed mining sectors had faster income growth than counties without a dominant mining sector, all else equal. Counties with relatively well-developed recreation sectors have greater migration, employment, and income growth than counties without well-developed recreation sectors, all else equal. However, it is important to note that these activities are not mutually exclusive. The dataset used in the model includes counties that have both large recreation *and* mining sectors, so that framing economic development choices as "resource use vs. recreation" is a false dichotomy.

Public Education

Public education is a top priority in every legislative session. No other function of state government requires near the funding that public education does. In the fiscal year 2014 budget, 48.9 percent of the $5.5 billion General Fund and Education Fund was appropriated to public education.

A source of funding to public education particularly relevant to this study is the State Permanent School Fund administered by the School and Institutional Trust Lands Administration (SITLA). Revenue generated on school trust lands must go to the State Permanent School Fund. Currently the fund has an asset value of over $1.6 billion. By state statute only the dividend and interest earnings generated by the fund are distributed annually to public schools. In FY2014, SITLA distributed $37.4 million to public schools, the largest distribution to date.

Most SITLA trust lands are public school lands and, with few exceptions, are largely scattered across the state in noncontiguous parcels interspersed with private and federal lands. Where state lands have development potential but are surrounded by federal lands, federal agencies become the de facto managers of trust lands, complicating state trust land development and resource use. The land transfer would allow SITLA to more easily develop its resources and potentially provide more funding for public education in Utah.

County Feedback

From a county perspective, the land transfer could be a positive catalyst for change. Priorities of the counties include keeping public land open and available to the public, more diversified land use, increasing local authority in public land management, resurrecting the timber industry, developing healthy forest management practices, and opening, expanding and maintaining rural roads and ATV trails. Concerns identified by the counties include the lack of a defined management plan and organization structure for the transfer, lack of funding for the new management structure, loss of federal revenues, and the possibility that the state would shift land management responsibilities to counties without providing offsetting funding.

CONCLUSION

This study provides a wealth of information about current activities and operations that are tied to public lands in Utah. Using that information, the cost of managing the transferred lands can be estimated and the potential revenue streams identified, but forecasting the full economic effects of a land transfer from the federal government to the state of Utah is simply not possible. The state of Utah is in the early stages of formulating a plan to manage a public land portfolio vastly larger than the one it now oversees. Which programmatic actions—such as grazing, wild horse and burro control, invasive species management—would be managed by the state and which would remain with the federal government has not yet been determined.

Broadly speaking, public lands can be managed to harvest marketable resources such as oil, gas, and timber; provide for outdoor recreation; and minimize disturbance of natural land cover to provide amenity and quality-of-life values associated with the preservation of unique landscapes and ecosystems. As noted by the Governor's Council of Balanced Resources,

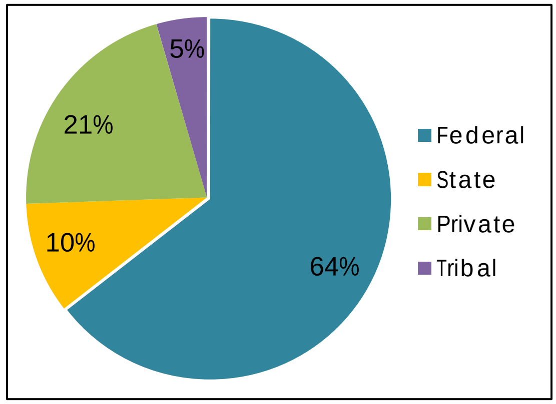
> We want Utah to be prosperous. This requires a diversified and enduring economy. To get there, we need to pursue development *and* the recreational economy, and ensure that our efforts to promote one economic sector do not unduly constrain another.

In conclusion, from a strictly financial perspective, it is likely the state of Utah could take ownership of the lands and cover the costs to manage them. Our research also suggests that it could put a strain on the state's funding priorities in the early years as the state adjusts to the loss of federal dollars, evaluates land resources and conditions, and develops programs to replace those now managed by federal agencies.

1 Background

Utah is a state rich in land resources, most of which are owned and managed by federal agencies. Like many other western states, land ownership in Utah is characterized by a high level of federally controlled land intermingled with state and privately owned lands (Figure 1.1). The high level of federal land ownership, combined with concerns about federal management of Utah's lands, culminated in the passage of H.B. 148 calling for the transfer of 31.2 million acres of public land to the state.

Figure 1.1
Land Ownership in Utah



Source: BEBR analysis of data from State of Utah, SGID.

Of Utah's 54.3 million acres, federal agencies manage 64.5 percent, or 35 million acres. Most of this land is administered by two federal agencies: the Bureau of Land Management and the U.S. Forest Service. Other federal agencies with much smaller shares include the National Park Service, the Department of Defense, the U.S. Fish and Wildlife Service, the Department of Energy and the Bureau of Reclamation. Twenty-one percent of lands are in private ownership (11.4 million acres), which includes county and municipal land. Tribal lands account for 4.5 percent of the total. Tribal trust lands are cooperatively managed by the Bureau of Indian Affairs and the Native American Indian tribes that own the land (Banner 2009). Utah state government agencies own and manage the remaining 10 percent of the land in the state (5.4 million acres) (Table 1.1 and Figure 1.2).

Most of Utah's lands are trust lands managed by the State of Utah School and Institutional Trust Lands Administration (SITLA). Other state agencies managing Utah lands include the Utah Department of Natural Resources (Division of Forestry, Fire and State Lands, Division of Wildlife Resources and Division of State Parks and Recreation), and the Utah Department of Transportation (Figure 1.2).

Table 1.1
Utah Land Ownership, by Agency

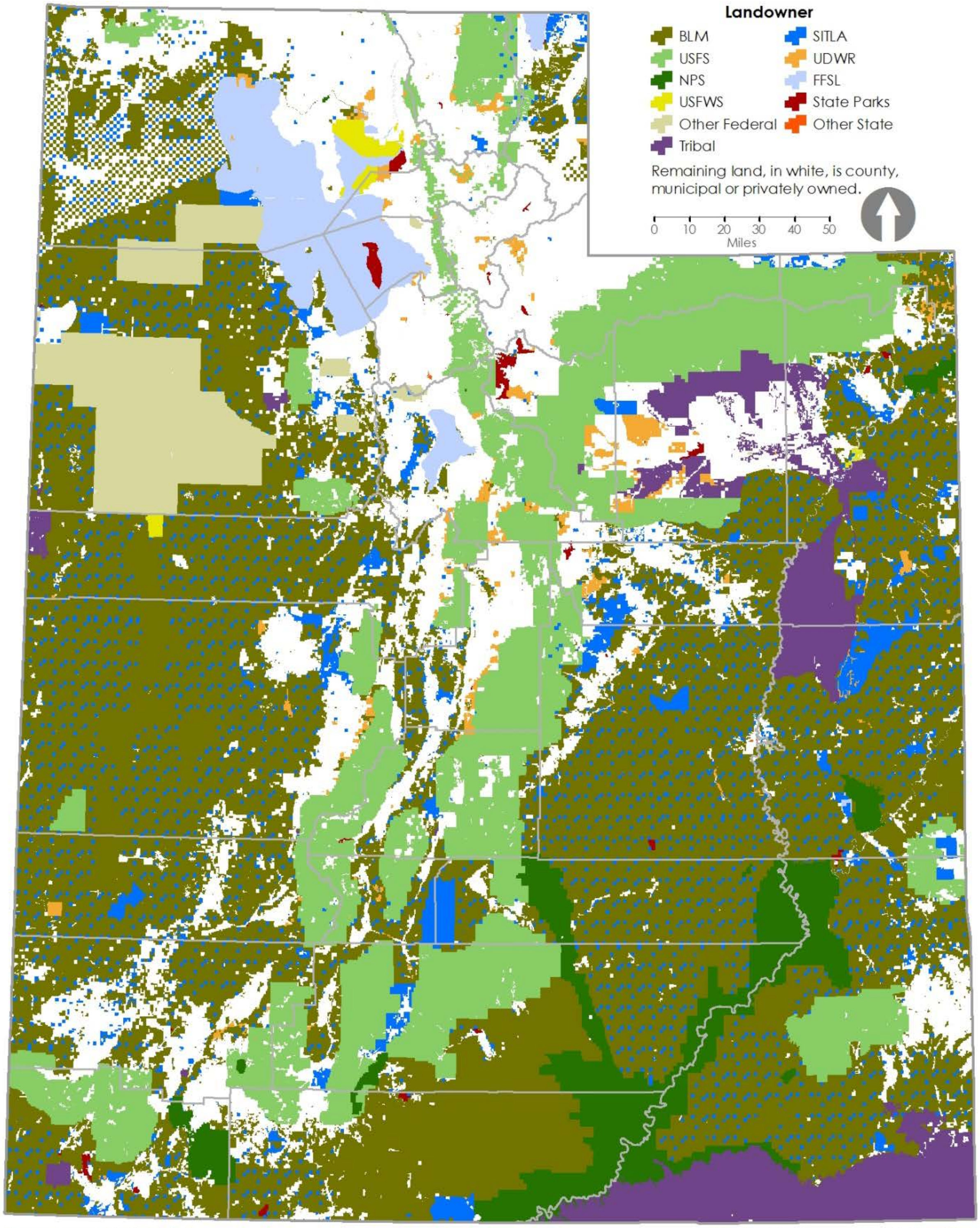
Entity	Acres	Share
Federal	**35,019,955**	**64.5%**
Bureau of Land Management	22,803,707	42.0%
Forest Service	8,175,253	15.1%
National Park Service	2,096,702	3.9%
Department of Defense	1,812,561	3.3%
U.S. Fish and Wildlife Service	112,696	0.02%
All Other Federal	19,001	.003%
State	**5,419,281**	**10.0%**
School and Institutional Trust Lands	3,400,511	6.3%
Department of Natural Resources[1]	2,015,984	3.7%
Utah Department of Transportation	2,150	.004%
Other State	636	.001%
Private, County and Municipal	**11,428,135**	**21.0%**
Tribal	**2,448,616**	**4.5%**
Grand Total	**54,315,952**	**100%**

1. Includes acres managed by Forestry, Fire and State Lands, Division of Wildlife Resources, and Division of State Parks and Recreation.
Source: BEBR analysis of data from State of Utah, SGID.

Utah's land ownership legacy is a result of federal land policies enacted shortly after the Revolutionary War, which continued as the government acquired, disposed of, and eventually retained its lands.

An overview of federal lands history explains the evolution of Utah's current land ownership patterns and provides context for passage of H.B. 148.

Figure 1.2
Land Ownership of Utah, by Agency



Source: State of Utah, SGID.

Map by John Downen, BEBR | October 2014

The federal government currently owns and manages more than 620 million acres of land in the United States, roughly one-third of the 1.8 billion acres it has acquired since the Revolutionary War. Most of these lands are heavily concentrated in the West (including Alaska), and most are managed by four federal agencies—the Bureau of Land Management, U.S. Fish and Wildlife Service, the National Park Service and the U.S. Forest Service. The remaining acres are managed by other federal agencies, most notably, the Department of Defense.

While the transfer of 1.3 billion acres to private and state ownership played an essential role in the settlement and development of the fledgling Republic, the present-day policy of federal land retention continues to be controversial. The history of land acquisitions, federal land disposal and land retention policies in the U.S. provides an important context for current affairs relating to the demands by some western states for transfer of federal lands to state ownership.

1.1 Federal Land Acquisition and Disposal

For much of America's history, federal land policies have been contentious; however, they were crucial in establishing a strong, centralized federal government after the Revolutionary War and in the settlement of vast, new areas of largely unsettled lands. Federal land ownership began with the cession of "western" lands claimed by several of the original colonies to the federal government. From 1781 to 1802, ownership of 237 million acres between the Appalachian Mountains and the Mississippi River was transferred to the newly formed Republic. Under this cession, these lands became the property of the federal government (Gates 1968). The public domain grew with subsequent acquisitions via purchases and treaties, beginning with the Louisiana Purchase in 1803 and ending with the Alaska purchase in 1867—eventually culminating in a U.S. land base totaling roughly 2.27 billion acres (Gorte and Alexander 2007).[1] Table 1.2 shows the acquisition of the public domain.

Table 1.2
Acquisition of the Public Domain

Acquisition	Date	Area[1]	Share of Total U.S. Land[2]
State Cessions	1781–1802	236,825,600	10.4%
Louisiana Purchase	1803	529,911,680	23.3%
Red River Basin[3]	1782–1817	29,601,920	1.3%
Cession from Spain	1819	46,144,640	2.0%
Oregon Compromise	1846	183,386,240	8.1%
Mexican Cession	1848	338,680,960	14.9%
Purchase from Texas	1850	78,9269,720	3.5%
Gadsen Purchase	1853	18,988,800	.8%
Alaska Purchase	1867	378,242,560	16.7%
Total Public Domain		1,840,709,120	81.0%

1. Includes land and water acres.
2. Represents the percentage of current total U.S. land acreage, which is 2,271,343,360. This excludes U.S. territories and possessions.
3. Treaties with Great Britain.
Source: U.S. Department of the Interior, Bureau of Land Management, Public Land Statistics, 2012*, www.blm.gov/public_land_statistics/pls12/pls12.pdf.*

The states' cession of their lands was an important resource for the federal government, providing a mechanism to resolve the country's massive Revolutionary War debts, address the ongoing financial needs of the government, and encourage settlement in the new lands.[2] The mechanism under which this land distribution would occur was defined in the Land nance of 1785. Questions about governance of the lands, including the requirements for statehood, were laid out in the Northwest Ordinance of 1787 (Culp, et al. 2005).

[1] Cessions of land from the original states and other lands acquired via treaty or purchase after 1781 totaled 1.8 billion acres. The remaining 429.6 million acres belonged to, or were retained by, the original states (BLM 2013).
[2] According to the Bureau of Public Debt, by 1791 debts incurred during the American Revolutionary War totaled $75,463,476, roughly equivalent to $2.25 billion in 2013.

The Land Ordinance of 1785 authorized the public land rectangular survey system that became the foundation by which land was surveyed and sold by the federal government. The General Land Office, predecessor to the modern-day Bureau of Land Management, was created to facilitate the surveying and disposal of the federal lands. The Northwest Ordinance of 1787 created a system of territorial governments and established the process for transitioning territories into new states.

In contrast to many other sovereign governments, the U.S. generally disposed of lands at nominal prices and encouraged private ownership, enacting numerous laws to sell, grant, or otherwise transfer federal lands to encourage and accelerate settlement of the West. Examples include the Pre-Emption Act of 1841, the Homestead Acts of 1862 and the Desert Lands Entry Act of 1877. These acts offered settlers large tracts of land (ranging from 160- to 640-acre parcels) at reasonable prices (ranging from $1.25 to $2.00 minimum per acre). To facilitate land disposal, Congress established the General Land Office in 1812, whose primary purpose was transferring lands into private ownership. Apart from the mass sale of land, Congress also granted lands to the railroads in the 1870s, providing incentives to establish a national transportation system (Gates 1968).

Through these acts, and other federal land policies encouraging settlement and development of the public domain, 816 million acres have been transferred to private ownership (homesteaders, railroads, veterans, etc.) since 1781. Most of the land transfers occurred prior to 1940. Apart from grants and sales, 471 million acres have been conveyed to the states, primarily in the form of trust land grants.

Providing educational opportunities for its citizenry was an important objective of the federal government. Lacking financial resources, Congress turned to its land resources. When new states entered the Union, they received one section in each township for public education as well as lands (to be selected by the state) for other public institutions. These land grants were known as "trust lands" and were to be used for the benefit of the beneficiary for which they were granted. Provisions for the lands were included in the enabling acts of the new states. As land was surveyed, these reserved sections were granted to the new state without further action (Walker 2006).

As development moved westward, the size of the grants increased significantly, first to two sections and ultimately to four sections of every township. The reasoning behind the increasingly large grants of land was a practical one. Land in the west was steeper, more arid and less likely to support agriculture. Congress recognized that western states would require a larger amount of land to produce the necessary resources to support public schools. In addition, the original reservation grants for common schools were accompanied by increasingly generous "block" grants for the support of other public institutions. Beyond these additional grants, Congress allowed states to select *in lieu* lands from elsewhere in the public domain when their reserved lands in a given township were already occupied by homesteaders or dedicated to other purposes (Culp, et al. 2005).

1.2 Federal Land Withdrawals and Retention

Coincident with federal policies during the mid- to late 1800s encouraging the settlement of the West through land disposal, were policies that provided for land withdrawals—the removal of lands from the disposal process to be retained for particular public purposes. For example, the Land Ordinance of 1785 mentioned above reserved sections of each township for the benefit of public schools in newly formed states. Other withdrawals were for specific public purposes such as military fortifications and mineral reservations. By the end of the 19th century, however, lands were withdrawn for much different reasons.

By the late 1800s there were growing concerns in Congress that rapid development in the West threatened some of the nation's scenic treasures and depleted resources that may be needed in the future. These concerns culminated in new laws focused on land preservation and conservation rather than land disposal. The establishment of Yellowstone National Park in 1872 was a first step this process, eventually leading to the establishment of the National Park System. In 1891 Congress passed the General Land Reform Act, which created the forest preserves, removing those lands from private entry. This act ultimately led to the creation of the National Forest System (Gorte and Alexander 2007). By the end of 1909, a total of 194.5 million acres were in forest reserves. In 1903, President Theodore Roosevelt began withdrawing lands to protect wildlife habitats, which led to the National Wildlife Refuge System.[3]

From 1891 onward, emphasis subtly shifted from land disposal to retention and management of the remaining federal lands. Greater emphasis was also placed on implementing policies focused on scientific approaches to resource conservation and preservation. By the 1930s, it was generally accepted that the federal government would reserve and manage millions of acres in the public domain. Under the auspices of the newly formed U.S. Department of the Interior's Grazing Service, the 1934 Taylor Grazing Act strengthened the move in this direction. This act, intended to remedy the deterioration of federal lands due to overgrazing and drought, established grazing districts on public rangelands, and provided "direct authority for federal management of lands which previously were freely available for transient grazing, and reflected the significant decline in homestead entries"(Gorte and Alexander 2007).[4]

The shift toward an explicit policy of retention was solidified in 1964 with the establishment of the bipartisan Public Land Law Review Commission (PLLRC) and enactment of the Classification and Multiple Use Act of 1964. PLLRC was tasked with reviewing existing public land laws and regulations and the policies and practices of federal land management agencies. The first recommendation from the PLLRC in its 1970 report to the President and U.S. Congress was that the remaining federal lands, in general, should be retained in federal ownership. Specifically it recommended that

> the policy of large-scale disposal of public lands reflected by the majority of statutes in force today be revised and that future disposal be of only those lands that will achieve maximum benefit for the general public in non-Federal ownership, while retaining in Federal ownership those whose values must be preserved so that they may be used and enjoyed by all Americans (PLLRC 1970).

[3] Although the first wildlife refuge was established by executive order in 1903, it was not until 1966 that all the refuges in the U.S. were collected into the National Wildlife Refuge System.

[4] The U.S. Grazing Service was formally merged with the General Land Office in 1946 to form the Bureau of Land Management.

Coincident to the research efforts of the PLLRC, the Bureau of Land Management (BLM) began classifying lands under its control for retention, disposal, and multiple-use values as directed under the Multiple Use Act. By the time PLLRC released its report, BLM had classified more than 90 percent of the remaining public lands under its jurisdiction for retention.

1.2.1 Era of Expanding Regulation

The 1960s and 1970s marked a transition into the modern era of federal land management with the enactment of federal statutes protecting air, water, habitat and wildlife resources and establishing administrative protocols for managing federal lands. These changes in land management were driven by federal laws centered on three broad topics: (1) environmental protection (amendments to existing laws), (2) federal land management administrative procedures, and (3) land, habitat and wildlife resource protection.

By the middle of the 20th century some ardent conservationists were demanding that parts of the public domain be permanently maintained as wilderness. They argued for prohibiting timber cutting, oil and gas drilling and other economic activities in these areas. In response to these demands, Congress passed the Wilderness Act of 1964, which set aside millions of acres of wilderness with very restrictive rules on their use. Many in the western states bitterly criticized this law, insisting that resource development was integral to their economic prosperity. Other resource protections were provided for in the Clean Air Act of 1970, the National Environmental Protection Act of 1970, the Clean Water Act of 1972 and the Endangered Species Act of 1973. Many of these laws continue to fuel contentious debates involving land users and federal land managers.

The enactment of the Federal Land Policy and Management Act of 1976 (FLPMA) codified the policy of federal land retention over disposal (except in specific cases), essentially ending the era of federal land disposal in the United States. With FLPMA, Congress expressly declared that the federal government would retain ownership of the public lands unless the Secretary of the Interior determines that the disposal of particular parcels serves the national interest. In addition to formalizing the policy of land retention, FLPMA also declared that public lands managed by the BLM were to be managed for multiple uses and values, and repealed almost 2,000 statutes addressing land disposal policies enacted in earlier decades (Skillen 2009).

The end of the land disposal era left most of the western United States under federal ownership. In 2010, 555 million acres or roughly 88 percent of remaining federal land was contained in the 11 western states plus Alaska. This high concentration of federal lands in the West, combined with policies outlined in FLPMA, were significant factors in the "Sagebrush Rebellion," a campaign by many westerners beginning in 1978 to assert title to federal lands or force their divestiture.

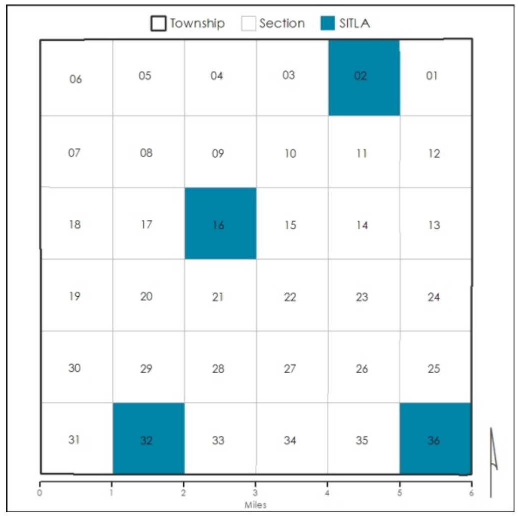
With the passage of FLPMA, these states faced a future with a substantial and permanent federal presence with little influence as to how those lands would be used. The Sagebrush Rebellion was a reaction to this environment, taking the form of state and local legislation, court challenges, federal administrative changes and efforts at federal legislation. While some of these efforts gained traction in Congress and with the Reagan administration, eventually they all proved unsuccessful. Since 1978, numerous bills have been introduced in Congress aimed at reducing federal land ownership through either land transfers or by capping federal land acquisitions. To date, none have been successful.

1.3 Land Ownership in Utah

The formal transfer of federal lands to private ownership in Utah began in 1869 with the establishment of the first General Land Office in Salt Lake City.[5] By the time the office opened, the Utah Territory was well established by members of the Church of Jesus Christ of Latter-day Saints (the Church) who settled in the area in 1847 after fleeing religious persecution in Illinois.

The territorial government established by the Church governed land ownership in the Utah Territory (May 1987). The early citizens of Utah were not permitted the benefits of land disposal laws due to disagreements between Church doctrine, laws of the United States, and the territorial legislature, which generated church-state conflicts. These conflicts delayed the process of land transfer to private citizens. For example, the Preemption Act of 1830 (which allowed settlers to purchase up to 160 acres of land for $1.25 per acre) and the Homestead Act of 1862 (which granted 260 acres to those willing to settle the "American Frontier") did not become applicable in the Utah Territory until January 1869, when the Land Office opened (Banner, et al. 2009).

Figure 1.3
Township Grid



Source: State of Utah, SGID.

With the opening of the General Land Office, Utah lands were integrated into the national land system by extending the rights of preemption, homestead and purchase to Utah inhabitants (State of Utah 2014).[6]

Utah's trust lands were granted under its Enabling Act of 1894.[7] By the time Utah was admitted to the Union, Congress had increased the grant allocation to four township sections—2, 16, 32 and 36 (Figure 1.3). While the rationale for scattering land grants was a practical one, it created a disjointed checkerboard pattern of 640-acre, noncontiguous, isolated parcels bordered by federally owned lands. Utah trust land grants for the support of public schools totaled 5.9 million acres. In addition, Utah received "quantity" or "floating" grants totaling 1.6 million acres. In total, Utah's original trust land grant was about 7.5 million acres, or roughly 14 percent of the state's surface lands. [8]

[5] All land in the Utah Territory became part of the public domain when the United States signed the Treaty of Guadalupe Hildalgo in February 1848. This land came into the possession of the United States government with an undisputed title. At that time no private rights had been established.
[6] The Preemption Act of 1842 gave settlers the first right to purchase 160 acres of land they had already homesteaded, and 21 months to make payments. The Homestead Act of 1862 evolved from preemption. This act provided free grants of public lands to any person who was a citizen of the United States and over 21 or the head of a household.
[7] After several unsuccessful attempts at statehood, Utah was admitted to the Union in 1896 under an 1894 Enabling Act (Matheson and Becker 1988).
[8] Because of its early settlement, many of the township sections had already been sold or transferred to private ownership. The Utah Enabling Act made provisions for this by specifying that if any of the township sections had already been disposed of by Congress, the state would be entitled to other equivalent lands. These lands have become known as 'in-lieu" lands. Utah did not complete its in-lieu selections until after 1985 (Harmer 1990).

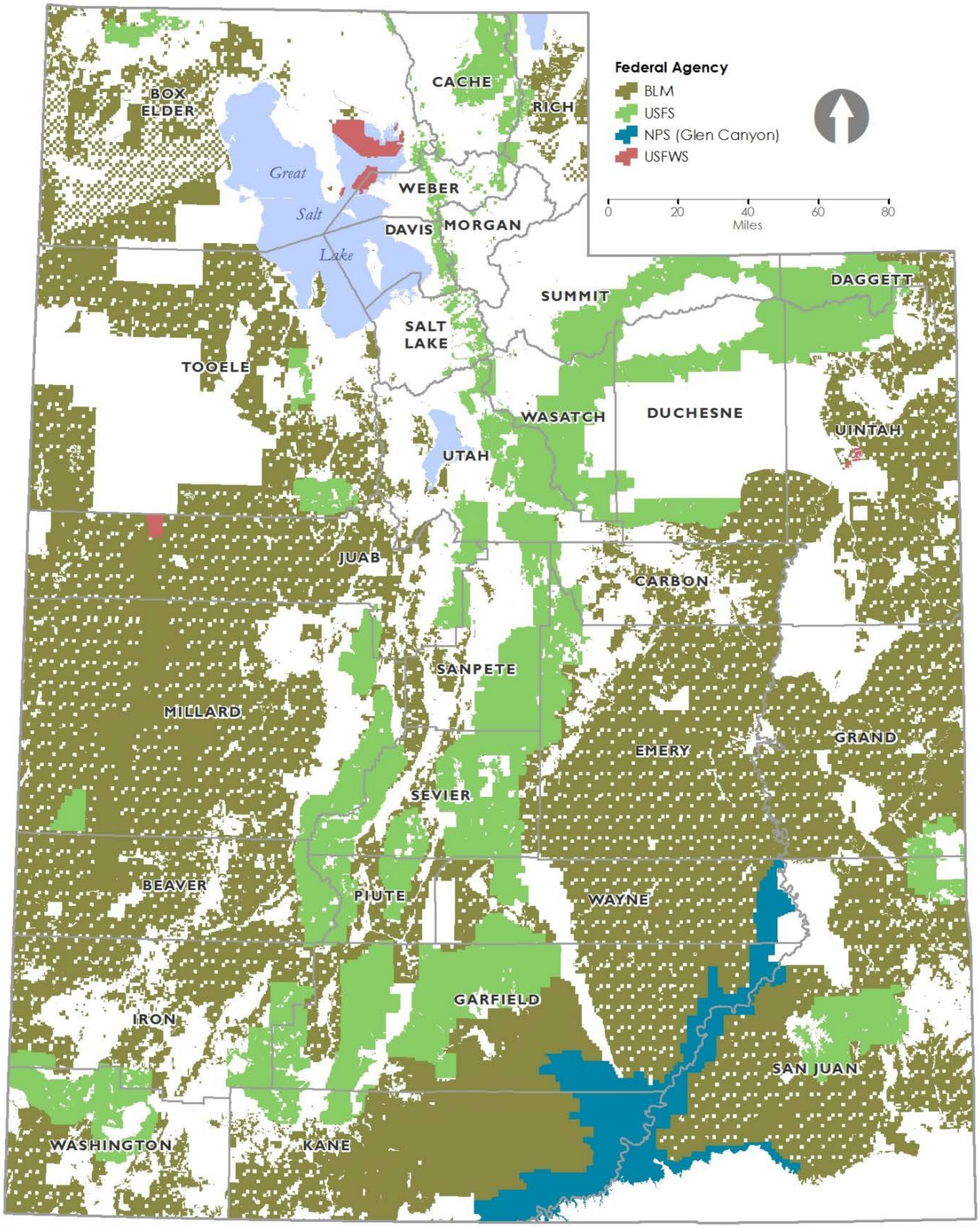
At the point government policy shifted to land retention, Utah was still a very young state and its lands, outside of the urban areas, were largely unclaimed.[9] Consequently, a large share of Utah's lands were retained by federal agencies—primarily the Bureau of Land Management, National Park Service and the U.S. Forest Service.

The present-day policy of federal land retention has been, and continues to be, controversial. It is within this context that Utah passed legislation in 2012 calling for the transfer of 31.2 million acres of federal lands to the state of Utah. H.B. 148, which enacted the Transfer of Public Lands Act (*Utah Code Ann.* 63L-6-101 to 104), "requires the United States to extinguish title to public lands and transfer title to those public lands to the state on or before December 31, 2014." "Public lands" are defined in the legislation as all federally owned lands in the state *except* the following: the national parks; all of the national monuments except Grand Staircase–Escalante, which is included in the transfer; the Golden Spike National Historic Site; designated Wilderness Areas; military lands; "real property or tangible personal property owned by the United States if the property is within the boundaries of a municipality"; and Indian tribal lands held in trust by the United States.[10] Figure 1.4 shows the extent of the lands to be transferred.

[9] When federal lands were allocated as school trust lands, the urban areas of Utah were largely settled and the relatively few acres of urban trust land were quickly sold. The result is that very few acres in the urban counties are trust land acres (Hedden and Bigler 2002).

[10] See Appendix H for the complete text of H.B. 148.

Figure 1.4
Federal Lands Called for in the Transfer of Public Lands Act



Source: State of Utah, SGID.

Map by John Downen, BEBR | October 2014

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2 MANAGEMENT OF UTAH'S LANDS

Utah's land ownership structure is similar to that of most western states—high levels of federally-controlled land intermingled with state and privately owned lands. Of Utah's 54.3 million acres, federal agencies manage 64.5 percent, or 35 million acres. Two of these agencies—the Bureau of Land Management (BLM) and U.S. Forest Service (Forest Service)—account for about 89 percent of the total. Other federal agencies with much smaller shares include National Park Service, Department of Defense, the U.S. Fish and Wildlife Service, the Department of Energy and the Bureau of Reclamation.

Fewer than 6 million acres of land in Utah are state owned and managed. Four agencies manage these lands—the Utah School and Institutional Trust Lands Administration (SITLA), the Utah Division of Forestry, Fire and State Lands (FFSL), the Utah Division of Wildlife Resources (DWR) and the Utah Division of State Parks and Recreation (SPR). Of these, SITLA manages the largest share, which is composed of trust lands granted to Utah by the federal government at statehood.

Twenty-one percent of lands are in private ownership (which includes county and municipal lands) and tribal lands account for 4.5 percent of the total (Table 2.1).

Under H.B. 148 most of the BLM and Forest Service lands would be transferred to the State of Utah. Land under the jurisdiction of the U.S. Fish and Wildlife Service (FWS) is also included in that bill as well as the Utah portion of the Glen Canyon National Recreation Area, now managed by the National Park Service. The transfer of these lands could have direct consequences for state land management agencies.

This chapter provides detailed operational information about the three of the four federal agencies that would be affected the land transfer. These include the BLM, Forest Service and the Fish and Wildlife Service. An operational overview of the Glen Canyon National Recreation Area is provided in Appendix A of this study.

Table 2.1
Utah Land Ownership, by Agency

Entity	Acres	Share
Federal	**35,019,955**	**64.5%**
Bureau of Land Management	22,803,707	42.0%
Forest Service	8,175,253	15.1%
National Park Service	2,096,702	3.9%
Department of Defense	1,812,561	3.3%
U.S. Fish and Wildlife Service	112,696	0.02%
All Other Federal	19,001	.003%
State	**5,419,281**	**10.0%**
School and Institutional Trust Lands	3,400,511	6.3%
Department of Natural Resources[1]	2,015,984	3.7%
Utah Department of Transportation	2,150	.004%
Other State	636	.001%
Private, County and Municipal	**11,428,135**	**21.0%**
Tribal	**2,448,616**	**4.5%**
Grand Total	**54,315,952**	**100%**

1. Includes acres managed by Forestry, Fire and State Lands, Division of Wildlife Resources, and Division of State Parks and Recreation.

Source: BEBR analysis of data from State of Utah, SGID.

An overview of state agencies that might be impacted by the land transfer, either because of budgetary effects or increased responsibilities, is also provided. These include SITLA, FFSL, DWR and SPR.

2.1 FEDERAL LAND MANAGEMENT

This analysis focuses on the Utah operations of the BLM, Forest Service and the FWS. An operational overview of the Glen Canyon National Recreation Area is provided in Appendix A.

2.1.1 Bureau of Land Management

Overview

The Bureau of Land Management (BLM) is an agency within the U.S. Department of the Interior created in 1946 by merging two agencies—the General Land Office established by Congress in 1812 to help convey western lands to settlers, and the U.S. Grazing Service established in 1934 to manage grazing on public lands. Most of the public lands managed by BLM were once part of the approximately 1.8 billion acres of public domain lands acquired by the federal government between 1781 and 1867 (CRS 2004).

Nationally, the BLM manages 247 million surface acres, primarily in 11 western states (including Alaska), and 700 million acres of federal mineral estate. In addition, the agency manages mineral operations and cadastral surveying on 56 million acres of Indian Trust Lands. In total, the BLM oversees 13 percent of the surface land in the United States.

Funding for BLM is provided through discretionary and mandatory appropriations. Discretionary appropriations require annual Congressional approval and come to the BLM through the annual Interior, Environment, and Related Agencies appropriations bill. Mandatory appropriations (also called permanent funds) are authorized under permanent existing laws and bypass the annual Congressional appropriations process. Mandatory appropriations come from trust funds that include money contributed to the BLM from non-federal sources; permanent operating funds that include offsetting collections such as recreation fees and timber and forest product sales; and fees, reimbursements and forfeitures collected for various BLM-provided services.

In the BLM's FY2015 Budget Justification and Performance Information report, the agency has proposed three new user fees, including new fees for onshore oil and gas inspections and on non-producing oil and gas leases; an abandoned mine lands (AML) fee on hard rock production; and a grazing permit management fee.[11] The budget also supports the continuation of the APD fee and recreation fees authorized in the Federal Lands Recreation Enhancement Act of 2004.

Management Authority

The BLM administers public lands within a framework of numerous laws, the most important being the Federal Land Policy and Management Act of 1976, or FLPMA. With FLPMA, Congress formally established a policy of retaining public lands in federal ownership and articulated BLM's responsibilities with respect to managing public domain lands. A key provision of FLPMA requires that BLM manage public lands on the basis of multiple use and sustained yield (MUSY), unless otherwise specified by law.[12]

[11] United States Department of the Interior, *Budget Justifications and Performance Information, Fiscal Year 2015*, Bureau of Land Management.

[12] The term "multiple use" is defined in section 103 of FLMPA as "the management of the public lands and their various resource values so that they are utilized in the combination that will best meet the present and future needs of the American people."

Land use plans developed by the BLM are the mechanisms by which MUSY is put into practice. The agency is legally required to inventory its lands then develop, maintain and revise land use plans for specific areas and tracts within areas. These plans, known as Resource Management Plans (RMPs), specify how and for what purposes lands will be used. The development of the RMP allows for, and incorporates extensive public involvement and typically requires a significant amount of agency resources and takes many years to complete. Based on the RMP, not all lands are open for all uses. Depending on the area, some public lands are withdrawn from one or more uses or managed for a predominant use.[13]

In 2010, BLM implemented oil and gas leasing reforms by adding another planning level in its oil, gas and other mineral development management.[14] Under these reforms, BLM conducts an in-depth review of areas within RMPs that are, or may be, opened to leasing. These areas are identified within Master Leasing Plans (MLPs). Typically, the development of an MLP does not require a full RMP revision, because it focuses only on issues pertaining to oil, gas and other mineral leasing and development in the planning area.

The purpose of an MLP is to plan for resource development in a defined area containing high-level potential resources. From an agency perspective, master lease planning is a systematic, efficient approach to offering leases in areas deemed suitable for oil and gas development in a consolidated manner, rather than on a lease-by-lease basis. In contrast, some voices from industry and local government believe the master lease planning process undermines the extensive analysis already completed in the RMP, resulting in unwarranted delays and possible removal of lands from oil and gas development that were allowed under the original RMP (Stevens 2014).

Regardless of the intent, developing MLPs requires agency resources it may not have. In 2013, the Utah office of BLM determined that MLP development required extensive personnel time and expensive outside contracts. As a result, Utah BLM Director Juan Palma announced that the Utah office would not be completing MLPs in the foreseeable future (Palma 2013). Oil, gas and mineral development could be postponed indefinitely on Utah lands that have already been approved for development.[15]

Bureau of Land Management Operations in Utah

The BLM is the primary land manager in Utah, overseeing 22.8 million surface acres—about 42 percent of the land area in the state. Of this, 260,356 acres are designated Wilderness Areas. In addition to managing surface acres, BLM is also responsible for approximately 35.2 million acres of federal subsurface mineral resources (34 million federal mineral acres and 1.2 million acres of federal mineral rights under private surface lands).[16] Figure 2.1 shows BLM's landholdings in Utah.

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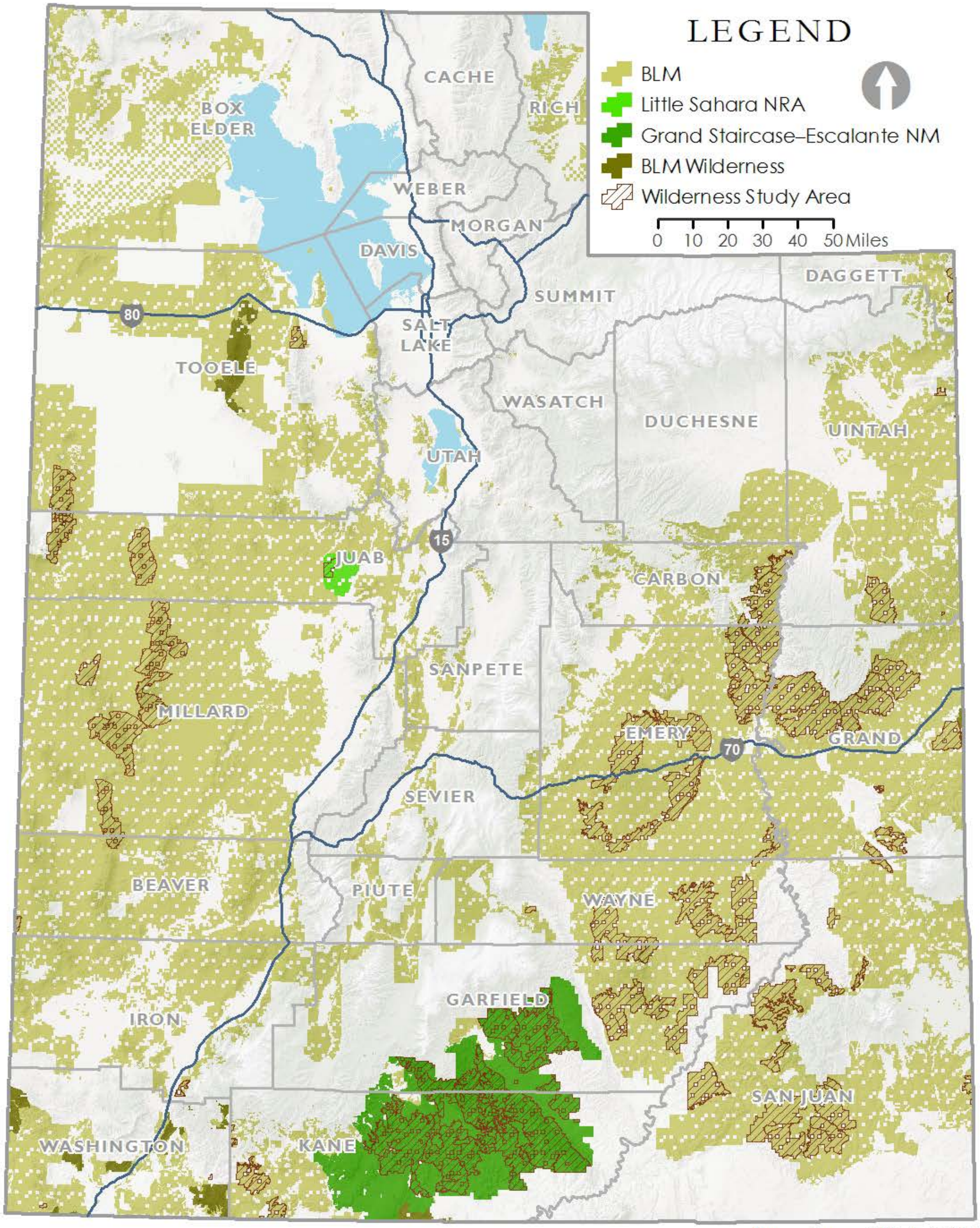
[13] Section 102 of FLMPA allows "the use of some lands for less than all of the resources; a combination of balanced and diverse use that takes into account the long-term needs of future generations for renewable and non-renewable resources, including, but not limited to, recreation, range, timber, minerals, watershed, wildlife and fish, and natural scenic, scientific and historical values."

[14] The Master Leasing Plan Policy was initiated in May 2012 through the Bureau of Land Management Washington Office's Oil and Gas Leasing Reform Instruction Memorandum 2010-117.

[15] The May 2010 Instruction Memorandum, among other things, authorized deferrals of lease nominations pending the completion of a Master Lease Plan.

[16] U.S. Department of the Interior, Bureau of Land Management, *Public Land Statistics, 2012*. Accessed at: www.blm.gov/public_land_statistics/pls12/pls12.pdf.

Figure 2.1
BLM Land Ownership in Utah



Map by John Downen, BEBR | August 2014

Source: State of Utah, SGID.

BLM operations in Utah are structured into four districts: Canyon Country District in Moab, Color Country District in Cedar City, Green River District in Vernal, and West Desert District in West Valley City. Within each of these districts are field offices and resource management areas. The Canyon Country District includes the Moab and Monticello field offices. Color Country includes the Cedar City, Kanab, Richfield and St. George field offices, as well as the Henry Mountains Field Station. The Green River District includes the Price and Vernal field offices. The West Desert District includes the Fillmore and Salt Lake field offices. BLM Utah also manages the Grand Staircase–Escalante National Monument. BLM Utah headquarters are located in Salt Lake City.

Landholdings by County

More than half of all BLM lands in Utah are located in six counties—Emery, Grand, Kane, Millard, San Juan and Tooele. Of these, only Tooele County is located within the Wasatch Front region. The remaining five, and most counties with large tracts of federal land, are located in Utah's rural areas.

As highlighted in Table 2-2, BLM lands make up more than 50 percent of total surface acres in seven Utah counties, including Beaver, Emery, Grand, Juab, Kane, Millard, and Wayne.

Table 2.2
Bureau of Land Management
Surface Acres, by County, 2013

County	BLM Acres	Share of County	County	BLM Acres	Share of County
Beaver	1,137,227	68.7%	Piute	165,920	33.8%
Box Elder	1,078,904	25.1%	Rich	171,472	24.7%
Cache	131	0.02%	Salt Lake	1,972	0.38%
Carbon	420,837	44.3%	San Juan	2,077,713	40.9%
Daggett	113,056	24.6%	Sanpete	135,039	13.2%
Davis	280	0.07%	Sevier	205,191	16.7%
Duchesne	208,086	10.0%	Summit	703	0.06%
Emery	2,063,025	72.1%	Tooele	1,905,632	40.9%
Garfield	1,491,292	44.7%	Uintah	1,373,301	47.6%
Grand	1,550,472	65.8%	Utah	104,263	7.6%
Iron	964,964	45.7%	Wasatch	1,904	0.25%
Juab	1,439,348	66.0%	Washington	634,215	40.8%
Kane	1,653,300	62.9%	Wayne	892,001	56.5%
Millard	3,012,299	68.8%	Weber	41	0.01%
Morgan	888	0.2%	**State Total**	**22,809,046**	**42.0%**

Source: BEBR analysis of data from the State of Utah, SGID.

Revenues

From FY2008 to FY2012, activities on lands managed by the BLM generated a total of almost $1.6 billion, or $317.6 million annually. This translates to almost $14 per acre.[17] After a sharp decline in 2009, revenues increased steadily, reaching $339.1 million in 2012—the highest level in the five-year study period.

[17] The estimate of revenue per acre is based only on BLM's surface acres.

Revenue from activities on Utah lands is collected by both the BLM and the Office of Natural Resources Revenue (ONRR), a separate division in the Department of the Interior. BLM collects permit and fee revenue, while payments for energy and mineral production are remitted directly to ONRR. Table 2.3 shows revenue collected by both BLM and ONRR since FY2008.

In FY2012, BLM's revenue collections totaled $8.6 million, a decline of $1.4 million over the previous year. From 2008 to 2012, annual revenues averaged $7.8 million. Revenue collected directly by the agency comes primarily from recreation fees and right-of-way rents. Combined, these two sources typically account for 60 percent or more of the annual revenue collected directly by the BLM.

The BLM also collects money (primarily in the form of reimbursement) for activities not shown in Table 2.3. This includes, among other things, work performed under contract to other federal agencies, payments for fire work performed on state and private lands, fire trespass collections (money collected from individuals for human-caused fires on BLM lands), money received through surface charges and forfeitures, APD mining fees, and Mining Law fees. This information is not available from public sources and was not provided by the BLM. However, revenue from these accounts is used by the BLM to fund its operations. Based on expenditure information provided by the agency, approximately 12 percent of all spending by the Utah BLM comes from these sources.

Most revenue generated on BLM lands comes from energy and mineral production. While the BLM administers the "in-field" aspects of onshore federal energy and mineral resources for its lands and those of the Forest Service, payments generated from production are remitted directly to ONRR, which is responsible for collection and disbursement.

In FY2012, ONRR collected nearly $330.5 million in bonuses, rents and royalties for mineral production on BLM and Forest Service lands in Utah. From FY2008 through FY2012, energy and mineral production generated $1.5 billion in revenue, for an average of $309.7 million annually. Oil and gas royalties account for the largest share—58 percent in fiscal year 2012 and 71 percent of the five-year average. Approximately half of the revenue generated on non-tribal lands in Utah is returned to the state.

Table 2.3
Bureau of Land Management
Revenue Generated on Federals Lands Managed by the BLM in Utah, FY2008–FY2012

Revenue Collected by the Bureau of Land Management						
Revenue Source	**FY2008**	**FY2009**	**FY2010**	**FY2011**	**FY2012**	**Mean**
Mineral Leases/Permits[1]	$334,162	$713,709	$470,900	$1,392,958	$743,399	$731,026
Timber Sales[2]	$5,250	$4,909	$14,423	$15,714	$12,701	$10,599
Land and Materials Sales	$605,657	$667,956	$665,595	$1,234,071	$690,381	$772,732
Grazing Permit fees	$1,005,339	$1,008,107	$1,059,476	$1,060,156	$1,139,825	$1,054,581
Fees and Commissions	$2,441	$3,764	$2,213	$1,975	$2,563	$2,591
Right-of-Way Rents	$1,061,757	$1,873,063	$2,785,579	$3,413,346	$2,933,515	$2,413,452
Land Rent	$17,171	$17,674	$15,571	$25,578	$20,263	$19,251
Recreation Fees	$2,835,216	$2,948,746	$2,738,602	$2,863,376	$3,061,573	$2,889,503
Other Sources[3]	$5,810	$3,340	$246	$33,892	$11,162	$10,890
Total BLM Collections	**$5,872,803**	**$7,214,268**	**$7,252,605**	**$10,041,066**	**8,615,382**	**$7,844,625**
Revenue Collected by the Office of Natural Resources Revenue						
Revenue Source	**FY2008**	**FY2009**	**FY2010**	**FY2011**	**FY2012**	**Mean**
Royalties Total	**$337,385,326**	**$231,359,959**	**$276,049,671**	**$274,176,905**	**$296,202,054**	**$283,034,783**
Gas	$198,130,612	$121,011,854	$132,263,281	$116,760,682	$90,186,156	$131,670,517
Oil	$106,789,117	$75,585,766	$95,036,587	$107,273,692	$112,866,462	$99,510,325
Coal	$22,955,578	$20,585,766	$28,332,372	$18,175,580	$35,984,973	$25,206,854
Natural Gas Liquids	$7,983,995	$11,435,223	$18,435,396	$28,667,996	$33,563,440	$20,017,210
Other Products[4]	$1,526,025	$2,439,860	$1,982,035	$3,298,956	$3,700,028	$2,589,381
Bonus Payments Total	**$17,933,232**	**$10,026,691**	**$11,711,885**	**$21,137,120**	**$50,734,617**	**$22,308,709**
Oil & Gas	$17,271,252	$693,126	$10,633,411	$-830,577	$50,204,297	$15,594,302
Coal	$66,1981	$582,800	$663,440	$1,004,920	$530,320	$688,692
Other Products[5]	0	$8,750,765	$415,034	$20,962,777	0	$6,025,715
Rents Total	**$6,985,505**	**$5,869,284**	**$5,915,435**	**$5,606,224**	**$5,101,091**	**$5,895,508**
Oil & Gas	$6,672,093	$5,452,366	$5,258,485	$4,844,705	$4,372,947	$5,320,119
Coal	$243,489	$166,761	$230,779	$278,101	$260,391	$235,904
Geothermal	$21,694	$218,167	$393,972	$423,582	$400,393	$291,562
Other Products[6]	$48,229	$31,990	$32,199	$59,756	$67,360	$47,907
Other Revenues[7] Total	**$15,338,225**	**$-10,251,182**	**$5,494,111**	**$3,428,438**	**$-1,640,146**	**$2,473,889**
Oil & Gas	$15,306,541	$-10,269,146	$5,464,705	$3,202,393	$-1,706,057	$2,399,687
Coal	0	$16,127	0	$191,616	$43,455	$50,240
Other Products[8] Total	$31,683	$1,837	$29,406	$34,429	$22,456	$23,962
Total ONRR	**$377,642,287**	**$237,004,752**	**$299,171,102**	**$304,348,687**	**$330,496,620**	**$309,732,690**
Grand Total All Revenue	**$383,515,090**	**$244,246,020**	**$306,623,707**	**$314,389,753**	**$339,112,002**	**$317,577,314**
Number of Acres Managed	**22,856,673**	**22,856,155**	**22,854,937**	**22,854,632**	**22,854,555**	**22,855,390**
Revenue per Acre	**$16.78**	**$10.69**	**$13.42**	**$13.76**	**$14.84**	**$13.90**

Note: Excludes production on tribal lands.
1 Amount includes first-year bonus bids and rents on oil and gas leases. All subsequent rents and royalties are collected by ONRR.
2 Amount includes receipts from fuel wood, posts, poles and other wood products
3 Amount includes receipts from fines, penalties, service charges, recovery fees and interest.
4 Amount includes carbon dioxide, clay, geothermal, magnesium chloride, potash and salt.
5 Amount includes geothermal, gilsonite, and potassium.
6 Amount includes clay, gilsonite, hard rock, limestone, oil shale, phosphate, potassium, sodium and tar sands.
7 The main components of "other revenues" are minimum royalty payments, estimated royalty payments, settlement agreements, and interest.
8 Amount includes clay, hard rock, geothermal, gilsonite, phosphate, and potassium.

Source: U.S. Department of the Interior, Office of Natural Resources Revenue, www.statistics.onnr.gov/ReportTool.sapx and Bureau of Land Management, Utah Office, FOIA request, 2013.

Spending

BLM funds its activities with Congressional appropriations, permanent operating funds, grants, offsetting collections and fees, and reimbursements. These funds constitute BLM's budget authority. In FY2012, BLM's budget authority for Utah was $142.9 million. This analysis is based on BLM's *actual* annual spending as opposed to the annual budget appropriations which can be obligated to fund projects over multiple years.

In 2012, BLM Utah spent nearly $120 million to manage lands in Utah. Of this amount, BEBR estimates that $14.8 million, or 12 percent came from fees, reimbursements and offsetting collections. Spending in FY2012 was only slightly higher than the 10-year average of $118.6 million, which was buoyed by high wildfire management costs in 2007 and 2008, and $33.5 million in American Recovery and Reinvestment Act funds in 2009 and 2010. Between FY2003 and FY2012, BLM spent, on average, $5.19 per acre to manage its lands (Table 2.4).[18] p

Table 2.4
Bureau of Land Management
Spending to Manage Utah Lands, FY2003–FY2012
(Dollars in Millions)

Fiscal Year	FTE Employment	Payroll	Nonpayroll	Total Spending	Spending per Acre
2003	895	$53,279,254	$53,860,846	$107,140,100	$4.69
2004	881	$54,657,801	$44,870,746	$99,528,547	$4.35
2005	863	$56,991,009	$50,077,666	$107,068,675	$4.68
2006	866	$59,722,758	$55,119,104	$114,841,862	$5.02
2007	866	$61,969,141	$71,660,777	$133,629,918	$5.85
2008	849	$61,368,987	$69,942,950	$131,311,937	$5.75
2009	785	$64,936,023	$48,382,863	$113,318,886	$4.96
2010	793	$66,660,320	$74,296,306	$140,956,626	$6.17
2011	777	$68,554,331	$50,013,769	$118,568,100	$5.19
2012	774	$69,198,294	$50,776,560	$119,974,854	$5.25
Mean	835	$61,733,792	$56,900,159	$118,633,951	$5.19

Source: Bureau of Land Management, Utah office. FOIA request, 2013.

Over the past decade, payroll has been increasing as a share of total spending. Of the $120 million spent to manage Utah lands, payroll costs accounted for 58 percent in FY2012, up from just 50 percent in FY2003. Over the same period, FTE employment dropped by more than 100 people. This decline coincides with the consolidation of certain activities into the National Operations Center in Denver, Colorado, which opened in 2007.

The spending spikes in fiscal years 2007, 2008 and 2010 shown in Table 2.4 were the result of spending for wildfire emergency stabilization and American Recovery and Reinvestment Act (ARRA) funding. From 2009 through 2011, BLM received and spent a total of $33.5 million in ARRA funds. Without these funds, spending in FY2009 would have been at virtually the same level as the amount spent in FY2003. During FY2007 and 2008, BLM spent a total of $43 million for emergency stabilization efforts to address the effects of wildfires that occurred in 2005 and 2006. Although wildfire management (WFM) is a fact of life in managing public lands, funding to manage public lands and the resources on those lands, exclusive of WFM expenditures,

[18] The information presented in Table 2.3 includes only the localized land management costs. It does not include costs borne by ONRR. Also not shown are operational costs associated with the BLM's Washington Office or the National Operations Center in Denver, Colorado, which provides Bureau-wide operational and technical support in human resources, information technology, geospatial services, finance and acquisition. While this analysis has not included the costs associated with BLM agencies located outside Utah, for perspective, in FY2012 ONRR's budget was $119.6 million. The agency collected $12 billion in payments; of which Utah's portion, excluding production on tribal lands, was $330.5 million, or 2.75 percent. In FY2007, NOC's budget was $50 million, according to information on the BLM Denver website.

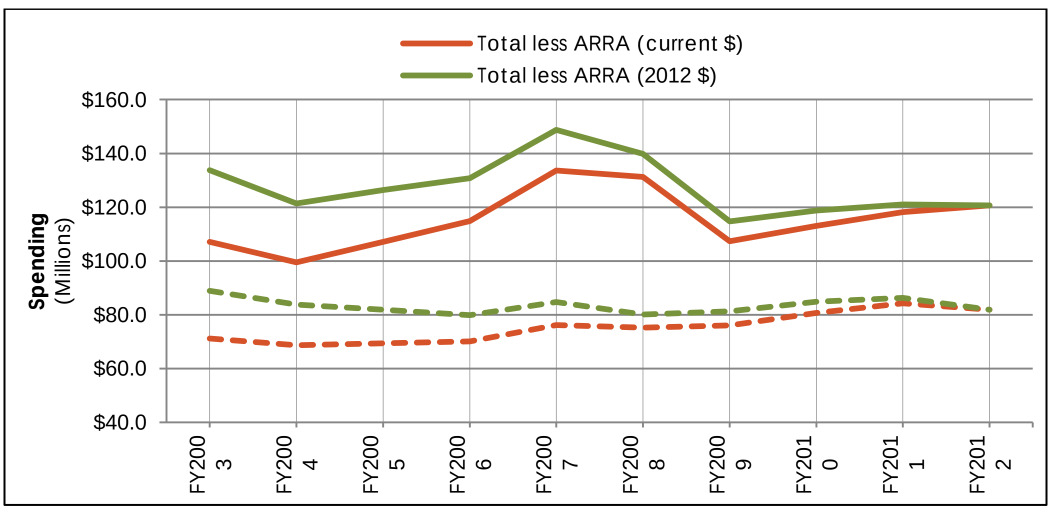
has not kept pace with inflation. Adjusting for inflation and WFM, spending to manage Utah's rangelands has been trending downward, hitting a 10-year low in 2012. The effects of wildfire management and inflation on BLM spending in Utah from FY2003 to 2012 are shown in Table 2.5 and displayed graphically in Figure 2.2.

Table 2.5
Bureau of Land Management Spending Adjusted for Inflation and Wildfire Management

Fiscal Year	Total Spending current dollars	Total Spending 2012 dollars	Total Less ARRA and WFM current dollars	Total Less ARRA and WFM 2012 dollars
2003	$107,140,100	$133,705,696	$71,209,141	$88,865,586
2004	$99,528,547	$121,356,846	$68,687,804	83,752,205
2005	$107,068,675	$126,435,102	$69,371,568	81,919,397
2006	$114,841,862	$130,814,384	$70,129,721	79,883,556
2007	$133,629,918	$148,730,815	$76,131,803	84,735,105
2008	$131,311,937	$139,882,413	$75,201,035	80,109,261
2009	$113,318,886	$121,110,222	$76,069,330	81,299,541
2010	$140,956,626	$148,153,583	$80,717,084	84,838,333
2011	$118,568,100	$121,427,727	$84,264,168	86,303,731
2012	$119,974,854	$119,874,854	$81,808,982	81,808,982

Notes: The inflation-adjusted spending was estimated using consumer price index data published by the U.S. Department of Labor, Bureau of Labor Statistics, available at www.BLS.gov.
Source: BEBR calculations.

Figure 2.2
Bureau of Land Management Utah Spending Analysis



Note: ARRA = American Recovery and Reinvestment Act funds. WFM = Wildfire Management.
Source: BEBR calculations.

BLM's detailed spending by primary accounts and subprograms for fiscal years 2008 to 2012 is shown in Table 2.6. To provide a contextual reference to the potential costs and liabilities the state might face in managing these lands under the land transfer, a discussion of selected subprograms and crosscutting activities (activities that are part of several subprograms) follows Table 2.6. These include: wildfire management, spending for infrastructure and maintenance, the Wild Horses and Burros program, recreation, grazing, oil and gas production, coal leasing, and abandoned mine lands.

Table 2.6
Bureau of Land Management, Utah Office, Expenditures to Manage Lands in Utah, FY2009–FY2012

Program and Subprogram	FY2008	FY2009	FY2010	FY2011	FY2012	Mean
Land Resources Management Program Total	**$18,867,167**	**$17,192,596**	**19,009,387**	**$23,148,828**	**$20,861,278**	**$19,815,851**
Soil, Water and Air Management Total	**$3,367,048**	**$2,926,998**	**$3,901,758**	**$4,575,650**	**$3,601,630**	**$3,674,617**
Rangeland Management	$7,129,770	$6,295,811	$6,530,364	$7,048,235	$7,310,375	$6,862,911
Resource Development and Protection funds	*$540,848*	*$263,413*	*$925,979*	*$1,989,000*	*$1,606,995*	$1,065,247
Range Improvement Fund	*$1,077,621*	*$538,555*	*$457,627*	*$738,639*	*$591,917*	$680,872
Rangeland Management Total	**$8,748,239**	**$7,097,779**	**$7,913,970**	**$9,775,874**	**$9,509,287**	**$8,609,030**
Public Domain Forest Management	$431,602	$397,551	$364,960	$361,698	$368,192	$384,801
Forest Ecosystem Health and Recovery	*$243,644*	*$125,267*	*$193,940*	*$169,452*	*$134,150*	$173,291
Public Domain Forest Management Total	**$675,246**	**$522,818**	**$558,900**	**$531,150**	**$502,342**	**$558,091**
Riparian Management Total	**$1,906,017**	**$1,473,499**	**$1531,540**	**$1,362,196**	**$1,465,045**	**$1,547,649**
Cultural Resources Management Total	**$1,706,951**	**$1,677,050**	**$1,450,887**	**$1,357,973**	**$1,325,577**	**$1,503,688**
Wild Horses and Burros Management	$2,441,426	$3,479,649	$3,627,869	$5,545,301	$4,457,397	$3,910,328
Adoption-A-Horse fund	*$22,240*	*0*	*0*	*0*	*0*	$4,448
Wild Horses and Burros Management Total	**$2,463,666**	**$3,479,649**	**$3,627,869**	**$5,545,301**	**$4,457,397**	**$3,914,776**
Mormon Grasshopper and Cricket control Total	**0**	**$14,853**	**$24,463**	**684**	**0**	**$8,000**
Wildlife and Fisheries Management Program Total	**$5,427,013**	**$5,216,414**	**$5,595,814**	**$5,329,679**	**$5,251,125**	**$5,364,009**
Wildlife Management Total	**$2,329,758**	**$2,523,712**	**$2,642,972**	**$2,422,213**	**2,470,489**	**$2,477,829**
Fisheries Management Total	**$557,468**	**$526,535**	**$607.710**	**$525,665**	**$474,548**	**$538,385**
Threatened and Endangered Species Program Total	**$2,539,787**	**$2,166,167**	**$2,345,132**	**$2,381,801**	**$2,306,088**	**$2,347,795**
Recreation Management Program Total	**$8,230,900**	**$7,495,840**	**$7,658,685**	**$8,258,082**	**$8,003,079**	**$7,929,317**
Wilderness Management Total	**$1,361,444**	**$1,449,692**	**$1,533,060**	**$1,773,538**	**$1,528,060**	**$1,529,159**
Recreation Resources Management	$4,482,073	$3,033,306	$3,340,043	$3,364,009	$3,335,679	$3,511,022
Recreation Demonstration Fee Program funds	*$2,333,073*	*$2,909,956*	*$2,609,679*	*$3,008,668*	*$2,991,587*	$2,770,593
Other permanent funds/collection account funds	*$54,310*	*$102,885*	*$175,903*	*$111,867*	*$147,753*	$118,544
Recreation Resources Management Total	**$6,869,456**	**$6,046,148**	**$6,125,625**	**$6,484,544**	**$6,475,019**	**$6,400,158**
Energy and Minerals Management Program Total	**$13,200,082**	**$14,455,772**	**$16,269,435**	**$14,757,603**	**$13,025,502**	**$14,341,679**
Oil and Gas Management	$6,046,692	$5,171,745	$3,639,041	$3,830,835	$4,548,556	$4,647,374
APD Processing Fees	*$2,088,068*	*$2,830,984*	*$5,847,986*	*$5,808,470*	*$4,074,712*	$4,130,044
Other energy fee-based collection account funds	*$230,560*	*$317,067*	*$78,011*	*$46,859*	*$6,547*	$135,827
APD Permit Processing Fund	*$2,323,012*	*$2,503,160*	*$1,494,481*	*$2,338,197*	*$1,698,433*	$2,071,457
Geothermal Steam Account Fund	*$135,532*	*$316,821*	*$259,875*	*$240,513*	*$121,555*	$214,859
Oil and Gas Management Total	**$10,823,864**	**$11,139,777**	**$11,319,483**	**$12,264,874**	**$10,449.803**	**$11,199,560**
Coal Managementp*Other energy fee-based*	$1,453,401	$1,532,281	$1,463,733	$1,442,250	$1,166,584	$1,411,650
collection account funds	*0*	*$33,610*	*$8,489*	*$21,945*	*$34,247*	$19,658
Coal Management Total	**$1,453,401**	**$1,565,891**	**$1,472,222**	**$1,464,195**	**$1,200,831**	**$1,431,308**
Other Mineral Resources Management	$922,817	$837,669	$927,389	$856,847	$867,398	$882,424
Energy and Minerals Case Charges	*0*	*$13,007*	*$26315*	*$105,443*	*$11,992*	$31,351
Other Minerals Resources Management Total	**$922,817**	**$850,676**	**$953,704**	**$962,290**	**$879,390**	**$913,775**
Total Renewable Energy Total	**0**	**$899,428**	**$2,524,026**	**$66,244**	**$495,478**	**$797,035**
Realty and Ownership Management Program Total	**$4,901,867**	**$7,550,086**	**$6,384,744**	**$5,467,466**	**$4,693,221**	**$5,799,477**
Cadastral Survey	$1,010,732	$1,465,767	$1,040,071	$798,886	$745,604	$1,012,212
Cadastral Reimbursements	*$554,884*	*$944,760*	$455,337	*$608,931*	*$533,266*	$619,436
Right-of-Way Process Fees	*$375,363*	*$603,115*	$1,238,735	*$966,458*	*$710,080*	$778,750
Cadastral Survey Total	**$1,940,979**	**$3,013,642**	**$2,734,143**	**$2,374,275**	**$1,988,950**	**$2,410,398**
Land and Realty Management	$2,863,283	$2,763,590	$3,533,189	$3,038,189	$2,634,382	$2,966,527
Land Acquisition LWCF	*0*	*$1,681,413*	0	*0*	*0*	$336,283
Acquisition Management Fee	*$72,781*	*$87,799*	$67,069	*$50,351*	*$53,984*	$66,397
Lease Permit Easement /Conveyance Fee funds	*$24,824*	*$3,642*	$50,343	*$4,651*	*$15,905*	$19,873
Land and Realty Management Total	**$2,960,888**	**$4,536,444**	**$3,650,601**	**$3,093,191**	**$2,704,271**	**$3,389,079**
Communications Site Management Program Total	**$137,303**	**$83,175**	**$94,206**	**$103,528**	**$154,598**	**$114,562**
Resource Protection and Management Program Total	**$4,858,326**	**$3,345,706**	**$4,927,754**	**$3,648,542**	**$4,985,225**	**$4,353,111**
Resource Management Planning Total	**$3,730,368**	**$2,279,006**	**$2,684,413**	**$2,414,080**	**$2,117,817**	**$2,645,137**
Abandoned Mine Lands	0	0	0	0	$1,617,717	$323,543
ARRA funding support	*0*	*0*	*$796,907*	*0*	*0*	$159,381
Abandoned Mine Lands Total	**0**	**0**	**$796,907**	**0**	**$1,617,717**	**$482,925**

(continued)

Table 2.6
Bureau of Land Management, Utah Office, Expenditures to Manage Lands in Utah, FY2009–FY2012

Program and Subprogram	FY2008	FY2009	FY2010	FY2011	FY2012	Mean
Law Enforcement Total	**$240,069**	**$235,066**	**$509,309**	**$462,125**	**$449,781**	**$379,270**
Hazardous Materials Management	$880,173	$774,628	$783,155	$774,312	$797,935	$802,041
Hazardous Materials Control	*$7,716*	*$57,006*	*$153,969*	*-$1,975*	*$1,975*	$43,738
Hazardous Materials Management Total	**$887,889**	**$831,634**	**$937,125**	**$772,337**	**$799,910**	**$845,779**
Transportation and Facilities Management Program Total	**$5,490,837**	**$7,797,752**	**$24,874,089**	**$4,545,861**	**$4,150,637**	**$9,371,835**
Annual Maintenance and Operations	$3,327,249	$2,873,943	$3,084,758	$3,190,612	$3,554,536	$3,186,222
Quarters Maintenance Collections	*$27,816*	*$12,572*	*$83,017*	*$26,652*	*$17,981*	$33,608
Road Maintenance, Public Domain Lands	*$28,902*	*$10,351*	*$1,647*	*1,699*	*$2,593*	$9,038
Total Annual Maintenance and Operations	**$3,283,967**	**$2,896,867**	**$3,169,422**	**$3,218,963**	**$3,575,110**	**$3,228,866**
Deferred Maintenance	$2,206,870	$588,423	$725,044	$1,273,100	$575,527	$1,073,793
ARRA funding support	*0*	*$4,312,462*	*$20,979,623*	*$53,798*	*0*	$5,069,177
Total Deferred Maintenance	**$2,206,870**	**$4,900,885**	**$21,704,667**	**$1,326,898**	**$575,527**	**$6,142,969**
National Landscape Conservation System Program Total	**0**	**$5,306,323**	**$5,772,466**	**$5,870,312**	**$5,726,018**	**$4,535,024**
Challenge Cost Share Program Total	**$1,223,079**	**$809,483**	**$841,908**	**$130,307**	**$708,124**	**$742,580**
Workforce and Organization Support Program Total	**$8,102,903**	**$8,204,244**	**$10,970,002**	**$9,420,688**	**$9,524,798**	**$9,424,527**
IT Support Total	**$313,259**	**$276,511**	**$254,110**	**$277,267**	**$264,085**	**$277,066**
Administrative Support	$1,894,349	$1,780,282	$1,893,306	$1,864,086	$1,758,377	$1,838,080
ARRA funding support	*0*	*$20,927*	*$106,831*	*0*	*0*	$25,552
Total Administrative Support	***$1,894,349***	**$1,801,210**	**$2,000,137**	**$1,864,086**	**$1,758,377**	**$1,863,632**
Bureau-wide Fixed Costs Total	**$2,707,756**	**$3,191,179**	**$3,168,397**	**$2,939,352**	**$3,976,871**	**$3,196,711**
Motorized Fleet Charges Total	**$3,015,959**	**$2,692,281**	**$5,160,438**	**$4,081,506**	**$3,194,406**	$3,628,918
Reimbursable Activities	**$171,580**	**$243,064**	**$386,820**	**$258,477**	**$331,059**	**$278,200**
Mining Law Administration Program Total	**$2,421,262**	**$2,450,501**	**$2,615,517**	**$2,625,782**	**$2,505,507**	**$2,523,713**
Construction Management Program Total	**$1,131,083**	**$310,543**	**$307,739**	**$185,131**	**$1,132,467**	**$612,793**
Wildfire Management Program Total	**$56,110,892**	**$31,293,367**	**$32,297,564**	**$33,942,427**	**$38,913,606**	**$38,687,771**
Fire Preparedness Activities	$9,245,345	$8,763,807	$8,955,673	$9,035,492	$8,869,642	$8,973,992
Fire Preparedness Reimbursements	*$166,062*	*$466,995*	*$586,151*	*$9,303*	*$515,284*	*$344,759*
Fire Preparedness Total	**$9,411,407**	**$9,210,802**	**$9,541,824**	**$9,044,795**	**$9,384,926**	**$9,318,751**
Suppression/ Severity Total	**$9,017,968**	**$7,747,275**	**$6,893,787**	**$12,356,914**	**$13,294,877**	**$9,862,164**
Emergency Stabilization Total	**$23,292,708**	**$2,352,167**	**$2,575,476**	**$627,984**	**$1,751,320**	**$6,119,931**
Hazardous Fuels Treatments	$10,965,544	$10,142,366	$10,710,142	$10,092,311	$10,638,421	$10,509,757
ARRA funding support	*0*	*$347,468*	*$416,600*	*0*	*0*	*$152,814*
Hazardous Fuels Treatments Total	**$10,965,544**	**$10,489,834**	**$11,126,742**	**$10,092,311**	**$10,638,421**	**$10,662,570**
Fire Facilities Maintenance and Construction	$14,897	$404,310	$314,000	$1,600,000	$966,020	$659,845
Fire Program Reimbursements	$155,635	$35,604	-$13,485	$9,036	$29,465	$43,251
Fire Assistance Reimbursement	$69,346	0	$9,983	$108,636	-$1,860	$37,221
Fire Reimbursements Total	$224,981	$35,604	-$3,502	$117,672	$27,605	$80,472
Rural Fire Assistance Total	**$455,000**	**$381,000**	**$500,000**	**0**	**0**	**$443,400**
Burned Area Rehabilitation Total	**$2,728,387**	**$672,375**	**$1,349,237**	**$102,751**	**$2,850,437**	**$1,540,637**
Other Activities, including ARRA and ARRA adjustments	**$1,209,223**	**$1,807,083**	**$3,337,316**	**$1,133,865**	**$339,399**	**$1,565,977**
Grand Totals	**$131,311,937**	**$113,318,885**	**$140,956,626**	**$118,568,100**	**$119,974,854**	**$124,826,026**
Surface acres managed	**22,856,673**	**22,856,155**	**22,854,937**	**22,854,632**	**22,854,555**	**$22,855,390**
Cost per surface acre	**$5.75**	**$4.96**	**$6.17**	**$5.19**	**$5.75**	**$5.47**

Note: The entries shown in italics are financial resources from other accounts that are used to support activities within sub-programs. These allocations are based on budget information presented in the *U.S. Department of the Interior, Budget Justifications and Performance Information Report FY2015, for the Bureau of Land Management*., available at www.doi.gov/budget/upload/FY2015_BLM_Greenbook.pdf.

Source: Bureau of Land Management, Utah Office, FOIA request, 2013.

Economic Impacts of Bureau of Land Management Operations in Utah

A large share of the money spent by the BLM to manage its Utah lands is spent locally. From FY2008 to FY2012, the BLM spent an average of $86 million annually in Utah—$66 million in payroll for almost 800 employees, and $20 million in purchases from Utah companies. This is approximately 70 percent of the agency's total spending.

The economic impacts of the BLM's operations can be measured by the additional employment, earnings, gross state product and fiscal revenues that accrue to state and local government. In addition to the agency's direct employment and earnings, its local spending supports another 1,310 jobs in the state and generates almost $41.1 million in earnings for Utah workers.[19] The contribution to gross state product is $80.4 million. The fiscal effects include $7.17 million in state tax revenues and $671,336 in local taxes. The direct, indirect and induced impacts of BLM's direct activities and local expenditures are summarized in Table 2.7

Table 2.7
Economic Impacts of the Bureau of Land Management, Average Annual Estimate FY2008–FY2012

Impact Type	Earnings	Jobs	GSP
Direct impacts	$66,169,041	796	$11,810,408
Indirect Impacts	$41,068,272	1,309	$80,492,449
Total Impacts	$107,237,313	2,105	$92,302,858
	State	**Local**	**Total**
Fiscal impacts	$7,169,580	$671,336	$7,840,946

Source: BEBR analysis of BLM data using BEA's RIMSII multipliers.

The impacts shown here are the statewide impacts; however, a majority of BLM's payroll and employment is concentrated in Salt Lake County, thus a majority of these impacts occur there. The effects of BLM's payroll spending are also important to counties located outside of the Wasatch Front; for example, 12.7 percent of the agency's payroll is allocated to Vernal, 12.5 percent to Cedar City, and 9.1 percent to Moab.

Effects of the Land Transfer

The land transfer will change the flow of money into Utah that is spent by the BLM to manage the lands. The amount (and timing) of this reduction is unknown as it depends on the programs and activities BLM might maintain in Utah. For example, the land transfer does not include designated Wilderness Areas or affect BLM's activities on tribal lands. To the extent the BLM maintains a presence in Utah, some level of impact would continue.

Selected Activity Analysis

Wildfire Management

BLM and the U.S. Forest Service are the primary agencies for federal wildfire response in Utah. BLM also works with other federal, state and local agencies to contain wildfires on state and federal lands. For the most recent year of this study, WFM totaled $38.9 million or 32 percent of all spending. Over the past 10 years, spending for WFM has averaged $39.9 million annually (Table 2.8).

[19] The direct impacts were estimated using five years of detailed spending data provided by the Utah office of the BLM. Using this information, BEBR calculated a five-year average to produce a typical annual spending figure.

Table 2.8
Bureau of Land Management
Wildfire Management Expenditures, FY2003–FY2012
(Millions of Dollars)

Year	Preparedness Activities	Fire Suppression	Emergency Stabilization	Hazardous Fuels Treatments[1]	Burned Area Rehab	Other Fire-Related Activities	Total Fire-Related Spending	Share of Total Spending
2003	$8.7	$10.8	$5.5	$10.0	$0	$0.9	$35.9	33.5%
2004	$8.6	$7.8	$4.3	$9.0	$0.2	$1.0	$30.8	31.0%
2005	$8.7	$13.4	$5.5	$8.5	$0.5	$1.2	$37.7	35.3%
2006	$8.8	$18.8	$6.7	$8.4	$0.7	$1.3	$44.7	38.9%
2007	$9.2	$16.3	$20.0	$9.6	$0.9	$1.5	$57.5	43.0
2008	$9.4	$9.0	$23.3	$11.0	$2.7	$0.7	$56.1	42.7%
2009	$9.2	$7.7	$2.4	$10.5	$0.7	$0.9	$31.3	27.6%
2010	$9.5	$6.9	$2.6	$11.1	$1.3	$0.8	$32.3	22.9%
2011	$9.0	$12.4	$0.6	$10.0	$0.1	$1.7	$33.9	28.6%
2012	$9.4	$13.3	$1.8	$10.6	$2.9	$0.9	$38.9	32.4%
Total	$90.6	$116.4	$72.6	$98.7	$10.0	$10.9	$399.2	–
Mean	$9.1	$11.6	$7.3	$9.9	$1.0	$1.09	$39.9	33.6%

1 Amounts shown for 2009 and 2010 include ARRA supporting funds.
Source: Bureau of Land Management, FOIA request, 2013.

The fire suppression costs shown in Table 2.8 are not solely for fires in the state of Utah. BLM provides resources for fires on BLM lands in other states when the need arises. The costs are reported in the budget of the state supplying these resources. BLM has provided information on wildfire suppression costs specific for its lands in Utah. This information is shown in Table 2.9.

BLM's wildfire management activities include preparedness, suppression, fuels reduction, site rehabilitation and more. Preparedness activities include efforts that contribute to fire prevention and detection, equipment purchases, training and payroll for baseline personnel (BLM employees). In 2012, the BLM spent $9.4 million from this account. Over the past 10 years, spending on preparedness activities has averaged $9.1 million annually, and is the most stable component of the WFM program.

Suppression costs are the volatile component of the WFM program. Fire suppression includes all activities necessary to suppress wildfires on or threatening National Forest System lands and other federal and non-federal lands covered under protection agreements with the BLM. Costs covered with fire suppression funds include certain personnel expenses (expenses above those covered under preparedness personnel costs), temporary emergency firefighters, and aircraft flight operations and support. Wildfire response activities range from intensive suppression to monitoring wildfires in areas where burning conditions are too dangerous to deploy firefighters or where burning provides resource benefits (CRS 2013). There is no discernable trend in suppression cost data shown in either Table 2.8 or Table 2.9. Funding (and spending) for wildfire suppression is driven by the number, location and severity of fires.

Emergency stabilization is typically a very small component of WFM. It includes costs associated with work to stabilize resources that have been damaged through wildfire. These actions must be taken within one year

Table 2.9
Bureau of Land Management Fire Suppression Expenditures, Utah Only, FY2003–FY2012

Year	Total BLM Expenditures
2003	$8,124,376
2004	$7,116,050
2005	$9,797,997
2006	$7,672,038
2007	$14,557,434
2008	$3,890,035
2009	$8,078,050
2010	$7,452,080
2011	$5,349,786
2012	$20,790,434
Total	$92,828,281
Mean	$9,282,828

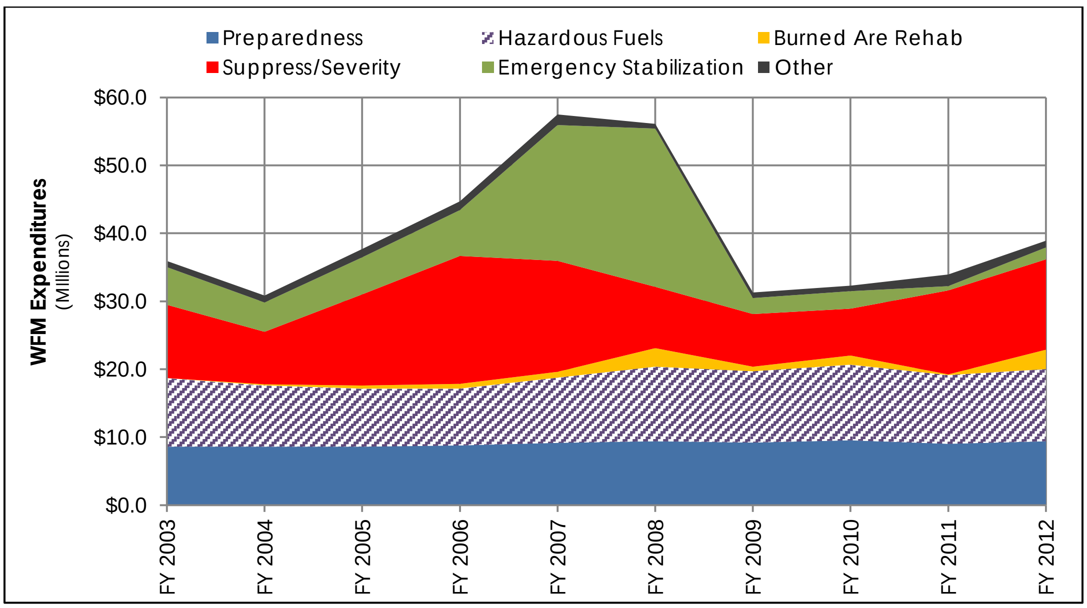
Source: Bureau of Land Management, Utah Office, FOIA request, 2013.

following the containment of a wildfire. In Utah, the high levels of emergency stabilization spending in FY2007 and 2008 followed two years of high suppression spending.

Hazardous fuels treatments include activities that decrease or alter fuel loads on federal lands to make fires less intense and severe, and therefore more controllable. A large portion of these funds is used to treat high-priority areas in the wildland-urban interface (WUI). In FY2012, $7.7 million of the $10.6 million spent by the BLM was to reduce hazardous fuels in areas considered part of the WUI. Over the past five years, funding for fuels reduction in Utah has remained steady at about $10 million annually.

Burned area rehabilitation includes activities to repair or improve fire-damaged lands that are unlikely to recover naturally, and to replace or repair minor facilities damaged by fire. These activities typically occur within three years of wildfire containment. Over the past 10 years, funding for rehabilitation activities has ranged from zero in 2003, to $2.7 million in 2008. Trends in WFM spending by activity are shown in Figure 2.3

Figure 2.3
Bureau of Land Management
Components of Wildfire Management



Source: Bureau of Economic and Business Research.

During the 2012 wildfire season, more than 400,000 acres burned in Utah (NIFC 2014). Approximately 30 percent of these acres were BLM lands. Table 2.10 shows BLM-managed wildland acres burned since 2003. The suppression costs used in estimating the costs per fire and acre burned are expenditures for BLM lands only in Utah. Fluctuations in the number of acres burned each year generally reflect factors such as short-term and long-term weather, fuel accumulations, etc.

Table 2.10
Bureau of Land Management
Fire Statistics, FY2003–FY2012

Fiscal Year	Fire Suppression Costs	Number of Fires	Number of Acres Burned	Acres Burned per Fire	Cost per Fire	Cost per Acre Burned
2003	$8,124,378	541	70,778	131	$15,017	$115
2004	$7,116,050	640	34,897	55	$11,119	$204
2005	$9,797,997	438	217,823	497	$22,370	$45
2006	$7,672,038	692	216,434	313	$11,087	$35
2007	$14,557,434	384	414,781	1,080	$37,910	$35
2008	$3,890,035	331	5,766	17	$11,752	$674
2009	$8,078,050	358	39,252	110	$22,564	$206
2010	$7,452,080	332	5,624	17	$22,446	$1,325
2011	$5,349,786	372	33,741	91	$14,381	$159
2012	$20,790,434	489	125,653	257	$42,516	$165
Total	$92,828,281	4,577	1,164,749	–	–	–
Mean	$9,282,828	458	116,475	254	$20,268	$80

Sources: Fires and Number of Acres Burned: National Interagency Fire Center, "Historical Year-end Fire Statistics by State," accessed at www.nifc.gov/fireinfo/fireinfo_statistics.html. Fire Suppression Costs: Bureau of Land Management, Utah Office, FOIA request, 2013.

Infrastructure and Maintenance

BLM owns and manages approximately 6,300 assets located throughout the state, including office buildings, visitor centers, fire stations, parking lots, kiosks, camping units, observation platforms, dams, bridges, roads, and trails. The current replacement value (CRV) of these assets has been estimated by BLM to be $24.1 *billion*. The CRV is not the market value of the asset, but rather an estimate of all costs necessary to replace the asset based on the BLM's full-cost methodology. This methodology includes planning costs, direct labor costs, maintenance, and administrative expenses (Matthews 2014).

The annual maintenance need for BLM's structures is also estimated using the full-cost methodology, and includes costs for janitorial services, waste management services, equipment, inspections, and agency overhead and administration. Using the full-cost methodology, BLM estimates the annual maintenance need for its assets is $39.2 million. This is the amount the agency has determined is needed each year to maintain and preserve its physical assets.

The asset group with the highest annual maintenance need (and highest CRV) is linear assets, which are defined by the BLM as roads, primitive roads and trails not associated with recreation or administrative sites. BLM's asset count, annual maintenance need, and the CRV for each its major asset groups are shown in Table 2.11.

While the annual maintenance need estimate is $39.2 million, the BLM typically spends less than 20 percent of this amount each year for maintenance operations and infrastructure improvement. However, linear assets are a low funding priority for the BLM, so annual maintenance spending is typically allocated to assets with a higher priority (Matthews 2014).

Table 2.11
Bureau of Land Management
Utah Assets

Major Assets	Count	Share	Annual Maintenance Need	Share	Current Replacement Value
Administrative Sites /Features[1]	761	12.1%	$2,990,643	7.6%	$2,372,675,211
Bridges	18	<1%	$23,878	<1%	$4,685,351
Dams	14	<1%	$772,042	2.0%	$14,482,055
Linear Assets (roads and trails)	2,651	42.0%	$28,962,945	73.8%	$14,753,084,398
Major Culverts	1	<1%	$64	<1%	$26,354
Recreation Sites/Features[2]	2,538	40.2%	$5,095,948	13.0%	$6,097,964,204
Site Roads[3]	266	42%	$1,285,960	3.3%	$868,095,750
Site Trails[3]	61	<1%	$93,383	<1%	$11,000,517
Totals	**6,310**	**100.0**	**$39,224,862**	**100.0%**	**$24,122,013,840**

1. Includes 58 sites and 703 features.
2. Includes 397 sites and 2,141 features.
3. Site Roads and Trails are defined as assets that are contained within the boundaries of recreation or administrative sites and are not counted as Linear Assets.

Source: Bureau of Land Management, Utah Office, FOIA request, 2013.

The BLM has estimated the deferred maintenance backlog of its Utah assets to be $26.4 million. Again, the largest portion of this is for linear assets (Table 2.12). To address the deferred maintenance backlog, BLM has developed a five-year deferred maintenance and capital improvement plan, which is scheduled to begin in 2015. If implemented, BLM will spend a total of $10.3 million on 48 projects between 2015 and 2019.

Table 2.12
Bureau of Land Management
Estimated Deferred Maintenance Backlog

Asset Type	Amount
Bridge/Major Culverts/Linear Assets	$12,383,152
Buildings	$3,718,385
Dams	$4,982,226
Other Structures	$5,346,407
Total	$26,430,170

Source: Bureau of Land Management, Utah Office, FOIA request, 2013.

Annual maintenance (AM) and deferred maintenance (DM) are cross-cutting activities. They are funded through two dedicated programs—the Transportation and Facilities Management program and the Construction program—and as activities within subprograms such as Recreation and Rangeland Management.

Within the dedicated programs, funding for AM and DM includes activities such as site inspections, law enforcement, operations and management, as well as direct construction. In FY2012 the BLM spent $5.3 million for maintenance and infrastructure improvements through its dedicated programs. From FY2003 to 2012, spending for maintenance and improvements from these programs averaged almost $5.7 million annually.

AM and DM are also components of subprograms. When AM or DM projects benefit a specific subprogram, the costs are paid for with funds from that subprogram's budget. In such cases maintenance expenditures are asset-specific and do not include the overhead, inspection or other activities that are part of the dedicated programs.

The annual and deferred maintenance spending, by asset type, for FY2009 through FY2012 is shown in Table 2.13. This includes asset-specific AM and DM expenditures from BLM's dedicated maintenance programs and asset-specific spending in other subprograms.

The high amount of DM spending in 2009 and 2010 included projects funded with ARRA allocations. In FY2012, the BLM spent more than $7.0 million in annual and deferred maintenance. The largest share of this was for buildings and facilities.

Table 2.13
Bureau of Land Management
Annual and Deferred Maintenance Spending by Asset Type, FY2009–FY2012

Asset Type	2009	2010	2011	2012
Annual Maintenance				
Buildings/Facilities	$1,835,357	$1,538,194	$1,728,307	$1,489,401
Administrative Sites	$716,285	$731,219	$562,841	–
Non-Building Sites	$892,165	$1,074,239	$753,056	$963,871
Roads	$258,100	$336,914	$490,155	$517,145
Trails	$44,864	$118,503	$200,942	$137,936
Dam	$16,358	$10,202	$346	$32,386
Bridge	$205	$8,900	$-826	$8,056
Total	$3,763,334	$3,818,171	$3,734,821	$3,148,795
Deferred Maintenance				
Buildings/Facilities	$684,885	$1,617,054	$1,075,808	$3,868,406
Administrative Sites	$3,729,406	$9,977,124	$1,207,060	–
Non-Building Sites	$685	–	–	–
Roads	$1,312,245	$8,958,298	$30,099	$20,482
Trails	$125,543	$1,627,349	$91,373	$43,146
Dam	$124,135	$28,044	$13,765	$51,120
Bridge	$11,904	$72,235	$7,341	$8,152
Total	$5,988,803	$22,280,104	$2,425,446	$3,991,306

Source: Bureau of Land Management, Utah Office, FOIA request, 2013.

Wild Horses and Burros Program

BLM Utah manages wild horses and burros under the Wild Free-Roaming Horses and Burros Act of 1971. Among other things, this act protects wild horses and burros within designated territories on lands managed by the BLM and Forest Service. It also mandates that BLM (and other federal agencies) inventory and monitor population numbers, determine appropriate management levels (AMLs) and remove excess horses from public lands in order to preserve and maintain a thriving ecological balance. Healthy animals may also be removed for private adoption.

BLM currently reports 4,292 wild horses and burros[20] roaming within 20 herd management areas (HMAs); this compares with the 2013 estimate of 3,842 and a 2012 estimate of 3,257.[21] Almost one-third of all wild horses and burros roaming in Utah are located in the Cedar Mountain HMA, located 50 miles west of Salt Lake City, and the Sulphur HMA located in western Iron, Beaver and Millard counties.[22]

The current free-roaming population is more than double the number BLM has determined can exist in balance with other public rangeland resources and uses. For Utah, BLM has set the upper limit of appropriate management levels (AMLs) for all wild horses and burro herds in Utah at 1,956—1,786 horses and 170 burros. The current estimated population of 4,292 is more than double the maximum AML established for Utah. From FY2003 to 2014 the number of wild horses and burros on public lands increased 63 percent, despite the removal and adoption of more than 7,000 animals (Table 2.14).

Removal from the range has been the primary method used by the BLM to manage its wild horse and burro population. As shown in Table 2.14, since 2003 a total of 5,057 animals were removed and 1,959 were adopted. Typically, animals removed from the range are placed in

[20] Estimate as of March 2014. Bureau of Land Management, "Wild Horse and Burro Quick Facts," available at www.blm.gov/wo/st/en/prog/whbprogram/history_and_facts/quick_facts; accessed August 1, 2014.

[21] Bureau of Land Management, *Public Land Statistics* FY2012 and 2013, Table 5-12.

[22] Bureau of Land Management, "Utah Wild Horse and Burro Herd Areas Administered by Bureau of Land Management," accessed at: www.blm.gov/pgdata/etc/medialib/blm/wo/Planning_and_Renewable_Resources/wild-horses-and-burros/statistics-and-maps/holding__adoption.Par.45280.File.dat/HMA_HA%20Stats%20FY2013.pdf.

short-term holding facilities where they are readied for adoption, sale, or sent to long-term holding (pasture facilities). In Utah, animals can be housed in one of three short-term holding facilities, which are currently at 69 percent holding capacity.

Table 2.14
Bureau of Land Management Utah Wild Horse and Burro Populations, Adoptions and Removals, FY2003–FY2014

	Herd Size				Adoptions			Removals			Total
Year	Horses	Burros	Total[1]	Natural Increase[2,3]	Horses	Burros	Total	Horses	Burros	Total	Adoptions/ Removals
2003	2,495	126	2,621	83	141	28	169	375	0	375	544
2004	2,605	140	2,745	939	167	21	188	627	0	627	815
2005	2,420	142	2,562	258	173	20	193	248	0	248	441
2006	2,545	169	2,714	1,009	175	54	229	628	0	628	857
2007	2,543	195	2,738	616	246	34	280	312	0	312	592
2008	2,892	204	3,096	741	173	32	205	95	83	178	383
2009	2,495	142	2,637	942	167	11	178	1,223	0	1,223	1,401
2010	2,724	164	2,906	1,109	150	26	176	664	0	664	840
2011	2,497	189	2,686	294	135	20	155	359	0	359	514
2012	3,040	217	3,257	813	98	14	112	130	0	130	242
2013	3,245	250	3,495	630	64	10	74	313	0	313	387
2014	3,979	313	4,292	na	Na	Na	Na	Na	Na	Na	Na
Totals	–	–	–	–	1,689	270	1,959	4,974	83	5,057	7,016

1 Total after adoptions and removals.
2 Natural annual increase is the change in herd size in a given year, over the previous year after adoptions and removals.
3 Herd size in 2002 was 3,082, including 2,972 horses and 110 burros.
Source: U.S. Department of the Interior, Bureau of Land Management, Public Land Statistics*, years as indicated.*

The BLM retains financial responsibility for animals sent to short-term facilities as well as those that are pastured long-term. These costs can be significant.[23] From FY2008 through 2012, BLM spent a total of $19.1 million to manage its WH&B program; at least 58 percent, or $11.1 million was for the preparation and holding of animals removed from the range, a situation that BLM admits is not sustainable.

Adoption is another method used by BLM Utah to reach AML; however, adoptions have declined steadily and significantly since FY2008. This trend mirrors the experience of the agency at the national level, except Utah's adoption-to-removal ratio of 28 percent is much lower than the national average of almost 60 percent, an indication that animals are less likely to be adopted in Utah than is the case in other states (BLM 2013).

Paring the WH&B population to AML has not been achieved in Utah or in any other western state. Furthermore, BLM's management of the WH&B program has long been controversial and recently culminated in a lawsuit filed against the agency by the Westland Rangeland Conservation Association.[24]

The number of wild horses and burros currently on Utah's rangelands exceeds the BLM's maximum AML estimate, creating concerns about animal and rangeland health and conflicts with

23 In 2010, the Congressional Research Service noted the cost of short-term facilities in 2009 was $4.74 per animal per day and $1.27 per day for animals in long-term facilities. See Congressional Research Service, *Wild Horses and Burro: Current Issues and Proposals*, May 2010 (CRS 2010).
24 In May 2014, the Westland Rangeland Conservation Association took legal action to force the BLM to reduce the number of wild horses roaming public lands in Utah.

other land uses. Because H.B. 148 does not specifically address federal agency programs, it is unclear if managing these animals would become a state obligation.

Recreation

Millions of people recreate on BLM lands each year and use of these lands is increasing. Over the past decade, the number of recreation-related visits[25] to BLM lands in Utah increased by almost 20 percent from 5.9 million in FY2003 to nearly 7.0 million in FY2012. A variety of recreation occurs on BLM lands, including activities that involve visits to recreation sites and as well as activities that occur on undeveloped lands. In Utah, recreation on BLM lands is almost evenly split between visits to recreation sites and dispersed recreation (visits to areas with no amenities).

Statewide, BLM maintains 69 recreation fee sites, including two off-road vehicle areas, 54 camping areas, four river-use sites and seven day-use sites. Although the BLM tracks and estimates recreation on its lands, it does not gather trip spending or expenditure information. Recreation fees are collected at fee sites as allowed under authority of the Federal Lands Recreation Enhancement Act of 2004.[26] The BLM retains and spends all recreation fee revenue, with at least 80 percent spent at the site where it is collected.

In FY2012, BLM collected almost $3 million in recreation fees. Since 2003, recreation fee collections have generally been trending upward, averaging $2.8 million annually. In addition to fee collections, BLM receives funding for recreation through the Recreation Resources and Wilderness Management accounts. Recreation spending from these accounts totaled $4.9 million in FY2012. Table 2.15 shows recreation visits, revenue and cost information for fiscal years 2003 through 2012.

Table 2.15
Bureau of Land Management Recreation Visits, Revenue and Costs, FY2003–FY2012
(Visits and Dollars in Thousands)

Fiscal Year	Recreation Site Visits	Dispersed Area Visits	Total Visits	Percent Dispersed	Total Revenue	Total Spending[1]	Net Cost per Visit
2003	2,722	3,224	5,946	54.2%	$1,809.3	$6,998.4	$0.87
2004	2,824	3,295	6,119	53.8%	$2,082.9	$7,014.4	$0.80
2005	2,873	3,335	6,208	53.7%	$2,155.7	$7,076.4	$0.79
2006	3,032	3,505	6,537	53.6%	$2,423.3	$7,487.3	$0.77
2007	3,063	3,661	6,724	54.4%	$2,602.6	$8,214.6	$0.83
2008	3,090	2,857	5,947	48.0%	$2,835.2	$8,230.9	$0.91
2009	3,820	2,691	6,511	41.3%	$2,948.7	$7,495.8	$0.70
2010	3,092	2,998	6,090	49.2%	$2,738.6	$7,658.7	$0.81
2011	2,690	3,012	5,702	52.8%	$2,863.4	$8,258.1	$0.95
2012	3,483	3,467	6,950	49.9%	$3,061.6	$8,003.1	$0.71

1 Includes spending from the following program accounts: Wilderness Management, Recreation Resources Management, Recreation Fee Demonstration Project, Recreation Costs Recovery, and Federal Lands Highway Program Fund account.

Sources: Recreation Visits: Bureau of Land Management, Public Land Statistics, *years as indicated; Revenue and Costs: Bureau of Land Management, Utah Office, FOIA request, 2013; adapted by BEBR.*

[25] The term "visits" is defined by the BLM as the entry of any person for recreational purposes onto lands and related waters administered by the BLM, regardless of duration.

[26] REA, Public Law 108-447.

Slightly more than half of all recreation on BLM land includes camping, picnicking and non-motorized travel. Table 2.16 shows participation levels for various recreation activities in FY2012 and 2013.

Table 2.16
Bureau of Land Management
Estimated Recreational Use of BLM Lands, FY2012–FY2013

	FY2012		FY2013	
Recreation Activities	**Visitor Days**	**Share**	**Visitor Days**	**Share**
Land-Based Activities	4,621,800	84.6%	4,708,157	88.4%
Camping and Picnicking	1,567,399	28.7%	1,564,024	29.4%
Nonmotorized travel	1,227,765	22.5%	1,134,623	21.3%
Off-highway travel	577,735	10.6%	629,431	11.8%
Driving for pleasure	343,367	6.3%	369,708	63.9%
Interpretation and Education	506,464	9.3%	547,431	10.3%
Hunting	217,286	4.0%	271,108	5.1%
Specialized sports and events	181,784	3.3%	191,832	3.6%
Water-Based Activities	834,699	15.3%	605,529	11.4%
Boating/Motorized	176,254	3.2%	19,647	.37%
Boating/Row/float/paddle	547,054	10.0%	526,678	9.9%
Fishing	63,856	1.2%	28,018	.5%
Swimming and other activities	47,505	.87%	31,186	.6%
Snow- and Ice-Based Activities	9,645	0.17%	10,535	3.3%
Snowmobile and motorized travel	3,527	.06%	4,414	.08%
Other winter activities	6,118	.11%	6,121	.1%
Total	**5,466,144**	**100%**	**5,324,221**	**100%**

Note: A visitor day is a common unit of measure of recreation use among federal agencies. One visitor day represents an aggregate of 12 visitor hours at a site or area. This measure differs from "visits," which is defined as the entry of any person for recreational purposes onto lands and related waters administered by the BLM, regardless of duration.
Source: Bureau of Land Management, Utah Office, FOIA request, 2013.

Grazing

BLM manages more than 1,400 grazing allotments covering 19.4 million acres of land (GAO 2005). Grazing on BLM allotments is authorized through the issuance of a grazing permit. These permits generally cover a 10-year period and are renewable by the BLM if the terms and conditions of the permit are met.

In fiscal year 2012, a total of 1,468 grazing permits were in place on BLM rangelands. Under these permits a maximum of 1,501,612 animal unit months (AUMS) of grazing could have been authorized for use.[27,28] This is the number of "active preference" AUMS allowed under the permits issued by the BLM. Instead, 755,210 AUMs were authorized (billed). The remaining AUMs were not used for a variety of reasons, including forage depletion by drought or fire, recreation or other resource protection factors.[29]

The amount that BLM can charge for grazing is limited by statute and based on a fee formula established in the Public Rangelands Improvement Act of 1978 (PRIA). The complex formula used in PRIA incorporates factors such as the rancher's ability to pay; therefore, the fee is not primarily imposed to recover agency expenditures or capture the fair market value of forage. The result is the BLM spends far more to manage its grazing program than it collects in revenue. In 2013, the grazing fee per AUM was $1.35—a rate that has remained unchanged since 2007. In FY2012, the BLM collected $1.1 million in grazing fees, and spent $4.2 million to manage the program—almost four times the amount collected. Table 2.17 shows revenue and expenditures related to management of the agency's grazing program from FY2009 to 2012.

[27] For fee purposes, BLM defines an animal unit month, or AUM, as a month's use and occupancy of the range by one animal unit, which comprises either one yearling, one cow and her calf, one horse, five sheep or five goats.
[28] Includes active and suspended AUMS.
[29] For a detailed discussion of grazing trends on lands managed by the BLM and Forest Service, see Chapter 13: Section 7.6.

Table 2.17
Bureau of Land Management Grazing Revenue and Direct Expenditures, FY2009–FY2012

	FY2009	FY2010	FY2011	FY2012
Authorized AUMS	740,845	758,798	813,264	792,721
Grazing Fee Receipts	$1,008,107	$1,057,476	$1,060,156	$1,139,825
Total Expenditures	**$4,329,729**	**$4,367,754**	**$4,444,454**	**$4,204,858**
Monitoring grazing allotments	$1,215,113	$1,461,290	$1,589,602	$1,716,125
Issuing grazing permits	$1,587,668	$1,624,926	$1,246,664	$1,098,226
Compliance inspections	$377,936	$387,673	$489,990	$364,251
Issue grazing bills	$473,073	$368,515	$302,336	$322,145
Manage grazing preferences	$137,384	$77,723	$77,223	$112,194
Range improvements	$538,555	$457,627	$738,639	$591,917
Net Cost	–$3,321,622	–$3,310,278	–$3,384,298	–$3,065,033
Cost per AUM	$5.84	$5.76	$5.47	$5.30
Net Cost per AUM	$4.48	$4.36	$4.16	$3.87

Source: AUMs: Bureau of Land Management, Public Land Statistics*, years as shown; Spending and Revenue Statistics: Bureau of Land Management, Utah Office, FOIA request, 2013; adapted by BEBR.*

Oil and Gas Production

Royalties from oil and gas production are the primary source of revenue generated from extractive activities on public lands in Utah. In the most recent study year, revenue from oil and gas production (including royalties, bonus payments, rents and other revenue) totaled $289.5 million; of this, $236.6 million or 82 percent was royalty payments. Over the past five years, production of oil and gas on public lands generated almost $1.3 billion, for an average of $251.2 million annually.

BLM's oil and gas program is a money maker. Spending by BLM to manage the oil and gas program totaled $10.4 million in FY2012, which included local administration and operational costs (such as lease processing, land use planning and plan reviews, and site inspections) but not costs borne by ONRR. In return, oil and gas revenue totaled $289.5 million, for a profit of $279.2 million or $27.84 for every dollar spent. Profit per producing acre leased was $259 in FY2012. Table 2.18 shows oil and gas revenue and expenses for FY2008 through 2012.

Increased demands by industry for access to oil and gas opportunities on public lands have stretched BLM's resources. At the same time, direct Congressional appropriations for oil and gas management have been flat. In response, BLM has turned to user fees and offsetting collections. To illustrate, in FY2003 BLM spent $5.7 million to manage oil and gas, which was funded entirely through federal appropriations to the Oil and Gas Management account. In FY2012, the agency spent $10.4 million, of which 42 percent was funded through that account. The remaining funds came primarily from processing fees tied to applications for permits to drill (APDs) and the APD Permit Processing Improvement Fund.

Table 2.18
Bureau of Land Management
Oil and Gas Program Revenue and Expenses, FY2008–FY2012

Measure	2008	2009	2010	2011	2012	Mean
Oil and Gas Revenue (000s)	$352,153.6	$203,909.2	$267,091.9	$259,918.9	$289,487.2	$274,512.2
Oil and Gas Spending (000s)	$10,823.9	$11,139.8	$11,319.5	$12,264.9	$10,449.8	$11,199.6
Profit (000s)	$341,329.7	$192,769.4	$255,772.4	$247,654.0	$279,037.4	$263,312.6
Acres of producing leases	1,493,683	1,092,640	1,086,431	1,107,185	1,117,548	1,179,497
Revenue per producing acre	$236	$187	$246	$235	$259	$232
Expense per producing acre	$7	$10	$10	$11	$9	$9
Profit per producing acre	$229	$177	$236	$224	$250	$223

Source: Revenue: U.S. Department of the Interior, Office of Natural Resources Revenue; Expenses: Bureau of Land Management, Utah Office, FOIA request, 2013.

Beginning in 2008, BLM had authorization to collect a $4,000 processing fee from operators for each new oil and gas APD. This processing fee was increased by Congress to $6,500 in FY2010. These fees are used to offset the agency's general fund appropriation. In its latest budget request, BLM is asking that the processing fee be increased to $9,500 per ADP. Currently, APD processing fee funds provide about 30 percent of the funding used by BLM Utah to operate the Oil and Gas Management program.

In addition to cost-recovery fees, some of the local field offices have access to the APD Permit Processing Improvement Fund. This fund is available to seven selected field offices in five western states. BLM's Vernal field office is one these offices. Since 2006, this fund has provided about $16 million in additional money that has been used to coordinate and process oil and gas authorizations on federal lands in Utah.[30]

A component of BLM's oil and gas management program is well inspections. BLM increased the number of environmental inspections it performed on federal oil and gas wells from 442 in FY2007 to 1,980 in FY2012. The BLM office with the greatest increase was the Vernal field office, which conducted 1,752 environmental inspections in 2012 (GAO 2013). Nonetheless, BLM continues to face challenges in meeting its inspection obligations. While BLM guidance does not call for a drilling inspection of all wells or specify when a well should be inspected, it does call for drilling inspections on all wells rated high priority (GAO 2104). Of the 327 high-priority wells in Utah, only 108 were visited by BLM inspectors (*SL Tribune* 2014). Budget and personnel are the primary constraints.

In the BLM's 2015 budget justification, the agency is requesting authority to levy new inspection fees on oil and gas wells drilled on federal land similar to those already charged for offshore drilling. This request is not new. The agency has made similar requests in its past two budget cycles; however, this year's request follows two GAO reports highlighting the struggles BLM faces in managing its oil and gas program.

Oil and gas leases on BLM lands are awarded using a competitive bonus-bid auction process. Winning bidders pay a bonus bid, a per-acre rent prior to first production, and then royalties

[30] Section 365 of the Energy Policy Act of 2005 established the Federal Permit Streamlining Pilot Project to improve oil and gas permitting. The project was funded by diverting 50 percent of mineral lease rental revenue into a special fund known as the APD Permit Processing Improvement Fund. Seven field offices in five western states were designated as Pilot Project offices and were allowed to access the fund for APD processing.

once production begins. If a parcel is not sold at competitive auction, the BLM can offer it "over-the-counter" on a noncompetitive basis. In 2013 there were a total 3,574 leases in effect covering 3.8 million acres of public land in Utah.

Operators obtaining a lease must submit an application to drill to BLM for approval before drilling oil or gas wells. In 2013, BLM processed 965 APDs, an increase of more than 100 APDs over the 848 processed in 2011. Since 2003, BLM has processed 6,254 APDs, more than half of these have been within the past five years.

Not all leases awarded to industry result in an APD. Leasing allows companies to secure mineral rights before investing in testing and other exploratory techniques to determine if development is economically feasible. Industry may opt to defer drilling for any number of reasons. Of all leases in effect in 2013, 41 percent (1,473) were producing—the highest share since 1988 (Table 2.19

Table 2.19
Bureau of Land Management
Oil and Gas Statistics

Year	New Leases	Leases in Effect[1]	Producing Leases	Share Producing[2]	New Acres Leased	Acres Under Lease	Producing Acres	Share Producing[3]	Drilling Permits Approved	Producible and Service Well Bores[4]
1988	665	6,163	1,030	16.7%	1,123,189	6,628,693	778,442	11.7%	145	2,048
1989	669	6,171	1,051	17.0%	757,923	6,822,169	783,361	11.5%	59	2,959
1990	615	6,088	1,051	17.3%	737,454	6,820,513	778,891	11.4%	84	2,035
1991	494	6,284	1,117	17.8%	645,787	6,819,384	829,794	12.2%	158	2,084
1992	403	5,417	1,038	19.2%	526,820	5,938,619	771,191	13.0%	276	2,135
1993	378	4,574	1,068	23.3%	459,189	4,880,947	795,033	16.3%	162	2,315
1994	365	4,285	1,101	25.7%	485,119	4,508,842	814,833	18.1%	127	2,349
1995	375	3,915	1,112	28.4%	393,573	3,964,397	822,845	20.8%	220	2,417
1996	278	3,550	1,236	34.8%	316,989	3,495,364	914,203	26.2%	173	1,919
1997	346	3,393	1,245	36.7%	444,385	3,330,012	912,044	27.4%	254	1,845
1998	272	3,493	1,320	37.8%	278,702	3,362,414	954,984	28.4%	236	2,907
1999	186	3,464	1,306	37.7%	217,934	3,256,028	956,768	29.4%	123	2,744
2000	176	3,416	1,279	37.4%	247,126	3,271,712	983,996	30.1%	248	2,902
2001	197	3,494	1,185	33.9%	284,928	3,420,577	881,319	25.8%	278	3,189
2002	132	3,711	1,199	32.3%	222,070	3,734,868	895,482	24.0%	217	3,330
2003	171	3,719	1,219	32.8%	240,527	3,818,544	904,467	23.7%	323	3,935
2004	93	3,383	1,235	36.5%	118,878	3,424,273	916,106	26.8%	517	3,745
2005	617	3,607	1,228	34.0%	1,001681	4,125,544	950,355	23.0%	66	1,095
2006	351	4,108	1,343	32.7%	535,181	4,646,688	1,007,603	21.7%	458	4,702
2007	303	3,818	1,327	34.8%	402,913	4,681,529	1,014,474	21.7%	896	4,702
2008	67	4,300	1,586	36.9%	94,569	4,988,903	1,493,683	29.9%	943	6,852
2009	155	4,271	1,427	33.4%	240,141	4,995,479	1,092,640	21.9%	557	6,593
2010	79	4,192	1,419	33.9%	110,857	4,855,833	1,086,431	22.4%	402	7,260
2011	28	3,947	1,460	37.0%	25,400	4,448,995	1,107,185	24.9%	602	7,490
2012	40	3,789	1,480	39.1%	46,807	4,213,384	1,117,548	26.5%	848	8,011
2013	97	3,574	1,473	41.2%	109,750	3,821,792	1,110,875	29.1%	965	8,459
Mean 1988–2013	290	4,236	1,251	29.5%	387,227	4,549,058	949,021	20.9%	367	3,847
Mean 2004–2013	183	3,899	1,398	35.9%	268,618	4,420,242	1,089,690	24.7%	625	5,891

1 Number of leases as of the last day of the fiscal year.
2 Share of producing equals "leases in effect" divided by "producing leases."
3 Share of acres producing equals "acres under lease" divided by "producing acres."
4 Includes all wells capable of production plus active injection, water storage and test wells.

Source: Bureau of Land Management, Oil and Gas Statistics, www.blm.gov/wo/st/en/prog/energy/oil_and_gas/statistics.html.

Over the past decade, development of oil and gas resources on federal lands in Utah has intensified. In addition to record levels of APD approvals over the past five years, by October 2014 there were a total of 6,738 producing oil and gas wells on federal land (DOGM 2014).

Interest in oil and gas exploration and development on federal lands in Utah is also increasing. Oil and gas companies nominated almost 2.1 million acres for leasing in 2013, up from 1.1 million in 2012. However, since 2009 the number of new leases issued by BLM has dropped considerably from previous years. The reason for this is unclear. During the five-year period from 2010 to 2014, a total of 2,388 parcels were nominated for leasing, of which BLM offered 461 and deferred 1,927. How this deferral rate compares with earlier periods is unknown, as BLM cleared its existing deferred lands list in mid-2010. While the reason for the decline in the number of new leases issued is unknown, the negative economic consequences for Utah could be significant.

Utah Oil & Gas Leasing and Access to BLM Lands

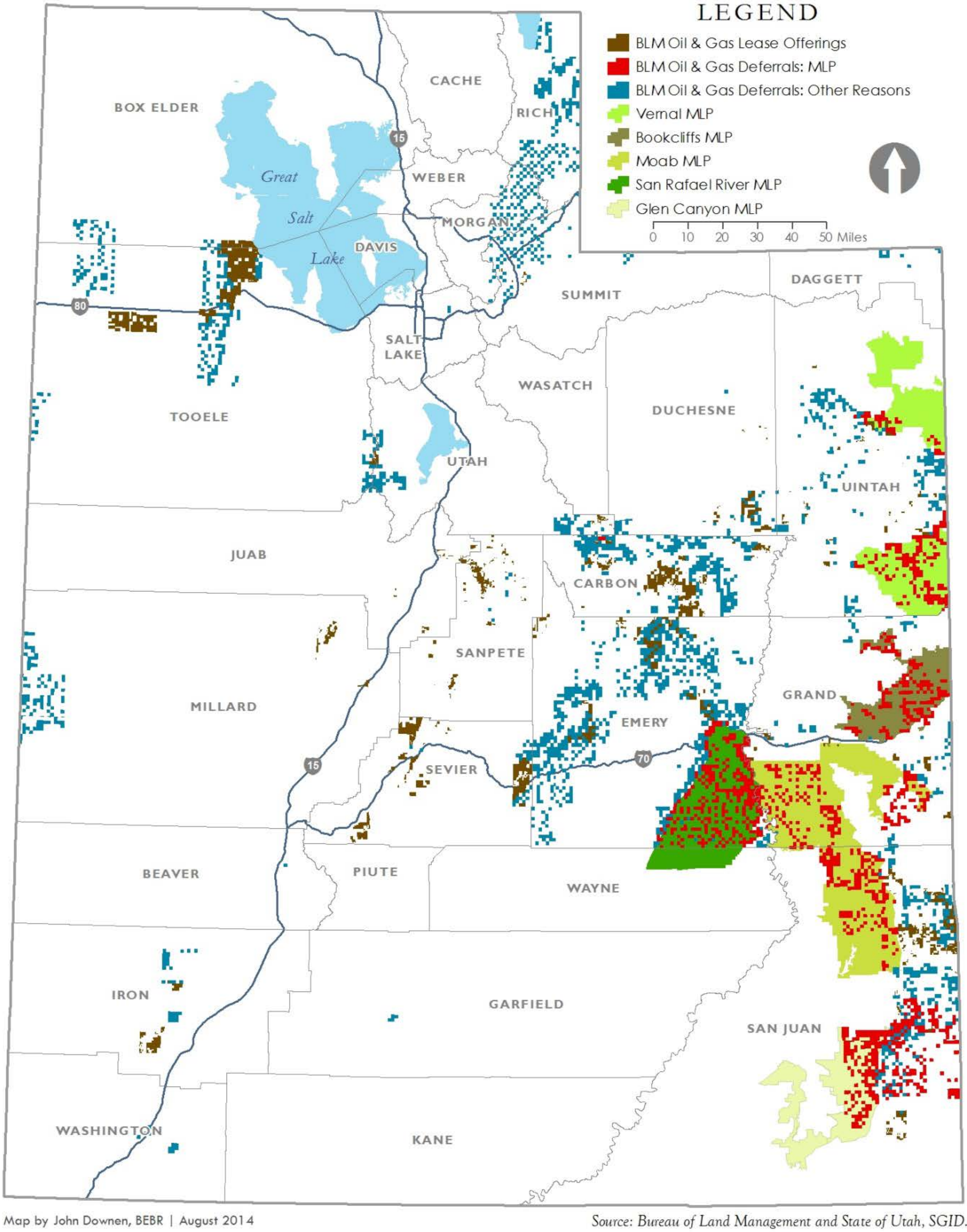
BLM operates under a multiple use mandate that allows for a range of uses of federal public lands. Striking the appropriate balance between resource development and resource protection is both difficult and controversial. This section addresses three public land management approaches which affect access to BLM lands in Utah. In an increasingly litigious context and in the interest of primitive recreation, environmental protection and habitat preservation, BLM has required master mineral lease planning in designated areas, protected certain lands found to have wilderness qualities, and deferred development on habitat for two sage-grouse species. These policies appear to have delayed and precluded oil and gas development in certain areas of the state. In the event of large-scale land transfer in Utah, the state will need to consider the very issues BLM has grappled with in regards to public access, multiple use, conservation and recreation.

First, BLM's Master Leasing Plan (MLP) process calls for additional fact-finding and preparation before BLM offers leases for oil, gas or potash development in portions of Grand and San Juan counties where MLP planning is well underway. Pending MLP completion, BLM has routinely deferred oil and gas parcel nominations there, as well as in four other sizeable MLP regions in Uintah, Grand and San Juan counties, where planning has not begun (Figure 2.4). Prior to the advent of master lease planning in 2010, Resource Management Plans (RMPs) were the official statement on which BLM lands were available for development, subject to individual review of parcel nominations and Applications for Permit to Drill.

Second, in addition to designated Wilderness Areas and Wilderness Study Areas (WSAs) authorized by Congress, BLM has identified "non-WSA lands with wilderness characteristics" (LWCs) through inventories, based on criteria set forth in the Wilderness Act. Natural Areas are a small subset of LWCs where the BLM has determined that management to maintain wilderness character is appropriate. Development is not permitted in Natural Areas. While not formally protected, LWCs often receive additional scrutiny in advance of development activity, and oil and gas activity is approved in LWCs less often than in undesignated BLM lands. This study finds a similar pattern of protection for Red Rock Wilderness areas identified and proposed by the Utah Wilderness Coalition.

Third, the greater sage-grouse and Gunnison sage-grouse are receiving serious consideration by the U.S. Fish and Wildlife Service for listings under the Endangered Species Act. In the interim, BLM is exercising abundant caution to avoid exacerbating declines and fueling calls for listing. This stance may limit land use opportunities within sage-grouse habitat.

Figure 2.4
Master Lease Planning and BLM Oil & Gas Lease Offerings and Deferrals in Utah, 2010–2014



This section utilizes recent data for oil and gas lease offerings and parcel deferrals to address the broader issue of access on federal lands in Utah. BLM offers five years of detailed geographic and tabular data statewide for oil and gas deferrals and offerings. Such extensive information is not available for other important uses of public lands in the state or for oil and gas before 2010. If BLM determines certain places are off-limits to oil and gas development, then a variety of other activities on BLM lands may be prohibited there as well, such as timber harvesting, mining, and motorized access for wildlife management, non-dispersed camping and other recreation.

The reader may refer to Appendix D for a more thorough review of BLM oil and gas leasing policies related to these three issues. The appendix provides a detailed analysis of BLM responses to nominations from the public for new development in Utah with maps for wilderness and sage-grouse areas.

BLM Land Designations

BLM lands in Utah are classified in various ways to emphasize certain values and uses. The designations shown in Table 2.20 overlap in many cases, offering layers of protection and multiple emphases. Several of these are addressed in Table 2.20 Master Leasing Plan (MLP) areas, sage-grouse habitat, and wilderness. Wilderness includes "non-WSA lands with wilderness characteristics" (LWCs), Natural Areas, and proposed Red Rock Wilderness. Policies regarding land use on the remaining land designations are discussed in the section Other Protected BLM Lands in Utah.

Table 2.20

BLM Lands in Utah with Restrictions on Multiple Use

Designation	Authority	Acres[1]	Share
Non-WSA Lands with Wilderness Characteristics (LWCs)	BLM	3,885,700	17.0%
Natural Area[2]	BLM	446,499	2.0%
Master Leasing Plan (MLP) Area	BLM	2,717,692	11.9%
Sage-Grouse Habitat	BLM/DWR	7,562,407	33.2%
Red Rock Wilderness, Proposed[3]	UWC	10,310,960	45.2%
Special Recreation Management Area (SRMA)	BLM	1,881,761	8.3%
Area of Critical Environmental Concern (ACEC)	BLM	757,814	3.3%
National Monument	President	1,867,858	8.2%
Designated Wilderness Area	Congress	257,886	1.1%
Wilderness Study Area (WSA)	Congress	3,434,012	15.1%
Wild and Scenic Rivers (WSR)	Congress	113,654	0.5%
National Conservation Area (NCA)	Congress	133,229	0.6%
National Recreation Area (NRA)	Congress	57,417	0.3%
Total BLM Lands in Utah		22,809,046	100%

1. Land areas overlap. Lands may have more than one designation. For example, proposed Red Rock wilderness includes all WSAs.
2. Natural Areas are a subset of "non-WSA lands with wilderness characteristics" that have been selected during the RMP process for protection of wilderness character.
3. The Utah Wilderness Coalition (UWC) provided input for "America's Red Rock Wilderness Act," introduced in Congress in 2013, but not passed. The bill proposed new designated wilderness in Utah. BLM has not adopted UWC's determinations of wilderness, but it constitutes one of many sources of public input.

Sources: BEBR analysis of geographic data from the Bureau of Land Management, Utah's Division of Wildlife Resources, Southern Utah Wilderness Alliance and Utah's State Geographic Database System.

BLM Leasing in MLP, Wilderness, and Sage-Grouse Areas

BLM follows a defined process for determining where to allow oil and gas development. The agency invites the public to nominate parcels of BLM and Forest Service lands by submitting "expressions of interest." There is no fee for nominations. A parcel may be approved outright, approved with specified requirements to mitigate environmental harm, or deferred. Deferral is often a final outcome, but in other cases it is a determination to delay a decision until sufficient fact-finding can occur. Leases for approved parcels are offered for sale at public auction. Operators who win oil and gas leases at auction may submit an Application for Permit to Drill (APD) for each well to be drilled on leased parcels. APD approval is a prerequisite to any surface disturbance. BLM reviews during these various stages are guided by the National Environmental Policy Act, RMPs governing resource use in the area, and in some areas, MLPs.

Based on an analysis of BLM records, the agency limited oil and gas development in wilderness, sage-grouse habitat and MLP areas from 2010 to 2014. BLM lease offerings there were relatively low compared to nominations in those areas, the share of BLM lands occupied, and lease offerings in other parts of the state. Such an outcome appears to be in keeping with laws and policies BLM followed, some recently adopted, to respond to competing public interests in its lands.

Of 2,388 parcels nominated for leasing during the period 2010 to 2014, BLM offered at auction 461 new leases for oil and gas development, amounting to 625,067 acres on BLM and Forest Service lands for which BLM administers the mineral estate. A total of 146 unique oil and gas leases were offered on four types of lands: "non-WSA lands with wilderness characteristics" (LWCs, 79), proposed Red Rock Wilderness (97), sage-grouse habitat (44) and MLP areas (8).[31] Most of the offerings, 63.8 percent, were outside these four designations, while only 32.0 percent of the nominated parcels were outside the area.

During the five year period from 2010 to 2014, BLM deferred 1,927 parcels totaling 3.2 million acres and approved for sale 461 parcels covering 0.6 million acres (Table 2.21). Less than one-third of the sale offerings (31.7 percent) and most of the deferrals (at least 62.6 percent) were associated with wilderness characteristics, MLPs or sage-grouse habitat. The approval rate for nominated parcels on BLM lands statewide was 19.3 percent, whereas the shares of nominated parcels resulting in lease offerings within these three protective categories were much lower, ranging from 1.2 percent (MLP areas) to 10.8 percent (LWCs).

A confluence of factors affects BLM approval rates for fluid mineral development. These may include legal mandates for protection, communication gaps between BLM and nominators, limited resources at BLM, nominator carelessness when naming parcels, BLM professionals' conservation priorities, and the prospect of litigation (Wilcken 2014).

Other Protected BLM Lands in Utah

BLM has protections for various land designations besides sage-grouse habitat, wilderness, and MLP areas with land use restrictions. No development is permitted within 3.7 million acres of designated Wilderness Areas or Wilderness Study Areas (WSAs). Disturbances to the natural environment are prohibited with few exceptions. For BLM lands with any of the other three congressionally-conferred protected statuses noted in the table—Wild and Scenic Rivers, National Conservation Areas (NCA), and National Recreation Areas (NRA)—permissible activities are largely outside BLM's purview. These 19 miles of Wild and Scenic Rivers and 190,646 acres of NCAs and NRAs are available primarily for recreation or conservation.[32] Protections for WSR river segments depend on whether an area has been classified as wild, scenic or recreational. River segments defined as "wild" are typically closed to new leasing, and "recreational" river segments receive the least protection of the three (Stevens 2014). Policies for mineral leasing in NCAs and NRAs are largely determined by the particular enabling legislation that created them.

[31] Up to 82 offerings given by land type were counted in more than one overlapping area.

[32] "National and Scenic Rivers System," *U.S. Fish and Wildlife Service*, accessed September 15, 2014, www.rivers.gov/info/contact.cfm; "Wild and Scenic Rivers," *Bureau of Land Management*, accessed September 15, 2014, www.blm.gov/wo/st/en/prog/blm_special_areas/NLCS/Rivers.html.

Table 2.21
BLM Oil and Gas Lease Offerings and Deferrals in Utah, 2010–2014

Location[1]	Offerings Number	Offerings Share	Deferrals Number	Deferrals Share	Total Nominated Number	Total Nominated Share
Lands with Wilderness Characteristics (LWCs)[2]	79	10.8%	651	89.2%	730	100%
Red Rock Wilderness, proposed[3]	97	10.6%	821	89.4%	921	100%
Sage-grouse habitat	44	9.4%	426	90.6%	470	100%
Master Leasing Plan (MLP) areas[4]	8	1.2%	686	98.8%	694	100%
One or more of the above[5]	146	9.0%	1,478	91.0%	1,624	100%
Anywhere in Utah	461	19.3%	1,927	80.7%	2,388	100%

1. The location of an offering or deferral is defined as whether any part of the parcel is within a specified area.
2. LWCs are outside of designated Wilderness Areas and Wilderness Study Areas.
3. Lands the Utah Wilderness Coalition identified as wilderness in America's Red Rock Wilderness Act
4. MLP areas include Book Cliffs, Glen Canyon, Moab, San Rafael River and Vernal.
5. "One or more..." shows the number of unique offerings and deferrals in any of the first four locations. These land designations overlap. For example, most LWCs are also considered Red Rock Wilderness.

Sources: Bureau of Land Management, Utah Division of Wildlife Resources, Southern Utah Wilderness Alliance; State of Utah, SGID.

As for BLM Utah's national monument, while limited oil and gas activity has not entirely ended since the monument's creation, new development is not permitted within Grand Staircase–Escalante National Monument (GSENM) (Matranga 2014).

Special Recreation Management Area (SRMA) is a BLM planning designation for lands it deems "require explicit recreation management to achieve recreation objectives and provide specific recreation opportunities" (BLM 2008b). Most SRMA acreage in Utah coincides with GSENM, but there are other SRMAs throughout the state. For example, the Moab Field Office has ten SRMAs, generally managed to favor primitive recreation. In the Fillmore Field Office, OHV and boating opportunities are emphasized in two SRMAs, both operated in conjunction with Utah's Department of Parks and Recreation.[33] Management appropriate to individual SRMAs in Utah varies, but generally development is restricted in favor of recreation opportunities, scenic values and artifact preservation.

The Federal Land Policy and Management Act (FLPMA) called for BLM to create Areas of Critical Environmental Concern (ACECs).[34] Some of BLM's 59 ACECs in Utah are not available for development, particularly the ACECs created to preserve cultural resources (Jarnecke 2014). Others are open to oil and gas activity with stipulations, such as "no surface occupancy" (NSO), depending mostly on the reason for ACEC creation. ACECs are created to preserve a variety of values, including scenery, cultural resources, geologic features, archeological sites, paleontological resources, relict vegetation, endangered species, other wildlife, riparian health, and soil stability, among others.[35]

Coal Leasing

The U.S. Department of the Interior has delegated regulatory authority for coal to the state of Utah. Although the BLM oversees the leasing process, including all aspects of regulatory com-

[33] "Special Recreation Management Areas," *Bureau of Land Management*, Fillmore Field Office, accessed September 10, 2014, www.blm.gov/ut/st/en/fo/fillmore/recreation/special_recreation.html.
[34] 43 U.S.C. § 1712(c)(3)
[35] "Utah ACECs," *Bureau of Land Management*, accessed August 27, 2014, www.blm.gov/ut/st/en/prog/more/acecs/utah_acecs.html.

pliance such as Environmental Impact Statements, the Utah Division of Oil, Gas and Mining (DOGM) is tasked with regulating the industry. Royalty payments tied to coal production from federal leases are remitted directly to ONRR.

DOGM is responsible for the oversight of all aspects of coal mining and reclamation, including inspection and enforcement, permit changes, and reclamation of the affected area. The agency also determines the amount of the reclamation bond and holds it until reclamation is complete. About 80 percent of the funding needed to oversee this program is provided with federal grants from the Office of Surface Mining, a division within the U.S. Department of the Interior.

DOGM's regulatory oversight, combined with ONRR's collection responsibilities, keeps BLM's costs of managing coal in check. On average, BLM spends less than $2 million annually to manage coal production. In FY2012, the agency spent $1.2 million (Table 2.22)

Table 2.22
Bureau of Land Management
Coal Management Program Revenue and Expenses, FY2009–FY2012

Measure	2008	2009	2010	2011	2012	Mean
Coal production (tons)	13,513,906	10,107,111	11,139,354	7,012,426	13,371,330	11,028,825
Revenue	$23,861,047	$21,351,454	$29,226,591	$19,650,297	$36,819,139	$26,181,705
Expenses	$1,453,401	$1,565,891	$1,472,222	$1,464,195	$1,200,831	$1,431,308
Profit	$22,407,646	$19,785,563	$27,754,369	$18,186,102	$35,618,308	$24,750,397

Source: Department of the Interior, Office of Natural Resources Revenue, www.statistics.onrr.gov and Bureau of Land Management, Utah Office, FOIA request, 2013; adapted by BEBR.

Between FY2003 and 2012, coal production from federal leases in Utah ranged from a high of 20.6 million tons in 2004 to a low of 7.0 million tons in 2011. In FY2012, coal mines produced 13.4 million tons of coal from federal leases, generating $36.8 million in revenue—almost $36 million of which was royalty payments. Utah receives half of these revenues.

Abandoned Mine Lands

The Abandoned Mine Lands (AML) program of the BLM addresses two broad categories of hazards associated with abandoned hard rock mines: physical safety hazards (open adits and shafts, highwalls, and pits) and environmental hazards (heavy metals, mill tailings and acid mine drainage). BLM has estimated that the number of abandoned mines on public lands in Utah ranges from 8,000 to 11,000, but has not yet conducted a complete inventory. Over the past four years, BLM spent almost $4.1 million in AML inventory and remediation.

Although BLM does not have a complete inventory of abandoned mines, it has developed a database to track information about known mines.[36] Of these known sites, BLM has identified and ranked 2,882 abandoned mines with physical safety hazards and which are located in close proximity to populated places or recreation areas. These sites are the agency's working inventory and current area of focus.

BLM has estimated that the cost to field-validate and remediate these mines is $26 million. This estimate is based on actual spending in the BLM state office for inventory and remediation from

[36] This interactive database is the Abandoned Mine-Site Cleanup Module.

FY2006 to 2010. During that period, BLM inventoried 756 abandoned mine sites at an average cost per site of $1,800, and remediated 235 sites at an average cost of $7,200. From this information, the BLM estimates the average cost of inventory and remediation per mine is $9,000 (Table 2.23) (BLM 2013b).

Table 2.23
Costs to Inventory and Remediate AML with
Physical Safety Hazards

	Field Validation		Remediation		
Inventory	**Average Cost**	**Subtotal**	**Average Cost**	**Subtotal**	**Total**
2,882	$1,800	$5,187,600	$7,200	$20,750,400	$25,938,000

Source: Bureau of Land Management, Abandoned Mine Lands Program: Feasibility Study for AML Inventory Validation and Physical Safety Closures, *July 2013.*

DOGM has a grant and cooperative agreement in place with the BLM for abandoned mines reclamation on BLM lands in Utah. In 2014, there are funds available in this agreement totaling $4.3 million. With the land transfer, DOGM personnel are not certain if BLM funds would still be provided for remediation (Schneider 2014, Fluke 2014). Transfer of federal lands to the state could result in the state assuming responsibility for abandoned mine remediation.

Revenue-Sharing Payments

Receipts from commercial activities on BLM lands are shared with the state of Utah and local units of government. Payment amounts are determined by codified formulas that govern the basis, methodology and timing of these payments. BLM also compensates counties by providing payments in lieu of taxes (PILT).

In FY2012, payments to Utah and counties in Utah totaled $201.1 million. This amount includes $164.6 million in energy and mineral payments from ONRR, $36 million in PILT, and almost $550,000 in payments from revenue collected by the BLM. Table 2.24 shows revenue-sharing payments made to Utah and Utah's counties since FY2003.

Table 2.24
Bureau of Land Management
Payments to Utah and Counties in Utah, FY2003–FY2012

Fiscal Year	Payments In Lieu of Taxes	Mineral Leasing Act	Taylor Grazing Act Sect. 3	Proceeds of Sales	Energy and Minerals	Geothermal Payments to Counties	Total
2003	$18,656,877	$33,012	$129,235	$26,103	$50,614,416	$0	$69,459,643
2004	$19,136,869	$44,477	$91,166	$24,981	$69,013,576	$0	$88,311,069
2005	$19,622,224	$55,319	$104,868	$15,337	$87,444,534	$0	$107,242,282
2006	$20,055,933	$122,147	$142,012	$23,446	$173,010,679	$64,034	$193,418,251
2007	$20,057,363	$220,144	$154,619	$21,629	$135,366,166	$63,493	$155,883,414
2008	$32,207,048	$164,401	$134,295	$36,664	$173,765,221	$74,107	$206,381,736
2009	$33,063,034	$24,767	$125,668	$24,436	$128,636,160	$2,310,439	$164,184,504
2010	$34,265,151	$240,013	$126,014	$26,907	$142,696,934	$274,787	$177,629,806
2011	$34,659,277	$694,786	$132,435	$27,200	$149,439,229	$162,893	$185,115,820
2012	$36,038,626	$367,424	$132,520	$49,990	$164,410,238	$192,746	$201,191,544

Source: U.S. Department of the Interior, Bureau of Land Management, Utah Office, email correspondence; U.S. Department of the Interior, Office of Natural Resources Revenue, Interactive Statistical Information Program, available at www.onrr.gov.

Summary and Conclusions

The Bureau of Land Management administers 22.8 million acres of rangelands in Utah. Under H.B. 148 these lands, less the wilderness acres, would be transferred to the state of Utah, which would then bear the costs of managing the lands. From 2008 to 2012, the BLM spent, on average, $124.8 million annually to manage Utah's rangelands. This translates to $5.47 per acre. Over the same five- year period, revenues generated on BLM lands averaged $317.6 million or $14.24 per acre. Table 2.25 summarizes the output measures for the BLM for fiscal years 2008 through 2012.

Table 2.25
Bureau of Land Management
Summary Efficiency Measures, FY2008–FY2012

Measure	FY2008	FY2009	FT2010	FY2011	FY2012	Mean
Employment (FTE)	849	785	793	777	774	796
Revenue	$383,515,090	$244,246,020	$306,623,707	$314,389,753	$339,112,002	$317,577,314
Spending	$131,311,937	$113,318,885	$140,956,626	$118,568,100	$119,974,584	$124,826,026
Profit/Loss	$252,203,153	$130,927,135	$165,667,081	$195,821,653	$219,137,418	$192,751,288
Revenue per acre	$16.78	$10.69	$13.42	$13.76	$14.84	$13.90
Spending per acre	$5.75	$4.96	$6.17	$5.19	$5.75	$5.47
Net Cost per acre	$11.03	$5.73	$7.25	$8.57	$9.09	$8.43
Acres managed per employee	26,922	29,116	28,821	29,414	29,528	28,713

Source: Bureau of Economic and Business Research.

With more than 22 million acres under its jurisdiction, the BLM controls more land than any other agency in Utah. Lands managed by the BLM provide diverse recreation opportunities for millions of people each year, and hundreds of ranchers in Utah depend on the lands for grazing. Revenue from production of oil, gas and coal are an important source of income for the state and its counties. As such, decisions about the ways rangelands are used have far-reaching economic effects on the state of Utah and her residents.

BLM's management decisions are constrained by budget considerations and a complex regulatory environment. While the overarching goals and principals governing management of public lands are provided in FLPMA, the BLM must also incorporate a plethora of other—and sometimes conflicting—laws and regulations in its management objectives, all while accommodating public demands for access and use.

Use of its limited funds is driven largely by circumstances outside of the agency's control; for example, wildfire management and Congressional funding. Managing for wildfire accounts for about one-third of the BLM's budget. Wildfire suppression is one component of those efforts. Over the past 10 years, fire suppression has ranged from $7 million to $19 million. While suppression is not always the largest component of wildfire management, it is the most volatile.

In real terms, the BLM is managing its lands with less money and fewer people than it had a decade ago. At the same time, the demand for use of the lands has been increasing. These demands are growing as population grows. Recreation visits on BLM lands have increased 17 percent over the past decade, over half of which occur in areas that are free for use but still must be maintained. Industry wants more lands opened for development at a time when BLM does not have sufficient funding to manage the production operations currently in place. The "do more with less" attitude of Congress is a political reality that is not likely to change in the near future.

From the state's perspective, revenue from oil, gas and coal production is the most direct source of revenue from activities on the rangelands. BLM policies that affect production affect the revenue stream. The BLM's Master Lease Planning could potentially constrain oil and gas production in Utah well into the future if the agency postpones leasing until such plans are completed. The economic consequences to Utah could be significant.

2.1.2 U.S. Forest Service

Overview

Created in 1905 to manage the nation's forest reserves (now the National Forest System), the U.S. Forest Service is the oldest land management agency in the United States. The agency functions within the U.S. Department of Agriculture, managing 193 million acres of forests and grasslands, primarily in the western U.S. The agency also conducts forestry research and provides assistance to state, local and private forest owners. Stewardship of the National Forest System is carried out through nine regional offices, each headed by a regional forester.

Funding for the Forest Service is provided through discretionary and mandatory appropriations. Discretionary appropriations provide the largest share of agency funding and are provided by Congress through the Interior, Environment, and Related Agencies appropriations bill.[37] Discretionary appropriations are primarily divided among seven accounts: Forest and Rangeland Research, State and Private Forestry, National Forest System, Capital Improvement and Maintenance, Land Acquisition, Wildland Fire Management and Other Appropriations.

Mandatory appropriations used by the agency come from permanent working funds and trust funds. For several of these accounts the budget authority (or right to utilize the funds) is dependent on revenue generated by activities on the national forests. Some funds also have expenditure restrictions, or limits on how the funds can be used. Unlike discretionary appropriations that are authorized each year by Congress, mandatory appropriations are available to the Forest Service without action by Congress.

Management Authority

The Forest Service manages national forests and grasslands for multiple use and sustained yields as specified in the Multiple Use–Sustained Yield Act of 1960 (MUSYA), amended in 1996.[38] This act directs land and resource management of the national forests for the combination that best meets the needs of the American people, with management efforts coordinated for multiple uses. The act also calls for sustained yield—specifically, managing the lands for a high level of resource output without impairing the productivity of the land.

The National Forest Management Act of 1976 (NFMA) was passed to further strengthen the agency's ability to meet its obligation to manage the lands and serve people. Similar in language to the MUSYA, NFMA mandates that the Forest Service provide for the multiple use and sus-

[37] Although the Forest Service is an agency of the United States Department of Agriculture, it has been included in the Interior bill as a "related agency" since 1955.
[38] Multiple Use–Sustained Yield Act of 1960 (Public Law 86-517).

tained yield of the products and services obtained from forests, and requires that the Forest Service include coordination of outdoor recreation, range, timber, watershed, wildlife and fish, and wilderness.[39] NFMA changed forest planning by obliging the Forest Service to use a systematic and interdisciplinary approach to resource management. It also provided for public involvement in preparing and revising forest plans.

In 1992, the Forest Service added another consideration to its planning process with the formal announcement that it would implement an ecosystem approach to managing multiple uses. The ecosystem planning strategy calls for protecting ecosystems within the forests and continuing multiple uses within the capabilities of those ecosystems (Fedkiw 1998).

While these legislative directives for managing the national forests were intended to provide the Forest Service with a clearly defined mission, some believe the existing regulatory framework constrains the agency from effectively completing that mission. For instance, while the regulations developed to implement NFMA instructed the Forest Service to produce outputs, the agency was required to do so with extensive public involvement and input from many constituencies with conflicting opinions on both forest management and use (Sedjo 1998). The agency's frustrations in managing the National Forests are summarized in *The Process Predicament*:

> Time, effort, and resources poured into a project might ultimately yield nothing but paperwork—competent studies and documentation, but no results on the ground.… It is not just a matter of delivering more outputs: it is a matter of getting anything done at all (USFS 2002).

Forest Service Operations in Utah

Utah is part of the Intermountain Region (Region 4). The Regional Office for Region 4 is headquartered in Ogden, Utah. Region 4 includes 12 national forests, one national grassland, an experimental area station, and a national recreation area.[40] The region encompasses 32 million acres of federally owned forests and grasslands in Utah, Nevada, southern Idaho and western Wyoming.

Five of the 12 national forests under Region 4 management are *entirely* or *primarily* located in Utah. These are the Ashley National Forest, the Dixie National Forest, the Fishlake National Forest, the Manti–LaSal National Forest, and the Uinta–Wasatch–Cache National Forest. These forests contain almost 8.5 million acres, of which 8.1 million acres (95 percent) are located in Utah, including 775,568 acres of designated National Wilderness.

Two national forests in Region 4 are partially located in Utah. Very small portions of the Caribou National Forest and the Sawtooth National Forest extend into the state from Idaho. The combined acreage in these forests is about 2.8 million, of which 78,938 acres are located in Utah. In total, there are 8.15 million acres of national forests in Utah, or about 15 percent of the state's land area. Figure 2.5 shows all national forests located either wholly or partially in Utah.

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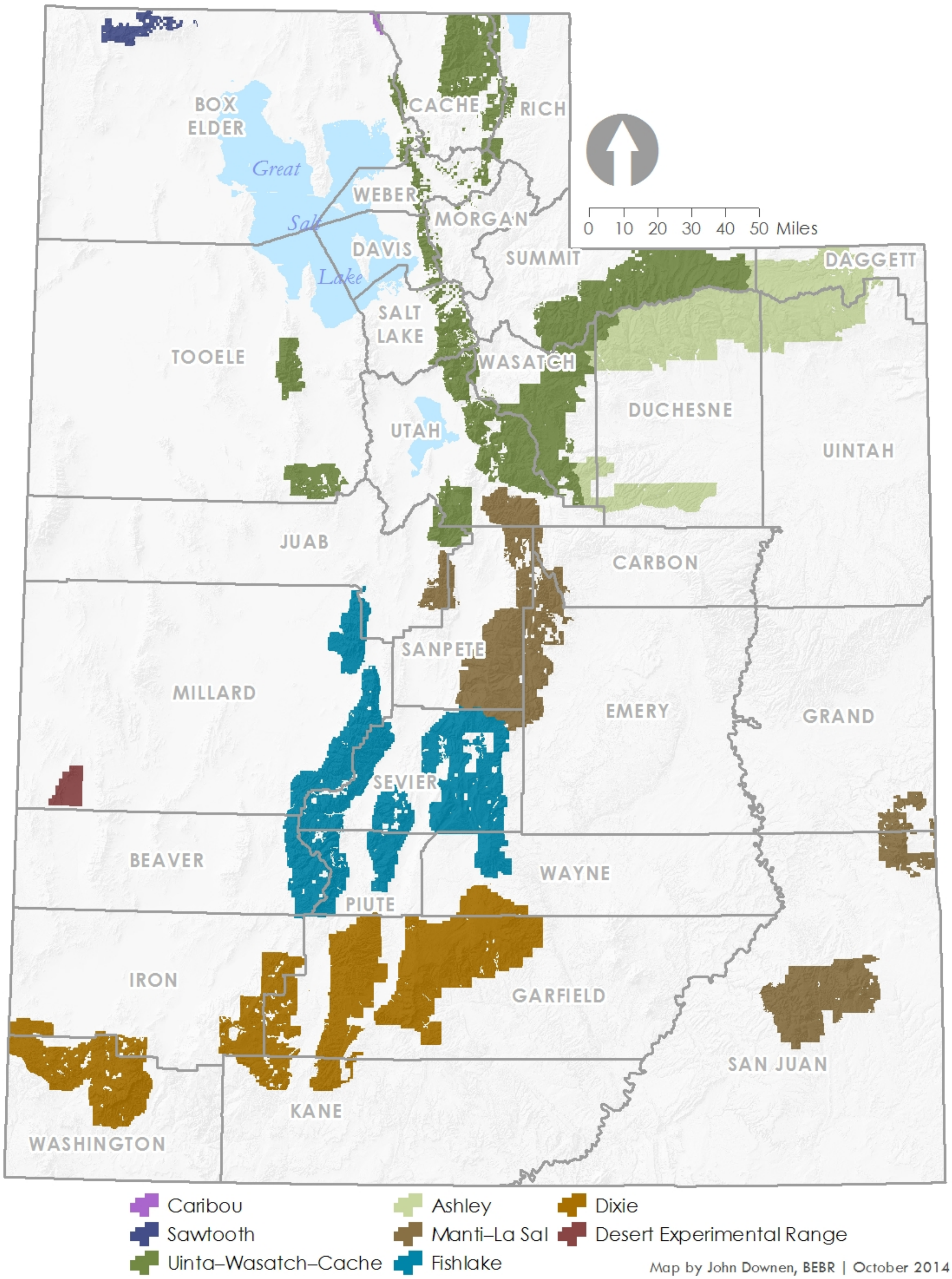
[39] National Forest Management Act of 1976 (P.L. 94-588).

[40] The USDA lists 18 national forests in its document "Land Areas of the National Forests System." Three of these national forests (Cache, Uinta, and Wasatch) are administratively managed as one unit known as Uinta–Wasatch–Cache National Forest.

Figure 2.5
Utah's National Forests



Source: State of Utah, SGID; U.S. Forest Service.

The Forest Service also manages the Flaming Gorge National Recreation Area, located in the Ashley National Forest, and the Desert Experimental Range in Millard County. There are no grasslands managed by the Forest Service in Utah.

In addition to the regional headquarters in Ogden there are forest supervisors who provide oversight and support to ranger districts. There are 29 ranger districts spread throughout the national forests in Utah. These are the units that directly manage activities within the forests.

The acreage and share of each national forest in Utah is shown in Table 2.26.

Table 2.26
National Forest Acres in Utah and Adjoining States

National Forest	Utah	Wyoming	Idaho	Colorado	Total	Share in Utah	Wilderness Acres in Utah
Ashley	1,286,123	96,223	0	0	1,382,346	93.0%	276,175
Cache	437,712	0	263,940	0	701,652	62.4%	65,542
Caribou	6,955	7,831	972,430	0	987,216	0.7%	0
Dixie	1,889,106	0	0	0	1,889,106	100.0%	85,669
Fishlake	1,461,226	0	0	0	1,461,226	100.0%	0
Manti–La Sal	1,243,700	0	0	27,105	1,270,805	97.9%	47,116
Sawtooth	71,983	0	1,732,108	0	1,804,091	4.0%	0
Uinta	880,719	0	0	0	880,719	100%	59,706
Wasatch	876,118	37,762	0	0	913,880	95.9%	241,360
Totals	8,153,642	141,816	2,968,478	27,105	11,291,041	72.2%	775,568

Note: Forests shown in italics are reported as national forests in the state of Utah by the U.S. Forest Service.
Source: U.S. Forest Service, Land Areas Report, *September 30, 2012, Table 5.*

Utah's national forests also include about 1.0 million acres of inholdings (not included in Table 2.26). This is land (primarily private) that lies within the designated boundaries of the national forests but is not managed by the Forest Service. Most of these acres (747,228) are located in the Uinta–Wasatch–Cache National Forest.

Under H.B. 148, the state of Utah would take possession of all portions of the national forests located in Utah, except wilderness acres. Currently, there are 16 wilderness areas containing 775,568 acres scattered throughout six of the nine national forests shown in Table 2.16. Under the land transfer, the wilderness acres would become federal inholdings.

Landholding by County

Forest Service lands are scattered throughout every county in the state, with the largest concentrations in Garfield, Sevier and Duchesne. Forest lands in these counties account for almost one-third of the state total. The highest concentration of forest acres is in Garfield County, which includes almost half of the Dixie National Forest (Table 2.27).

At least 25 percent of land acres in 11 Utah counties are administered by the Forest Service. These counties are highlighted in Table 2.27 and include Cache, Daggett, Duchesne, Garfield, Piute, Sanpete, Sevier, Summit, Utah, Wasatch, and Washington. The economic consequences of land ownership changes in these counties could be significant.

Table 2.27
National Forest Acreage in Utah, by County

County	Forest Acres	Share of Forest Total	Share of County Total	County	Forest Acres	Share of Forest Total	Share of County Total
Beaver	138,967	1.7%	8.4%	Piute	196,543	2.4%	40.1%
Box Elder	103,938	1.3%	2.4%	Rich	52,219	0.6%	7.5%
Cache	285,921	3.5%	38.1%	Salt Lake	97,556	1.2%	18.9%
Carbon	30,270	0.4%	3.2%	San Juan	449,924	5.5%	8.9%
Daggett	257,323	3.1%	55.9%	Sanpete	391,422	4.8%	38.2%
Davis	38,951	0.5%	9.6%	Sevier	732,423	9.0%	59.7%
Duchesne	722,748	8.8%	34.7%	Summit	528,858	6.5%	43.9%
Emery	211,965	2.6%	7.4%	Tooele	160,819	2.0%	3.4%
Garfield	1,046,311	12.8%	31.4%	Uintah	269,081	3.3%	9.3%
Grand	56,695	0.7%	2.4%	Utah	485,761	5.9%	35.4%
Iron	243,783	3.0%	11.5%	Wasatch	432,060	5.3%	55.8%
Juab	116,853	1.4%	5.4%	Washington	395,395	4.8%	25.4%
Kane	123,403	1.5%	4.7%	Wayne	160,140	2.0%	10.1%
Millard	358,371	4.5%	8.4%	Weber	60,993	0.7%	14.4%
Morgan	16,534	0.2%	4.2%	State	8,175,226	100.0%	15.0%

Note: State total shown here is higher than reported by the Forest Service source due to rounding.
Source: BEBR analysis of SGID data, 2014.

Revenue, Spending and Employment

Spending and employment data specific to Forest Service operations in Utah are not included in sources available to the public. BEBR obtained the financial and employment data presented in this analysis through a Freedom of Information Act request in 2013. The analysis of that information should be viewed in the context of the following information.

- According to the Forest Service, there is no reliable method to allocate the costs of managing the forests to specific states. The Forest Service was able to provide spending and employment information for the five national forests in Utah that are primarily or wholly located in the state. This group of five forests—Ashley, Dixie, Fishlake, Manti–La Sal, and Uinta–Wasatch–Cache—is referred to throughout this analysis as the "Utah forests."

- Information on the Utah forests was used in its entirety even though some portion of spending, employment and revenue production occurs outside the state of Utah.

- The information provided by the Forest Service excludes spending for programs that will not be affected by House Bill 148. These include activities and programs funded through the Forest and Rangeland Research and State and Private Forestry accounts.

- The spending associated with the Regional Office headquartered in Ogden, Utah and Regional Services units has not been fully integrated into this analysis.[41] These offices support ranger districts and activities throughout the Intermountain Region, not just in Utah. The Forest Service believes there is no reliable method to identify or allocate these costs to either the state of Utah or to a particular forest. BEBR allocated costs to Utah based on the average cost (and employment) per acre for the region, then assigned a proportional share to the five Utah forests based on acreage within those forests.

[41] Regional Services includes work that would normally be done at a forest level but has been centralized for efficiency.

Revenue Generated in Utah National Forests

The Forest Service collects revenue from an array of activities that includes recreation, livestock grazing, sales of mineral resources and forests products, land use for power generation, ski operations, and other business activities.

Revenues are classified into two groups: (1) receipts from commercial activities in national forests and (2) special collections that come from fees. Receipts from commercial activities are deposited into the National Forest Fund (NFF) for subsequent deposit into the U.S. Treasury general fund. NFF receipts are used for payments made to counties through the Secure Rural Schools and Community Self Determination Act of 2000.[42] Special collections are deposited into special accounts and trust funds and are available to the Forest Service without Congressional appropriation (Headwaters 2014).

In fiscal year 2012, $7.9 million in revenue was generated in Utah's national forests. NFF receipts were $5.2 million of this amount, and came primarily from special use leases for recreation and rights-of-way easements and permits. Special collections provided $2.7 million, most of which came from recreation fees.

The $7.9 million generated in the Utah forests does not include revenue from oil and gas or coal production. These activities are managed by the BLM. Royalties and other payments tied to energy production on Forest Service lands are remitted directly to the Office of National Resources Revenue.[43]

Table 2.28 shows all revenue generated in the five Utah forests from FY2008 to FY2012.

Activities related to recreation generate more than half of all revenue collected in Utah's forests. In FY2012, fees collected through the recreation fee demonstration program and recreation-related special use permits generated $4.1 million; of this at least $1.8 million was retained by the Forest Service and used for improvements at local recreation sites.

Revenue from rights-of-way easements and permits for power generation projects posted the largest gains over the past five years, increasing from $97,119 in FY2008 to $1.25 million in FY2012. Revenue from land use fees, which includes permit fees and trespass settlements, has also steadily increased.

[42] SRS, P.L. 106-393.

[43] Most of the energy production on Forest Service lands is coal production. The Forest Service estimates that royalties from coal production on Forest Service lands in Utah averaged about $15.2 million annually during fiscal years 2009 to 2012.

Table 2.28
U.S. Forest Service
Receipts and Revenue, Utah Forests, FY2008–FY2012

Revenue Source	FY2008	FY2009	FY2010	FY2011	FY2012	Mean
NATIONAL FOREST GROSS RECEIPTS						
Timber sales	$74,913	$34,042	$66,643	$65,601	$77,600	$63,760
Land use fees	$305,855	$311,503	$381,951	$457,992	$612,890	$414,038
Recreation special use	$1,800,002	$2,151485	$1,658,987	$2,324,274	$1,741,531	$1,935,256
Power project easements, permits, rights-of-way	$97,119	$240,710	$311,765	$481,420	$1,250,077	$476,218
Mineral lease and permit fees	$4,101	$5,486	$2,896	$4,950	$4,982	$4,483
Grazing fees	$608,982	$588,921	$595,791	$612,382	$577,267	$596,669
Knutson-Vandenberg Act collections	$388,428	$202,032	$97,250	$100,706	$22,0841	$201,851
Timber purchaser road credits	$881	0	0	0	0	$176
Specified road credits	$143,427	$191,536	$24,151	$62,265	$11,362	$86,548
Timber salvage sales	$1,223,935	$740,382	$548,208	$432,809	$630,910	$715,249
Timber Sale Pipeline Restoration Fund	0	0	$14,936	$19,331	$56,679	$18,189
Total National Forest Gross Receipts	**$4,647,643**	**$4,466,097**	**$3,702,578**	**$4,561,730**	**$5,184,139**	**$4,512,437**
SPECIAL COLLECTIONS						
Recreation fee demo program	$2,057,719	$2,406,916	$2,186,598	$2,101,933	$2,322,951	$2,215,223
Botanical products	$4,025	$25,334	$62,573	$58,220	$36,129	$37,256
Land use fees	$25,273	$25,636	$35,899	$15,934	$27,288	$26,006
Commercial filming fees	$4,050	$14,636	$14,005	$8,046	$12,080	$10,563
Cost recovery projects	$103,012	$267,689	$1,261,251	$298,709	$241,374	$434,407
Other	$20,879	$32,274	–$5,188	$15,646	$68,301	$26,382
Total Special Collections	**$2,214,958**	**$2,772,485**	**$3,555,138**	**$2,498,488**	**$2,708,123**	**$2,749,838**
Grand Total all Receipts and Revenue	**$6,862,601**	**$7,238,582**	**$7,257,716**	**$7,060,218**	**$7,892,262**	**$7,262,276**
Average per Acre	**$0.81**	**$0.85**	**$0.85**	**$0.83**	**$0.93**	**$0.85**

Note: Information includes receipts and collections from the following national forests: Ashley, Dixie, Fishlake, Manti–LaSal, and Uinta–Wasatch–Cache. Acreage used to calculate per acre cost was 8,499,734.

Source: U.S Forest Service, "National Forest Statement of Receipts (ASR-13-2)," U.S. Forest Service, Region 4, "U.S. Forest Service, Utah Forest Collections." FOIA request 2014.

Timber sales and timber salvage sales averaged $63,760 and $715,249, respectively, over the five-year period covered in this analysis. This includes revenue from timber sales and other forest products such as posts, poles and firewood. It also includes timber damaged by fire, wind, insects and diseases. Grazing receipts totaled $577,267 in FY2012, a five-year low.

In FY2012, less than $1.00 per acre of revenue was generated or earned on forest lands in Utah. The five-year average was $0.85 per acre.

Spending and Employment

Forest-Level Operations

In FY2012, the Forest Service spent $102 million in direct support of Utah's forests, employed 987 people at the forest level, and paid wages totaling $51.1 million. Employment includes 621 permanent workers and 366 temporary and term employees. Table 2.29 shows forest employment and spending from FY2008 to FY2012. In addition to Forest Service employment are volunteers who provide assistance to the agency. In FY12, the forests service reported a total of 87,840 volunteer hours.

As shown in Table 2.29, wildfire management (WFM) is consistently the costliest program for the Forest Service. From FY2008 to FY2012, WFM (including fire suppression costs) averaged almost $34.6 million, or 37 percent of the Forest Service budget.p

Table 2.29
U.S. Forest Service
Utah Forest Employment and Spending, FY2008–FY2012

	FY2008	FY2009	FY2010	FY2011	FY2012	Mean
Employment (FTE)	902	1,035	1,052	1,018	987	999
Volunteer hours	135,846	93,438	81,396	100,728	87,840	99,850
Spending Total	**$80,546,102**	**$100,771,524**	**$97,266,223**	**$88,401,765**	**$102,471,208**	**$93,891,364**
Payroll	$44,511,604	$48,158,500	$49,230,170	$47,454,996	$50,955,322	$48,062,118
Nonpayroll	$36,035,498	$52,613,024	$48,036,053	$40,946,769	$51,515,886	$45,829,446
Spending less Fire Suppression	$73,523,391	$84,070,747	$83,511,360	$79,302,722	$71,403,342	$78,362,312
Spending by Major Activity						
Wildland Fire Management Total	$24,921,492	$37,568,009	$33,930,818	$29,131,585	$47,347,635	$34,574,508
Fire suppression	$7,023,711	$16,700,777	$13,754,863	$9,099,043	$31,067,866	$15,529,252
Non–fire suppression	$17,897,781	$20,867,232	$20,175,955	$20,032,542	$16,279,769	$19,045,256
Capital Improvements and Maintenance[1,2]	$12,843,061	$16,555,541	$17,795,593	$14,893,044	$9,575,560	$14,332,560
Management and Administration	$10,927,399	$11,199,615	$12,127,948	$11,750,228	$11,775,093	$11,556,057
Recreation Management	$9,521,706	$11,112,314	$10,106,769	$9,939,136	$9,756,494	$10,087,284
Grazing Management	$2,235,768	$3,298,981	$2,616,857	$2,508,848	$2,602,640	$2,652,619
Minerals/Geology Management	$2,091,440	$2,838,4189	$2,240,511	$2,140,022	$1,901,085	$2,242,295
Forest Products[2]	$3,314,331	$2,763,777	$2,809,799	$2,799,405	–	$2,921,828
Vegetation and Watershed Mgmt.[2]	$3,548,821	$4,460,974	$4,038,166	$4,165,055	–	$4,053,254
Wildlife/Fisheries Management[2]	$2,578,698	$3,020,081	$2,937,448	$2,527,892	–	$2,766,030
Inventory and Monitoring	$3,389,386	$3,332,796	$3,229,995	$3,212,315	$2,532,152	$3,139,329
Land Management Planning	$1,046,695	$816,753	$296,189	$370,694	$213,835	$548,833
Land Ownership Management	$834,780	$866,229	$1,027,934	$882,991	$665,040	$855,394
Integrated Resource Restoration[2]	–	–	–	–	$12,894,904	–
All Other Activities	$3,292,525	$2,938,036	$4,135,196	$4,080,550	$3,206,770	$3,530,615
Spending per Acre	$9.48	$11.86	$11.44	$10.40	$12.05	$11.04

Note: Includes Ashley NF, Dixie NF, Fishlake NF, Manti–LaSal NF and Uinta–Wasatch–Cache NF. Total acreage for these forests is 8,499,135 of which 435,030 is located outside Utah. FTE = full-time equivalent

1 Shows the four-year average from 2008 to 2011. In prior years, Legacy Road Remediation was presented in this activity.

2 In FY2012, the Forest Service collapsed some accounts into a new account titled Integrated Resource Restoration. The accounts include: Forest Products, Vegetation and Watershed Management, Wildlife and Fisheries Management, Legacy Road remediation and 25 percent of spending for Hazardous Fuels in non–wildland-urban interface.

Source: U.S. Forest Service, Region 4, FOIA request 2014. Adapted by BEBR.

Fire suppression costs are the most volatile component of WFM, ranging from 28 to 63 percent of all WFM spending from FY2008 to FY2012. These fluctuations mask an underlying trend in forest spending in Utah. Funding for the non-suppression component of WFM remained relatively stable during the study years (2008–2012), while fire suppression costs ranged from $7 million to $31 million. Years when fire suppression costs were high (2009, 2010 and 2012) were also years when total forest spending was high. Removing fire suppression costs from the Forest Service budget shows that forest spending has been steadily declining since FY2009. Put differently, at current levels, funding may not be enough to adequately maintain forest health or support activities that take place on forest lands.

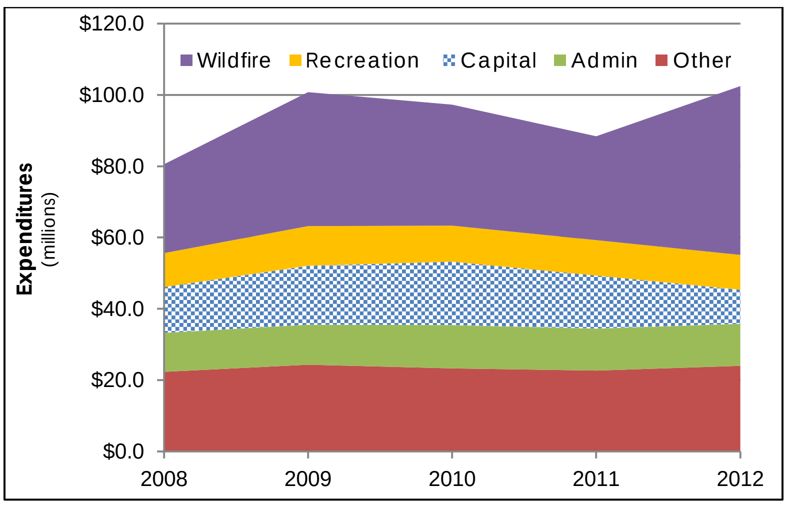
Capital improvements and maintenance (CIM) is the second costliest program for the Forest Service. This includes funding for ongoing maintenance, infrastructure improvements, deferred maintenance and, until FY2012, legacy roads remediation. In 2012, costs associated with legacy roads, along with several other budget line items, were collapsed into a new account called Integrated Resource Restoration, a consolidation that makes the Forest Service budget even less transparent.

Spending for forest-level administrative functions totaled $11.8 million in FY2012, and includes business services, general management support and IT operations. At the forest level, spending for administrative functions averaged $1.36 per acre over the five-year study period.

Funding for the recreation program peaked in FY2009 at $11.1 million and has steadily declined since, dropping to $9.8 million in FY2012. That same year spending also declined in four other major programs—minerals and geology management, inventory and monitoring, land management planning and land ownership management.

Figure 2.6 shows spending, by major program, in Utah's five forests for fiscal years 2008 to 2012.

Figure 2.6
U.S. Forest Service
Direct Spending for Utah Forests, FY2008–FY2012



Source: BEBR analysis.

Regional Office Allocations

In FY2012, spending by the Regional Office (RO) and for regional services (RS) in the Intermountain Region totaled $35.2 million. BEBR allocated $9.3 million of this to Utah forests, or $1.10 per acre.[44] The five-year average estimate, based on this allocation method, was $9.7 million, or $1.15 per acre.

Over the study period, direct forest-level spending averaged $11.05 per acre. Adding RO and RS spending increased per-acre spending in Utah to $12.20.

[44] The allocation formula used to make this estimate is: (Total RO and RS spending / number of acres in the Intermountain Region) * number of acres in the five Utah forests, or ($35.2 million / 32 million) * 8.49 million = $9.3 million. While it is reasonable to assume that some portion of the RO and RS spending is used in Utah, there is not always a one-to-one distribution between dollars and forest acreage. Therefore, this allocation may not accurately reflect actual spending in Utah's forests.

Table 2.30 shows the estimated total employment and spending in support of Utah forests for fiscal years 2008 to through 2012.

Table 2.30
U.S. Forest Service
Utah Employment and Spending, FY2008–FY2012
Utah Forests and Regional Office Allocations

	FY2008	FY2009	FY2010	FY2011	FY2012	Mean
Employment Total	981	1,128	1,150	1,114	1,085	1,091
Utah Forests	902	1,035	1,052	1,018	987	999
Regional Office/Services	79	93	98	96	95	92
Spending	$89,553,931	$112,178,442	$106,955,179	$97,776,150	$111,833,611	$103,659,662
Utah Forests	$80,546,102	$100,771,524	$97,266,223	$88,401,765	$102,471,208	$93,891,564
Regional Office/Services	$9,007,829	$11,406,918	$9,688,956	$9,374,385	$9,362,403	$9,768,098
Acres Managed per Employee	8,673	7,535	7,391	7,630	7,856	7,791
Spending per Acre	$10.54	$13.20	$12.58	$11.50	$13.16	$12.20

Notes: Includes Ashley NF, Dixie NF, Fishlake NF, Manti–LaSal NF and Uintah-Wasatch-Cache NF. Total acreage for these forests is 8,499,135 of which 435,030 is located outside Utah. FTE = Full-time Equivalent

Source: U.S. Forest Service, Region 4 Office, FOIA request, 2014.

Economic Impacts of Forest Service Operations

Forest Service operations in Utah generate economic impacts that are measured by the additional employment, earnings, gross state product and fiscal revenues that accrue to state and local government.

Over the past five years, the employment impact of the Forest Service has averaged 2,384 jobs annually, with an annual earnings impact of $108.9 million. The annual contribution to gross state product has been almost $64.5 million, with state and local fiscal impacts totaling almost $8 million annually. These impacts are summarized in Table 2.31.

Table 2.31
Economic Impacts of U.S. Forest Service Average Annual Estimate for FY2008–FY2012

Impact Type	Earnings	Jobs	GSP
Direct Impacts	$77,877,139	1,365	–
Indirect Impacts	$31,049,615	1,018	$64,497,847
Total Impacts	$108,926,755	2,384	$64,497,847
	State	Local	Total
Fiscal Impacts	$7,282,181	$681,910	$7,964,091

Source: BEBR analysis of Forest Service data using BEA's RIMS II multipliers.

The employment used in estimating the economic impacts of Forest Service operations in Utah is different from the employment shown in Table 2.29. The direct employment shown in Table 2.30 includes forest-level employment and total employment at the regional headquarters in Ogden. The employment shown in Table 2.30 includes forest-level employment and a proportional allocation of RO and RS employment to show the estimated number of people who are involved with managing Utah forests. The impacts shown in Table 2.31 are based on Forest Service employment Utah and the spending of those employees. This information was provided by the Regional Office.

The transfer of public lands to the state of Utah would change the impacts presented here if Forest Service employees move from Utah. In this case, the economic impacts derived from employee spending would decline. Additionally, the Forest Service payroll represents a net "new" flow of money into Utah. This new money expands the state's existing money supply.

When this money is spent locally, it increases economic activity and expands the state's economic base. State funds spent locally are a reallocation of the existing money supply. From an economic perspective, this spending does not increase the state's economic base. Put differently, the net gain to Utah of using state dollars to manage lands is the difference between the amount the state pays for that management and the amount it receives in tax revenues generated on earnings and sales. When federal dollars are used to manage these same lands, the state receives the tax revenue without bearing the management cost. The methodology and assumptions used to make the impact estimates shown in Table 2.31 are provided in Appendix E: Economic Impact Modeling.

Selected Activity Analysis

Specific activities undertaken by the U.S. Forest Service may be of particular interest to the State of Utah; therefore a more detailed analysis of specific programs has been provided. These activities include wildfire management, infrastructure and maintenance, recreation, livestock grazing, and timber production.

Wildfire Management

The Forest Service is responsible for wildfire management (WFM) in Utah's national forests. The cost of WFM activities accounts for the largest single share of agency spending, not just in Utah but nationally as well. As a percentage of the combined spending for the Utah forests, WFM averaged almost 37 percent from FY2008 to FY2012, ranging from 31 percent in 2008 to 46 percent in 2012. Nationally, the fire portion of the Forest Service budget increased from 13 percent in FY1991 to 45 percent in FY2008 (USFS 2007).

Components of wildfire management include preparedness, hazardous fuels reduction, suppression and rehabilitation. On a per-acre basis, wildfire management for Utah forests is expensive. From FY2008 to FY2012 the Forest Service spent $4.07 per acre for WFM in the Utah forests.

Suppression costs are the most volatile of the WFM activities. As shown in Table 2.32, suppression costs ranged from $7.0 million in FY2008 to $31 million in FY2012—the largest amount spent in 10 years. Other components of WFM remained relatively stable over this period.

Table 2.32
U.S. Forest Service
Wildfire Management Spending, FY2008–FY2012

Activity	FY2008	FY2009	FY2010	FY2011	FY2012	Mean	Mean Per Acre
Preparedness	$11,787,762	$11,952,897	$12,201,973	$11,230,128	$10,449,871	$11,524526	$1.39
Hazardous Fuels Reduction	$5,778,973	$8,564,720	$6,915,450	$7,824,096	$5,758,973	$6,968,442	$0.82
Suppression	$7,023,711	$16,700,777	$13,754,863	$9,099,043	$31,067,866	$15,529,252	$1.82
Burned Area Rehabilitation	$331,046	$349,615	$1,058,532	$978,318	$70,925	$557,687	$0.07
Total Spending	$24,921,492	$37,568,009	$33,930,818	$29,131,585	$47,347,635	$34,579,908	$4.07
Per Acre Spending	$2.93	$4.42	$3.99	$3.43	$5.57	$4.07	–

Source: U.S. Forest Service, Region 4 Office, FOIA request, 2014.

Table 2.33 shows fire suppression costs, the number of fires on Forest Service lands in Utah, and acres burned in those fires between FY2003 and FY2012. There is no clear trend in the data. Fluctuations in the number of fires, acres burned each year, and fire suppression costs are a function of myriad factors such as climate change, weather conditions, hazardous fuel loads, proximity of the fire to the wildland-urban interface, and biomass accumulations within the forests.

Table 2.33
U.S. Forest Service
Fire Statistics for Utah Forests, FY2003–FY2012

Fiscal Year	Fire Suppression Costs	Fires[1]	Acres Burned[1]	Acres Burned per Fire	Cost per Fire	Cost per Acre Burned
2003	$19,367,148	501	11,830	24	$38,657	$1,637
2004	$15,187,230	363	33,177	91	$41,838	$458
2005	$13,359,951	242	16,402	68	$55,206	$814
2006	$22,216,210	336	41,897	125	$66,120	$530
2007	$3,769,418	270	27,520	102	$13,961	$137
2008	$7,023,711	184	10,662	58	$37,172	$659
2009	$16,700,777	227	45,827	202	$73,572	$364
2010	$13,754,863	199	48,445	243	$69,120	$284
2011	$9,099,043	209	1,968	9	$43,536	$4,639
2012	$31,067,866	313	146,473	468	$99,258	$212
Mean	$15,154,622	284	38,420	139	$53,361	$394

Note: Number of fires and acres burned shown here are state specific and fire suppression costs are forest specific, therefore some of the costs may have been used for fire suppression on portions of forests located outside Utah.
1 Excludes prescribed burns.
Sources: Fires and Number of Acres Burned: National Interagency Fire Center, "Historical Year-end Fire Statistics by State," accessed at www.nifc.gov/fireinfo/fireinfo_statistics.html; Fire Suppression Costs: U.S. Forest Service, Region 4 Office, FOIA request, 2014.

Infrastructure and Maintenance

The Forest Service owns and maintains approximately 1,300 assets in Utah, most of which are recreation-based. Table 2.34 summarizes data provided about asset type, capitalization value and accumulated depreciation of Forest Service assets in Utah.

Table 2.34
U.S. Forest Service, Utah Assets

Asset Type	Count	Capitalization Value	Accumulated Depreciation
Administrative Sites and Features	117	$3,198,602	$2,896,944
Bridges	131	$3,959,077	$1,789,681
Buildings	426	$15,671,991	$10,889,915
Communication Sites	24	$662,700	$662,700
Dams	29	$291,610	$37,909
Interpretive Sites and Observation Areas	21	$160,667	$156,125
Recreation Sites and Features	481	$47,141,646	$44,540,422
Sites	36	$2,020,692	$2,010,318
Campgrounds	182	$31,803,335	$30,066,163
Trailheads	124	$3,140,287	$2,385,503
All other recreation areas and features	139	$10,177,332	$10,078,438
Roads, Road Prisms, Culverts	36	$7,839,520	$7,839,556
Water and Wastewater Systems	41	$564,4531	$4,930,510
Totals	1,306	$84,570,244	$73,743,762

Note: Includes buildings and administrative sites for the regional office and regional units.
Source: U.S. Forest Service, Region 4 Office, FOIA request, 2014, adapted by BEBR.

The amount spent by the Forest Service to maintain these assets is provided in Table 2.35. Between FY2008 and FY2012, the agency spent a total of $71.6 million in maintenance and improvements (M&I), or an average of $14.3 million each year. Almost half of this ($31.7 million) was to maintain and improve roads.

Table 2.35
U.S. Forest Service Detailed Spending for Maintenance, Deferred Maintenance and Capital Improvements, FY2008–FY2012

Activity	FY2008	FY2009	FY2010	FY2011	FY2012	Total	Mean[2]
Facilities	$3,303,577	$3,021,481	$3,400,418	$5,093,790	$3,023,075	$17,842,341	$3,568,468
Roads	$6,616,696	$7,475,813	$7,553,849	$5,543,416	$4,481,356	$31,671,130	$6,334,226
Trails	$1,793,806	$2,540,012	$2,231,465	$2,587,635	$2,071,129	$11,224,047	$2,244,809
Legacy Road Remediation[1]	$999,272	$3,150,470	$4,469,718	$1,610,345	NA	$10,229,805	$2,557,451
Deferred Maintenance	$129,710	$367,765	$140,143	$57,858	$0	$695,476	$139,095
Total	$12,843,061	$16,555,541	$17,795,593	$14,893,044	$9,575,560	$71,662,799	$14,332,560

NA: Not available.
1 In 2012, amounts spent for legacy road remediation were collapsed into the Integrated Resource Restoration account.
2 Average shown for legacy road remediation is a 4-year average based on annual data for fiscal year 2008 to fiscal year 2011.
Source: U.S. Forest Service, Region 4 Office, FOIA request, 2014.

Expenditures shown for legacy road remediation in Table 2.35 include funding for road decommissioning, road and trail repair, and removal of fish passage barriers. The amount spent for legacy road remediation in FY2012 is not available because this account became part of the Integrated Resource Restoration account.

As a percentage of total spending, M&I has accounted for 16 to 18 percent of the combined annual budgets for Utah forests since FY2008. Whether this level of spending is sufficient to maintain the agency's assets is unknown as the annual maintenance need for assets shown in Table 2.35 was not provided by the Forest Service and is not available from publicly accessible sources.

Deferred maintenance is a continuing problem for the Forest Service.[45] Over the study period, the agency spent less than $1.0 million *in total* for deferred maintenance, although the estimated deferred maintenance backlog for infrastructure in Utah's forests is $72.8 million.

The Forest Service classifies its deferred maintenance as either critical or noncritical. Critical maintenance is defined as a serious threat to public health or safety, a natural resource, or the ability to carry out the mission of the organization. Noncritical maintenance is defined as a potential risk to the public, employee safety or health, and potential adverse consequences to natural resources or mission accomplishments (USFS 2012).

The Forest Service estimates that 37 percent of the estimated $72.8 million deferred maintenance backlog is classified as critical, the largest share of which is maintenance involving fences. Almost half of the deferred maintenance backlog (critical and noncritical) is for buildings. Table 2.36 shows the deferred maintenance backlog by major asset group.

Table 2.36
U.S. Forest Service Deferred Maintenance Backlog, Utah Assets

[45] The Forest Service defines deferred maintenance as "maintenance that was scheduled to be performed on an asset but was delayed due to backlog, funding shortages or other reasons." It does not include maintenance that is aimed at expanding the capacity of an asset or otherwise upgrading it to service needs different from those originally intended.

Asset Type	Critical	Noncritical	Total
Bridges	$1,017,673	$3,221,476	$4,239,149
Buildings	$2,112,713	$34,108,183	$36,220,896
Dams	$686,500	$224,205	$910,705
Fences	$16,582,744	0	$16,582,744
Handling Facility	$687,320	0	$687,320
Heritage Assets [1]	$78,979	$865,650	$944,629
Trail Bridges	$6,800	$65,217	$72,017
Wastewater System	$2,043,387	$422,129	$2,465,516
Water System	$3,258,806	$1,311,598	$4,570,404
Structures for Wildlife, Fish and Threatened & Endangered Species	$219,054	$497,174	$716,228
Minor Constructed Features	0	$5,402,356	$5,402,356
Totals	$26,693,976	$46,117,988	$72,811,964

1 Heritage assets include archaeological sites that require determinations of the National Register of Historic Places status, National Historic Landmarks, and significant historic properties,

Source: U.S. Forest Service, Region 4 Office, FOIA request, 2014.

Grazing

Livestock grazing in Utah is permitted on roughly 7 million acres in Utah's five national forests. Grazing use is administered through a grazing permit system. Permits on Forest Service land are set for not more than 10 years, and can be renewed without competition at the end of that period. The grazing permits do not give the rancher title to the lands nor do they allow ranchers to have exclusive access to those lands.

The Forest Service declares a maximum occupancy (or permitted use) for its grazing permits and authorizes and bills annually for use (authorized use) based on annual operating instructions. Many times the annual authorized use will be lower than the permitted use because of management decisions that take into account such factors as drought and overall forest health.

In fiscal year 2012, the Forest Service managed permits for 793 permittees. The authorized use was for 614,682 AUMs of grazing by cattle, horses, sheep and goats.[46] This was more than the number of permitted AUMS that year.[47] Since 2000, the number of AUMs permitted for use has remained above 600,000; however, drought conditions in some years reduced the number of AUMS authorized for use.

Utah's national forests are typically more productive than the rangelands managed by the BLM. As a result, Utah's national forests provide a disproportionate amount of livestock grazing compared with lands managed by the BLM. Although the Forest Service lands are roughly 35 percent of the land area managed by the BLM, the number of AUMs permitted in the national forests is roughly the same as the number authorized on BLM lands. Forest Service allotments are generally used as seasonal range for livestock grazing in the summer months (Banner 2009).

Table 2.37 shows the combined number of permitted and authorized AUMS on national forest lands in Utah for fiscal years 2003 to 2012.

[46] One AUM is the amount of forage required by a 1,000-pound cow, or the equivalent, for 1 month.

[47] The number of *authorized* AUMs is typically lower than the *permitted* AUMS if drought or other conditions do not support the total specified under the permit.

Table 2.37
U.S. Forest Service Commercial Livestock Grazing Statistics for National Forests in Utah, FY2003–FY2012

Fiscal Year	Permit Holders	Permitted AUMs	Authorized AUMs	Authorized Share
2000	983	682,331	624,136	91.5%
2001	983	676,993	609,758	90.1%
2002	972	666,367	560,370	84.1%
2003	844	616,363	366,989	59.5%
2004	842	614,731	508,441	82.7%
2005	839	603,266	543,670	90.1%
2006	848	632,518	499,260	78.9%
2007	840	635,375	527,972	83.1%
2008	840	636,785	614,267	96.4%
2009	813	625,493	626,846	100.2%
2010	808	624,032	653,897	104.8%
2011	806	616,075	610,563	99.1%
2012	793	613,002	614,682	100.3%
Mean	862	634,102	566,219	89.3%

Notes; The total authorized AUMs in fiscal years 2009, 2010 and 2012 exceeded the number of AUMs permitted for those years.
Source: U.S. Forest Service, Annual Grazing Statistical Report*, various years.*

The Forest Service spends more to manage its grazing program than it collects in grazing fees. In FY2012, the Forest Service spent at least $2.6 million to manage its grazing program and collected $577,267 in fees—about one-fifth of the cost (Table 2.38). Program costs include $2.4 million in direct spending from the agency's Grazing Management discretionary account and $218,692 from the Range Betterment Fund (RBF)—a mandatory account into which 50 percent of all grazing fees collected are placed. Funds from the RBF are returned to the forests and used for land improvements.

The Grazing Management account and Range Betterment Fund are direct sources of funding for grazing management; however, the costs to manage grazing are likely much higher than the amounts provided through those accounts. According to the Forest Service, range improvements are funded from other accounts as well. For example, the Vegetation and Watershed Management Program, which is used to fund activities that support improvements to the rangelands, forests, watersheds, and air quality and provide species control, also benefits grazing.

While the Regional Office indicated there was no reliable way to identify amounts in other programs that contribute to grazing management, in 2005 the Washington office of the Forest Service did provide such information to the U.S. Government Accountability Office. At that time, the Forest Service estimated approximately 11 percent of its Watershed and Vegetation account was used for grazing and another 11 percent from its cost pool accounts (GAO 2005). Assuming these relationships are still valid, the actual cost of managing grazing on forest lands could be, on average, $1.7 million dollars more per year than the direct expenditures shown here.[48]

Table 2.38 shows revenue collected from grazing and the *direct* costs of managing grazing in Utah forests from FY2008 to FY2012.

Table 2.38
U.S. Forest Service Grazing Revenue and Expenditures for Utah Forests, FY2008–FY2012

	FY2008	FY2009	FY2010	FY2011	FY2012	Mean
Revenue	$608,982	$588,921	$595,791	$612,382	$577,267	$596,669
SpendingpGrazing	$2,235,768	$2,848,981	$2,616,857	$2,508,848	$2,602,640	$2,562,619
Management Acct.pRange	$2,033,409	$2,481,971	$2,341,999	$2,178,456	$2,383,948	$2,285,957
Betterment Fund	$202,359	$367,010	$364,858	$330,392	$218,692	$276,662
Net Cost	–$1,626,786	–$2,260,060	–$2,021,066	–$1,896,466	–$2,025,373	–$1,965,950
Revenue as a Share of Spending	27%	21%	23%	24%	22%	23%

Source: U.S. Forest Service, Region 4 Office, FOIA request, 2014.

[48] From 2008 to 2012, spending in the Cost Pool accounts identified in the GAO report as partially supporting the Forest Service grazing program averaged about $11.6 million. The estimate of grazing costs supported through the Watershed and Vegetation account was based on the average spending over the same period, which was $4.0 million.

Currently, the Forest Service charges a grazing fee of $1.35 per AUM. This is the lowest fee that can be charged under the Public Rangeland Improvement Act (PRIA), which lays out the federal grazing fee formula. It is generally lower than fees charged for grazing on state trust and private lands. Fee reform has been attempted but not adopted several times over the past three decades. Despite reviews of grazing fees on federal lands that have been completed by the U.S. Government Accountability Office and the U.S. Congressional Research Service, there is currently no legislation under consideration that provides the Forest Service a mechanism to recover a larger share of its costs to manage grazing (GAO 2005) (CRS 2012).

Recreation

More than 10 million visitors each year recreate in Utah's national forests. Forests in Utah offer a diversity of fee and non-fee recreational opportunities, including skiing, snowmobiling, camping, hiking, off-road vehicle riding, biking, backpacking, hunting and fishing, boating and swimming at both developed sites and general forest areas. Because of its proximity to the Wasatch Front, recreation is especially important in the Uinta–Wasatch–Cache National Forest.

Visitor activity participation is an indicator of the types of recreation opportunities and settings currently in demand by visitors. Based on Forest Service surveys, the most popular outdoor recreation activities in Utah's national forests are hiking and walking, skiing, hunting and fishing. Table 2.39 shows the top activities of people visiting the national forests in Utah over the past four years.[49]

Table 2.39
U.S. Forest Service Top Recreational Activities in Utah National Forests

Primary Reason for Forest Visit	Response Percent
Hiking or Walking	20.7%
Skiing	16.5%
Fishing and/or Hunting	12.5%
Viewing natural features	9.6%
Camping (developed and primitive)	6.0%
Driving for pleasure	5.6%
Relaxing	5.1%
Motorized trail use	3.2%
Bicycling	3.1%
Picnicking	2.9%
Percent of users stating these preferences	85.2%

Source: Calculated by BEBR using the U.S. Forest Service National Visitor Use Monitoring Data estimation tool.

Although some of the activities shown in Table 2.39 do require fees and/or special licenses, most of them do not. In fact, the vast majority of national forest lands in Utah are available to the public free of charge.

In FY2012, the Forest Service collected almost $4.1 million in recreation-related fees. Revenue from recreational use of the forests is generated in two ways: special recreation use fee assessments, and user and entrance fees authorized for collection under the Federal Lands Recreation Enhancement Act (REA).

REA allows the Forest Service to charge fees at developed campsites, rental cabins and day-use areas that have specific facilities. These fees are retained by the agency. A large portion of REA fees (80 percent or more) is used for improvements at sites where fees are collected. REA fees consistently provide more than half of all recreation receipts for the Forest Service. REA is set to expire in December 2014. After that date the Forest Service will no longer have collection authority or access to this important source of revenue. In FY2012, fees collected under REA

[49] The visitor activity information shown in Table 2.39 was generated using the Forest Service's National Visitor Monitoring Data online estimation tool. The top activities identified by users in each forest were multiplied by the number of visitors to that forest. These estimates were then aggregated to produce the list of primary activities shown in the table.

authority in Utah's forests totaled $2.2 million. From FY2008 to FY2012, REA fee collections averaged about $2.0 million annually.

Special recreation use fees cover a variety of activities, but a large share of the total for Utah comes from five ski resorts operating in Utah's forests. These are Alta, Brighton, Snowbird, Solitude and Snowbasin in Uinta–Wasatch–Cache National Forest and Brianhead in Dixie National Forest. Ski resorts pay revenue-based rents for use of Forest Service lands. The amount paid is determined using a graduated fee applied to adjusted gross revenues. Special recreation use fee assessments totaled $1.9 million in FY2012.

In FY2012, recreation spending totaled $9.8 million, a year-over decline of roughly $200,000. In fact, recreation spending overall has declined sharply since peaking at $11.1 million in FY2009. The actual costs of managing recreation in Utah's forests are difficult to estimate as many campgrounds are operated by private concessionaires or host-managers under special-use permits issued by the Forest Service. Host managers collect user fees under a different authority and retain these monies to cover costs of staffing campgrounds and general upkeep. Information about concessionaire costs (and the revenue collected) was not provided by the Forest Service.

The data presented in Table 2.40 show that recreation management costs the Forest Service significantly more than it collects, even with REA fees. The loss of REA fees would hinder the agency's ability to provide quality recreation experiences for people visiting the Utah forests.

Table 2.40
U.S. Forest Service Revenue and Spending for Recreation, FY2008–FY2012
(Millions)

Account/Program	FY2008	FY2009	FY2010	FY2011	FY2012	Mean
Revenue Total	$3.9	$4.6	$3.8	$4.4	$4.2	$4.2
Recreation Special Use Fees	$1.8	$2.2	$1.7	$2.3	$1.9	$2.0
Recreation Fee Program[1]	$2.1	$2.4	$2.2	$2.1	$2.2	$2.2
Spending Total	$9.5	$11.1	$10.1	$9.9	$9.8	$10.1
Recreation, Heritage and Wilderness	$7.9	$8.7	$7.8	$7.9	$7.9	$8.1
Recreation Fee Program[2]	$1.6	$2.4	$2.3	$2.1	$1.8	$2.0
Net Cost	–$5.7	–$6.6	–$6.3	–$5.5	–$5.6	–$5.9

1 Fees collected under the Federal Lands Recreation Enhancement Act. 2 Includes site specific collections and collection support funded with receipts authorized under the Federal Lands Recreation Enhancement Act.

Sources: Spending: U.S. Forest Service, Region 4 Office. FOIA request, 2014. Revenue: U.S. Forest Service, Region 4 Office and U.S. Forest Service, "National Forest Statement of Receipts" (ASR-13-2). Various years.

Flaming Gorge National Recreation Area—H.B. 148 calls for the transfer of the Utah portion of the Flaming Gorge National Recreational Area (Flaming Gorge NRA) to the state. Because exceptional recreation is considered a priority use of this area, management as a state park has been proposed. A brief overview of the Flaming Gorge NRA is presented here.

The Flaming Gorge NRA lies within the Ashley National Forest, spanning the border between Utah and Wyoming. Of the 201,114 acres that make up the Flaming Gorge NRA, almost 48 percent (96,413 acres) is in Utah. Most recreation activity at Flaming Gorge is water based. Marina access and canyon scenery are better in the Utah portion of the NRA, while some of the best fishing locations are in the north end of the reservoir in Wyoming (Haynes, 2014). The Utah portion of the NRA also offers rafting, fishing and other recreation on the Green River below the dam.

The Utah portion of the Flaming Gorge NRA includes 32 campgrounds containing 609 campsites, or roughly 84 percent of all campsites in the existing NRA. Of the 32 campgrounds, 21 are considered by the Forest Service as "heavily used." Although the Forest Service does not maintain actual counts of visitors entering the Flaming Gorge NRA each year, it does estimate the number of unique visits to the Ashley NF. The Forest Service estimated that 233,000 to 356,000 people visited Ashley NF in FY2012 (USFS 2014).

Visitors to the NRA purchase recreation access passes issued by the Forest Service to enter certain parts of the area. The NRA also receives revenue for a variety of special uses. In FY2013, Ashley NF reported $157,310 in special use revenue from utilities, outfitters and guides, recreation events, and rights-of-way in the Flaming Gorge Ranger District and $139,266 in recreation pass revenue. Ninety-five percent of the recreation pass revenue is retained by the Ashley NF under REA.

The Forest Service budgets $400,000 annually for recreation and maintenance costs in the Flaming Gorge Ranger District, which contains the Flaming Gorge NRA. The Forest Service has concessionaire contracts for most of its campgrounds. Costs incurred by concessionaries are not included in the $400,000.

The federal budget provided for recreation and maintenance for the Flaming Gorge NRA has declined steadily over the past three years (Ryan 2014). That trend is expected to continue into the foreseeable future, calling into question whether federal funding levels are adequate to continue recreation offerings and maintain the land and water endowment at Flaming Gorge NRA.

Timber Harvest

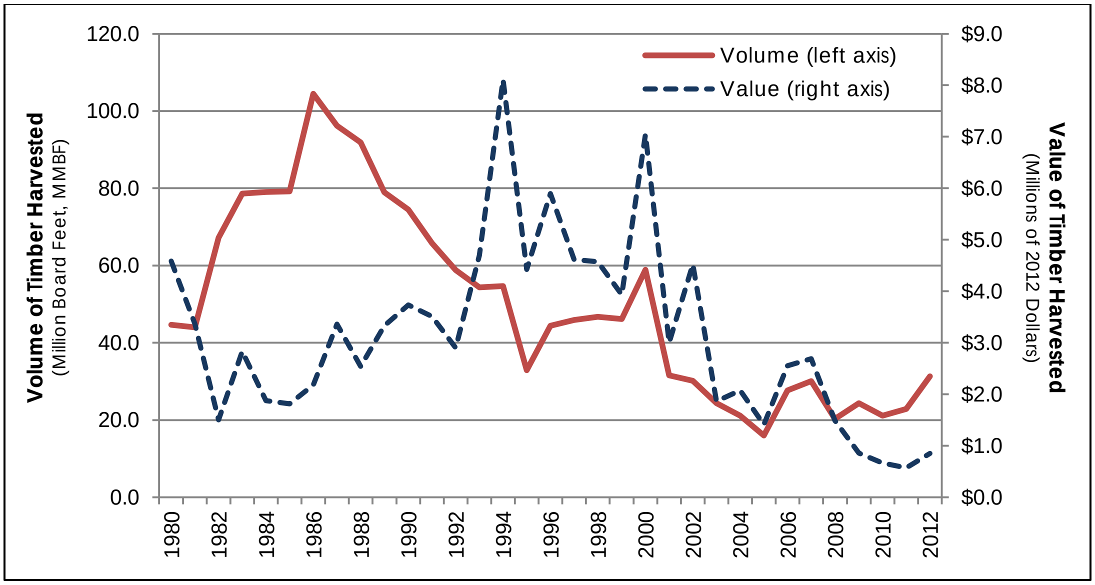
Over the past 30 years, the Forest Service has offered only a few valuable timber stands for sale in Utah due to evolving conservation principles and ecological priorities, with diminished emphasis on commodity production. Since the late 1990s, the market value of Utah timber cut from national forests has declined, along with the harvest in board feet (Figure 2.7). The drop in market value (and harvest volume) is a combination of market conditions, the type of wood products the Forest Service makes available for harvest, and overall conditions of the national forests in Utah.

Products removed from national forests in central and southern Utah are mostly salvage wood from trees that are dead or dying due to disease, drought, insects and fire. About half of the wood harvested, at least in central and southern Utah, is for fuel wood, and the rest is used for log homes, rough-cut wood, trim, shavings and some dimensional lumber (Cote 2014).

Beetle infestation and wildfire have intensified in Utah in recent decades, damaging the state's timberland (McNaughton 2014). The Forest Service estimates that as many as 1.9 million acres of forests in Utah have been damaged by beetle infestations alone.

The sale of forest products (timber and timber salvage) is not a significant source of revenue from forest lands in Utah. Since FY2008, revenue from timber sales has averaged less than $65,000 annually, and receipts from timber salvage sales, road credits, and collections from timber sale purchasers for sale area improvement work averaged about $1.0 million.

Figure 2.7
Harvest Volume and Market Value, Utah Forests, 1980–2012



Source: U.S. Forest Service "Cut and Sold Reports for All Convertible Products, by State, FY1980 to FY2012," compiled by Headwaters Economics. Dollar amounts are adjusted for inflation to federal fiscal year 2012 dollars, based on the U.S. Consumer Price Index, CPI-U from the Bureau of Labor Statistics.

Planning, preparing and administering timber sales and timber salvage operations costs the Forest Service significantly more than the revenue generated from those sales. From FY2008 to FY2011, the Forest Service spent $2.9 million annually to manage timber sales—more than double the amount collected in receipts.

Revenue Sharing

Counties with forest lands have historically received a percentage of revenue generated by the sale and use of natural resources from the forests to compensate them for the tax-exempt status of federal lands. A steep decline in timber harvests during the 1990s significantly decreased revenues from the national forests. The Secure Rural Schools and Community Self-Determination Act of 2000 (SRS) was enacted to address this decline by largely decoupling payments from commodity receipts and providing a stabilized source of revenue for rural counties and school districts, with the ultimate objective of facilitating an economic transition away from commodity extraction in rural, forest-dependent communities.[50]

SRS was reauthorized in 2008 and amended to continue, on a sliding scale, through FY2011. The program was reauthorized again for 2012 and 2013. In FY2013, the program provided $10 million in funding to counties in Utah. These payments were made in FY2014.

While SRS is an important source of revenue for some Utah counties and school districts, there is no guarantee it will be ongoing or sustained at current levels. SRS is set to expire after the FY2013 payments are made in FY2014. A replacement program was proposed and passed in 2013 by the House of Representatives—H.B. 1526, the Restoring Healthy Forests for Healthy

[50] This discussion is a simplified version of the SRS Act. A more detailed overview is presented in Chapter 5: Revenue Impacts of Federal Land Ownership in Utah, Section 5.3.

Communities Act. Among other things, that act directs the BLM and Forest Service to distribute a payment to eligible counties in February 2015 equal to the fiscal year 2010 payment for counties receiving Forest Service payments—essentially an FY2014 SRS payment. After that payment is made, the county payments would return to a revenue-sharing system equal to 25 percent of current-year gross receipts. This bill has been referred to the Senate Committee on Energy and Natural Resources (CRS 2013).

Returning to a receipt-based payment system will reduce the amounts counties receive. According to a recent Congressional Research Service report, payments through SRS are significantly greater than the receipt-sharing payments would be. Information in that report indicates that from 2000 to 2012, at the national level, SRS payments have been two to four times higher than they would have been under receipt-sharing (CRS 2013).

SRS payments to Utah counties are shown in Table 2.41. In 2012 and 2013, SRS payments totaled $11.5 million and $10.9 million, respectively. These payments are more than double the *entire* amount collected in Utah under the Forest Service's receipt-sharing programs.[51] Under a receipt-based formula, only *25 percent* of the total amount generated in Utah forests would be distributed.

Table 2.41
U.S. Forest Service Payments to Counties in Utah, FY2012 and FY2013

County	FY2012	FY2013	County	FY2012	FY2013
Beaver	$169,940	$179,685	Piute	$348,133	$332,244
Box Elder	$128,074	$125,150	Rich	$62,470	$54,731
Cache	$447,988	$425,021	Salt Lake	$77,087	$74,649
Carbon	$30,150	$31,330	San Juan	$976,121	$996,234
Daggett	$350,437	$246,598	Sanpete	$882,796	$832,407
Davis	$37,945	$35,683	Sevier	$1,122,251	$1,080,575
Duchesne	$606,771	$495,715	Summit	$145,586	$144,198
Emery	$219,100	$334,122	Tooele	$246,334	$232,350
Garfield	$1,619,089	$1,454,826	Uintah	$308,060	$292,334
Grand	$52,465	$46,405	Utah	$826,162	$768,901
Iron	$502,943	$466,191	Wasatch	$654,604	$587,215
Juab	$224,467	$213,121	Washington	$611,095	$588,768
Kane	$140,698	$125,622	Wayne	$239,659	$241,104
Millard	$387,854	$444,243	Weber	$77,157	$72,712
Morgan	$15,426	$13,113	Total	$11,510,564	$10,935,246

Note: Payments include Title I, Title II and Title III payments. Detail for this table is provided in Chapter 5: Revenue Impacts of Federal Land Ownership in Utah.
Source: U.S. Forest Service, www.fs.usda.gov/main/pts/securepayments/projectedpayments, accessed 8/30/13.

Summary and Conclusions

The Forest Service manages almost 8.2 million acres of national forests in Utah. Under H.B. 148, these forests, less the wilderness acres, would be transferred to the state, which would bear the cost of managing the lands. From FY2008 to FY2012, the Forest Service spent, on average, more than $100 million each year to manage the Utah forests. This translates to $12.20 per acre. Over the same five-year period, revenue generated in the Utah forests averaged almost $7.3 mil-

[51] National Forest Fund receipts and timber sales receipts in Utah forests totaled $3,927,870 in FY2013.

lion, or about $0.85 per acre. Table 2.42 summarizes the efficiency measures for the U.S. Forest Service for fiscal years 2008 to 2012.

Table 2.42
U.S. Forest Service Summary Financial Efficiency Measures, FY2008–FY2012

Measure	FY2008	FY2009	FT2010	FY2011	FY2012	Mean
Employment (FTE)	981	1,128	1,150	1,114	1,085	1,091
Revenue	$6,862,601	$7,238,582	$7,257,716	$7,060,218	$7,892,262	$7,262,276
Spending	$89,554,931	$112,178,442	$106,955,179	$97,776,150	$111,833,611	$103,659,662
Net Cost	–$82,692,330	–$104,939,860	–$99,697,463	–$90,715,932	–$103,941,349	–$96,397,386
Revenue per Acre	$0.81	$0.85	$0.85	$0.83	$0.93	$0.85
Spending per Acre	$10.54	$13.20	$12.58	$11.50	$13.16	$12.20
Profit/Loss per Acre	–$9.73	–$12.35	–$11.73	–$10.67	–$12.23	–$11.34
Acres Managed per Employee	8,673	7,535	7,391	7,630	7,856	7,791

Source: Bureau of Economic and Business Research.

This analysis has focused on the financial aspects of the Forest Service. While this is one way to evaluate the agency, it is not the only way. Forests provide a spectrum of public goods and services, some of which can be valued in dollars, and others which generate benefits that are more difficult to quantify or monetize. These include water and watershed protection, wildlife and habitat provision, scenery, cultural and historical sites and opportunities, among others.

Another measure of how well a forest is doing is referred to as net benefit (or economic benefit) which is an indicator of the degree to which resources are allocated, used and managed to generate outcomes with the greatest benefit to the public. These concepts are discussed in detail in Chapter 7, Section 7.1. In that chapter, the net benefit to Utah residents of recreation on Forest Service lands has been estimated.

Despite these limitations, decisions by the Forest Service with respect to generating revenues from forest resources have financial consequences. Testimony by the General Accounting Office, now Government Accountability Office (GAO), before the subcommittee of Interior and Related Agencies in 1999 sums up the current situation with respect to the Forest Service. In that testimony, the GAO noted that:

> Generating revenue is not a priority mission for the Forest Service. Increasingly, legislative and administrative decisions and judicial interpretations of statutory requirements have required the agency to shift its emphasis from uses that generate revenue to those that do not. Furthermore, the Forest Service is required by law to continue providing certain goods and services at less than fair market value. Among these are most recreation sites that the agency manages directly, hardrock minerals and grazing (GAO 1999).

Based on the Forest Service analysis presented here, these observations are just as relevant today as they were 15 years ago. The U.S. Forest Service functions within a regulatory environment which dictates a seemingly impossible mission—provide a broad range of goods and services in a way that incorporates disparate views from competing constituencies and still reflects the general will of the people.

Under state ownership, forest management would be accomplished in a less politicized environment, allowing more flexibility for the state to explore options and opportunities to restore, manage and maintain Utah's forests. Operating under a less restrictive regulatory regime, Utah could move quickly to identify cost-effective ways of managing the forests and develop programs to improve forest health without the ever-present threat of legal challenges.

However, even with more efficient management, wildfire will continue to be a wildcard. Factors affecting or contributing to the outbreak of wildfires are myriad. Some of these factors can be controlled or mitigated, such as reducing hazardous fuels and biomass, limiting encroachment in the wildland-urban interface, and increasing the overall health of Utah's forests. Other factors simply cannot, such as climate change and weather conditions.

Finally, counties in Utah receive and may heavily rely on payments from the Forest Service to offset the loss of use of their lands through the Secure Rural Schools and Community Reinvestment Act (SRS). However, the future of SRS is not at all assured. Proposed changes in the program, if enacted, would significantly reduce the amounts counties receive in 2015, with no guarantee that the program will be reauthorized after that time.

2.1.3 U.S. Fish and Wildlife Service

Overview

The U.S. Fish and Wildlife Service (FWS) is the country's oldest federal conservation agency, tracing its lineage back to 1871. It functions within the U.S. Department of the Interior and is charged with implementing acts related to protecting the nation's fish and wildlife, including the Endangered Species Act, Migratory Bird Treaty, Marine Mammal Protection Act, and Lacey Act. As such, it is primarily a regulatory agency rather than a land management agency, although 306.1 million acres are under the agency's jurisdiction (CRS 2014).

The agency has a primary-use mission—to conserve plants and animals. Other uses of FWS lands (recreation, hunting, timber, oil or gas drilling) are permitted to the extent they are compatible with species' needs. Wildlife-related activities such as hunting, bird watching, and hiking are considered priority uses and are given preference over consumptive uses such as timber harvest and mineral production (CRS 2012).

FWS manages the National Wildlife Refuge System of more than 551 national wildlife refuges throughout the United States. The agency also manages a fisheries program that includes 70 national fish hatcheries, 65 fishery resource offices and 86 ecological services field stations. Among other things, FWS is responsible for enforcing wildlife laws, ensuring endangered species protection, managing migratory birds and conserving and restoring wetlands.[52]

The agency's programs are administered through eight regional offices with more than 700 field stations.

[52] "About the U.S. Fish and Wildlife Service." U.S. Fish and Wildlife Service website, www.fws/gov/help/About_us.html.

U.S. Fish and Wildlife Operations in Utah

Utah is part of the eight-state Mountain-Prairie Region (Region 6), which includes Utah, Montana, North Dakota, South Dakota, Wyoming, Nebraska, Colorado and Kansas. The FWS manages approximately 112,696 acres (including acres in refuges, hatcheries and coordination areas). Its land holdings are largely contained in three wildlife refuges and two fish hatcheries. The agency also maintains a conservation office and manages the Colorado River Fishery Project. In 2012, FWS employed 67 people in Utah with a total payroll of $4.3 million.

Under H.B. 148, the lands managed by the FWS would be transferred to the state of Utah. Of the 112,696 acres managed by the FWS, only 65,781 acres are federal acres reserved from the public domain.[53] The remaining 46,915 acres were purchased by the FWS, donated, or acquired from other federal agencies. According to information in its land area report, the FWS paid almost $14.8 million for the lands (and easements) it has purchased in Utah. It is not clear if purchased, donated and acquired acres would be included in the transfer.

Most of the land managed by FWS in Utah is tied to wildlife refuges and fish hatcheries (104,480 acres).[54] The remaining acres include refuge system lands that are managed by under cooperative agreements between the FWS and the Division of Wildlife Resources.

The cost to manage the agency's local refuges and hatcheries accounts for roughly 20 percent of the FWS's appropriated budget for the state of Utah. The remaining 80 percent is spent on other programs and grants to the state of Utah, which might not be affected by a change in land ownership. Therefore, much of this analysis is focused on the national wildlife refuges (NWRs) and the national fish hatcheries (NFHs) and assumes that after the transfer they will continue to operate under state ownership. In addition to the hatcheries and refuges, the Service also maintains the Utah Fish and Wildlife Management Assistance Office in Vernal, the Utah Ecological Services Field Office in West Valley City, and the Rocky Mountain Fire Management District in Brigham City.

Data used to estimate the management costs of the NWRs and NFHs include information provided by the FWS under a FOIA request in 2014 and information provided by the Congressional Research Service to Congressman Rob Bishop in a memorandum dated August 8, 2012 titled "Federal Land Management Agency Appropriations for Utah."[55]

In FY2012, appropriations for FWS operations in Utah totaled $21.2 million, slightly more than the amount appropriated in FY2011. Most of the money spent in Utah is not used to manage the NWRs and NFHs; rather, more than half of the agency's budget is for fish and wildlife restoration grants to the state of Utah ($14.0 million in FY2011 and $14.2 million in FY2012). In FY2012, the FWS collected a total of $37,950 in revenue from all activities in Utah.

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[53] Public domain lands are those lands which the United States obtained from a sovereign nation and has never left federal ownership.

[54] This does not include 1,008 acres that are within Utah's boundaries but are part of the Colorado River NWR or 443 acres acquired from the Farm Service Agency.

[55] The FWS provided detailed information about spending in Utah but did not provide information about its total budget for fiscal years 2008 through 2012; therefore, we used the annual appropriations for these years provided in a Congressional Research Service memorandum to Congressman Bishop. The total appropriated budget for those years is similar to the total spending in Utah reported by the FWS.

Table 2.43 provides total employment and appropriations directly for the state of Utah for FY2011 and FY2012.

Table 2.43
U.S. Fish and Wildlife Service
Employment and Appropriations, FY2011–FY2012

	Fiscal 2011	Fiscal 2012	Mean
FTE Employment	67	68	67.5
Salaries	$4,437,663	$4,360,510	$4,399,087
Appropriations			
National Wildlife Refuges	$2,995,000	$2,995,000	$2,995,000
National Fish Hatcheries	$1,050,000	$1,109,000	$1,079,500
Utah Fish & Wildlife Mgmt. Assistance Office	$395,000	$365,000	$380,000
Utah Ecological Services Field Office	$2,198,000	$2,229,000	$2,213,500
Grants to state of Utah	$14,029,000	$14,243,000	$14,360,000
Rocky Basin Fire Management District	$193,000	$89,000	$141,000
Utah Partners for Fish and Wildlife	$229,000	$241,000	$235,000
Division of Bird Habitat	$53,000	0	$26,500
Total Appropriations	$21,142,000	$21,271,000	$21,206,500

Source: Congressional Research Service 2012, Memorandum "Federal Land Management Agency Appropriations for Utah, August 8, 2012; U.S. Fish and Wildlife Service, FOIA request, 2014.

From FY2009 to FY2011, the FWS employed 34 people and spent an average of $4.35 million annually to manage local refuges and hatcheries. Table 2.44 summarizes the employment, revenue and spending by the FWS to manage these refuges and hatcheries, followed by a brief overview of each unit.

Table 2.44
U.S. Fish and Wildlife Service
Employment, Revenue and Spending
National Wildlife Refuges and National Fish Hatcheries in Utah, FY2008–FY2011

	FY2008	FY2009	FY2010	FY2011	Mean
National Wildlife Refuges					
Employment	23	26	27	24	25
Revenue	$34,838	$24,841	$25,391	$22,164	$26,809
Total Spending	$2,876,672	$2,898,534	$3,622,126	$3,188,079	$3,146,353
Payroll	$1,836,475	$1,863,216	$2,036,167	$2,036,178	$1,943,009
Nonpayroll	$1,040,197	$1,035,318	$1,585,959	$1,151,901	$1,203,344
Net Cost	–$2,841,834	–$2,873,693	–$3,596,735	–$3,165,915	–$3,119,544
National Fish Hatcheries					
Employment	8	10	9	10	9
Revenue	$9,498	$18,837	$19,184	$20,092	$16,903
Total Spending	$1,026,033	$1,160,363	$1,227,289	$1,411,223	$1,206,227
Payroll	$626,975	$739,103	$716,447	$911,590	$748,529
Nonpayroll	$399,058	$421,260	$510,842	$499,633	$457,698
Net Cost	–$1,016,535	–$1,141,526	–$1,208,105	–$1,391,131	–$1,189,324
Total Refuges and Hatcheries					
Employment	31	36	36	35	34
Revenue	$44,336	$43,678	$44,575	$42,256	$43,711
Total Spending	$3,902,705	$4,058,897	$4,849,415	$4,599,302	$4,352,580
Payroll	$2,463,450	$2,602,319	$2,752,614	$2,947,768	$2,691,538
Nonpayroll	$1,439,255	$1,456,578	$2,096,801	$1,651,534	$1,661,042
Net Cost	–$3,858,369	–$4,015,219	–$4,804,840	–$4,557,046	–$4,308,869

Source: U.S. Fish and Wildlife Service, Region 6 Office. FOIA request 2014.

National Wildlife Refuges in Utah

The FWS currently manages three national wildlife refuges in Utah: the Bear River Migratory Bird Refuge, the Fish Springs National Wildlife Refuge, and the Ouray National Wildlife Refuge. These areas cover a total of 103,948 acres. In FY2011, FWS spent almost $3.2 million to manage these units. The combined appropriation in FY2012 was less than $3.0 million.

Bear River Migratory Bird Refuge

The Bear River Migratory Bird Refuge was created by Presidential proclamation in 1928. It is the largest of the Utah refuges covering 76,340 acres of marsh, open water, uplands and alkali mud-flats around the Great Salt Lake.[56] The marshes and open water are managed using a complex system of dikes and water control structures to provide a variety of water depths suitable for the needs of different wild bird species. The FWS also operates the James V. Hansen Visitor Center 15 miles east of the refuge.

Of the 76,340 acres of land contained in the refuge, just 43,443 acres (or about 57 percent) were reserved from the public domain. The remaining 32,897 acres have been purchased by FWS or donated to the agency at a cost of $11.1 million.[57]

The costs to manage the Bear River Migratory Bird Refuge averaged about $1.85 million annually from FY2008 to FY2011. Over that period, the refuge posted losses averaging $1.84 million annually. In FY2012, appropriations to manage the refuge totaled $1.67 million. A total of $7,376 in revenue was produced at the refuge in FY2012. Table 2.45 provides trend information about Bear River for fiscal years 2008 through 2011.

Table 2.45
Bear River Migratory Bird Refuge
Employment, Revenue and Spending, FY2008–FY2011

	FY2008	FY2009	FY2010	FY2011	Mean
Employment (FTE)	12.9	16.0	14.7	14.5	14.5
Revenue	$9,304	$4,484	$8,479	$6,111	$7,095
Total Spending	$1,751,861	$1,697,491	$2,176,443	$1,786,052	$1,852,962
Payroll	$1,128,691	$1,180,668	$1,219,792	$1,253,750	$1,195,725
Nonpayroll	$623,170	$516,823	$956,651	$532,302	$657,237
Net Cost	–$1,742,557	–$1,693,007	–$2,167,964	–$1,779,941	–$1,845,867

Source: U.S. Fish and Wildlife Service, Region 6 Office. FOIA request 2014.

Fish Springs National Wildlife Refuge

The Fish Springs NWR was established in 1959 to provide habitat for migratory bird management within the Pacific Flyway. Located on the southern extreme of the great Salt Lake Desert, it covers almost 18,000 acres of which approximately 10,000 acres are wetlands. The refuge provides managed wetland habitats for a diversity of species, with priority given to a variety of migratory birds, including wading birds, shorebirds and waterfowl, as well as to species at risk of becoming listed as federally endangered.[58]

56 "Bear River Migratory Bird Refuge." U.S. Fish and Wildlife Service website. www.fws.gov/Refuge/Bear_River_Migratory_Bird_Refuge/about.html.

57 U.S. Fish and Wildlife Service. "2013 Annual Lands Report and Data Tables." www.fws.gov/refuges/land/Landreport.html.

58 "Fish Springs National Wildlife Refuge." U.S. Fish and Wildlife Service website. www.fws.gov/refuge/Fish_Springs/about.html.

Most of the acreage contained in the Fish Springs NWR was reserved from the public domain (14,217 acres of 17,992 acres). The remaining 3,775 acres were purchased by the FWS for $93,325.[59]

The costs to manage the Fish Springs NWR averaged about $513,000 from FY2008 to FY2011. During this period, the refuge posted an average annual loss of about $500,000. In FY2012, appropriations to manage Fish Springs totaled $529,000. Revenue produced at this refuge in FY2012 totaled $6,987.

Table 2.46 provides trend information about Fish Springs for fiscal years 2008 through 2011.

Table 2.46
Fish Springs National Wildlife Refuge
Employment, Revenue and Spending, FY2008–FY2011

	FY2008	FY2009	FY2010	FY2011	Mean
Employment (FTE)	3.9	4.6	5.2	4.6	4.6
Revenue	$10,692	$10,698	$10,067	$8,387	$9,961
Total Spending	$407,367	$510,694	$624,201	$510,255	$513,129
Payroll	$263,365	$319,269	$367,140	$342,138	$322,978
Nonpayroll	$144,002	$191,425	$257,061	$168,117	$190,151
Net Cost	–$396,675	–$499,996	–$614,134	–$501,868	–$503,168

Source: U.S. Fish and Wildlife Service, Region 6 Office. FOIA request 2014.

Ouray National Wildlife Refuge

Ouray NWR lies along the Green River in the Uinta Basin of northeastern Utah. Located on the Colorado Plateau within the upper Colorado River drainage area, the refuge stretches along 16 miles of the Green River, 120 river miles downstream of Flaming Gorge Dam. It was established as a sanctuary for migratory birds in 1960. It is the smallest of the NWRs in Utah, covering just 9,616 acres. The refuge provides diverse habitat types that support more than 350 fish and wildlife species and offers wildlife-dependent recreational opportunities.[60]

Of the 9,616 acres contained in the Ouray NWR, about one-third, or 3,111 acres were reserved from the public domain. The remaining acres (6,505) have been donated or purchased by the FWS for a total of $461,084.[61]

The cost to manage the Ouray NWR has averaged about $780,000 annually from FY2008 to FY2011. Over this period, the refuge posted an average loss of $770,509 annually. In FY2012, appropriations to manage the Ouray NWR totaled $778,000. A total of $5,981 in revenue was produced at the refuge in FY2012.

Table 2.47 provides trend information about the Ouray for fiscal years 2008 through 2011.

[59] U.S. Fish and Wildlife Service. "2013 Annual Lands Report and Data Tables." www.fws.gov/refuges/land/Landreport.html.
[60] "Ouray National Wildlife Refuge." U.S. Fish and Wildlife Service website. www.fws.gov/refuge/Ouray/About.html.
[61] U.S. Fish and Wildlife Service. "2013 Annual Lands Report and Data Tables." www.fws.gov/refuges/land/Landreport.html.

Table 2.47
Ouray National Wildlife Refuge
Employment, Revenue and Spending, FY2008–FY2011

	FY2008	FY2009	FY2010	FY2011	Mean
Employment (FTE)	5.8	5.5	6.7	5.2	5.8
Revenue	$14,842	$9,659	$6,845	$7,666	$9,753
Total Spending	$717,444	$690,349	$821,482	$891,772	$780,262
Payroll	$444,419	$363,279	$449,235	$440,290	$424,306
Nonpayroll	$273,025	$327,070	$372,247	$451,482	$355,956
Net Cost	–$702,602	–$680,690	–$814,637	–$884,106	–$770,509

Source: U.S. Fish and Wildlife Service, Region 6 Office. FOIA request 2014.

National Fish Hatcheries in Utah

The FWS manages two fish hatcheries in Utah: the Ouray NFH and the Jones Hole NFH. These facilities cover a total of about 532 acres. In FY2011, FWS spent a total of $1.4 million to manage the two hatcheries. The combined appropriation to manage the hatcheries in FY2012 was $1.1 million.

Ouray National Fish Hatchery

The Ouray hatchery was established in 1996 as a fish refuge and technology development center to assist in the recovery of razorback sucker, Colorado Pikeminnow, Boneytail and humpback chub. The facility consists of a 34,000-gallon indoor recirculation hatchery, 24 0.2-acre production ponds and 12 0.5-acre broodstock ponds.[62] The Ouray NFH is located on the Ouray National Wildlife Refuge.

The Ouray NFH does not engage in any revenue-producing activities. Costs to manage the hatchery averaged about $623,000 annually from FY2008 to FY2011. Total appropriations to manage the hatchery in FY2012 were $514,000. Table 2.48 provides trend information about the Ouray hatchery for fiscal years 2008 through 2011.

Table 2.48
Ouray National Fish Hatchery
Employment, Revenue and Spending, FY2008–FY2011

	FY2008	FY2009	FY2010	FY2011	Mean
Employment (FTE)	4.3	4.5	4.1	6.0	4.7
Revenue	0	0	0	0	0
Total Spending	$525,058	$550,719	$561,184	$855,251	$623,053
Payroll	$306,155	$376,662	$347,607	$535,906	$391,583
Nonpayroll	$218,903	$174,057	$213,577	$319,345	$231,471
Net Cost	–$525,058	–$550,719	–$561,184	–$855,251	–$623,053

Source: U.S. Fish and Wildlife Service, Region 6 Office. FOIA request 2014.

Jones Hole National Fish Hatchery

The Jones Hole NFH was established in 1956 as part of the Colorado River Storage Project (CRSP), which mandated fish be reared and then stocked into all CRSP waters. The hatchery is located 40 miles northeast of Vernal on the Utah-Colorado border and covers 532 acres of land.

[62] "Ouray National Fish Hatchery." U.S. Fish and Wildlife Service website. www.fws.gov/ouray/hatchery/.

The hatchery provides management and production of trout for mitigation of Colorado River Storage Project waters of the Upper Colorado River System.[63]

About 88 percent of the acres that are part of this hatchery were reserved from the public domain (465). The remaining 66 acres were purchased by, or donated to the FWS.

Costs to manage Jones Hole averaged about $583,000 annually from FY2008 to FY2011. During that period, the Hatchery posted an average loss of about $566,000 annually. Total appropriations to manage the hatchery in FY2012 were $595,000, and revenue totaled $17,607. Table 2.49 provides trend information about the Jones Hole for fiscal years 2008 through 2011.

Table 2.49
Jones Hole National Fish Hatchery
Employment, Revenue and Spending, FY2008–FY2011

	FY2008	FY2009	FY2010	FY2011	Mean
Employment (FTE)	3.8	5.3	4.8	4.3	4.6
Revenue	$9,498	$18,837	$19,184	$20,092	$16,903
Total Spending	$500,975	$609,644	$666,105	$555,972	$583,174
Payroll	$320,820	$362,441	$368,840	$375,684	$356,946
Nonpayroll	$180,155	$247,203	$297,265	$180,288	$226,228
Net Cost	-$491,477	-$590,807	-$646,921	-$535,880	-$566,271

Source: U.S. Fish and Wildlife Service, Region 6 Office. FOIA request 2014.

The Economic Impact of U.S. Fish and Wildlife Service Operations in Utah

Fish and Wildlife Service operations in Utah generate economic impacts that are measured by the added employment, earnings, gross state product and fiscal revenues for state and local government. These impacts have been estimated using expenditure data provided by the agency through a FOIA request.

FWS's spending in Utah averaged $25 million annually from fiscal years 2007 through 2011, including $4.2 million in employee payroll and $20.8 in goods and services from Utah vendors and suppliers.[64] The annual economic impacts of these expenditures include 491 jobs with an earnings impact of almost $20.1 million. The annual contribution to gross state product is roughly $42 million, with state and local fiscal impacts totaling almost $1.5 million. These impacts are summarized in Table 2.50.

Table 2.50
Economic Impacts of the U.S. Fish and Wildlife Service Average Annual Estimate for FY2007–FY2011

Impact Type	Earnings	Jobs	GSP
Direct impacts	$4,195,756	68	$13,322,918
Indirect impacts	$15,874,567	423	$28,804,685
Total Impacts	$20,070,323	491	$42,127,603
	State	Local	Total
Fiscal Impacts	$1,372,411	$125,646	$1,498,056

Source: BEBR analysis of U.S. Fish and Wildlife Service data using BEA's RIMS II multipliers.

The transfer of lands to the state of Utah would change some of the impacts presented here, primarily those associated with operating the refuges and hatcheries. In addition to losing the funds used to manage these units (and the impacts associated with that spend-

[63] "Jones Hole National Fish Hatchery." U.S. Fish and Wildlife Service website. www.fws.gov/JonesHole/.
[64] The actual spending by the FWS in Utah is higher than the budget appropriation shown in Table FWS-1 because appropriations from the regional office in Lakewood, Co. are also used for certain programs in Utah.

ing) the state would likely spend more to operate the refuges and hatcheries than it would generate in revenue.

The methodology and assumptions used to estimate the impact estimates shown here are provided in Appendix E: Economic Impact Modeling.

Conclusions

In Utah, lands under the jurisdiction of the U.S. Fish and Wildlife Service are managed for express purposes—preserving wildlife habitat and maintaining healthy fish populations through a system of refuges and hatcheries. From a budget perspective, however, most of the money spent in Utah by the FWS is not used to support the NWRs and NFHs. In FY2011, FWS appropriations totaled $21 million, of this about $4.0 million was appropriated for managing refuges and hatcheries. More than half ($14 million) was appropriated for grants to the state of Utah.

From FY2008 to FY2011, FWS spent $4.35 million managing the NWRs and NFHs; more than 60 percent of the total cost was for payroll. Collections from activities undertaken at these units averaged $43,712, resulting in a combined loss of $4.3 million.

Most of the money budgeted for use in Utah would likely not be affected by the land transfer. The FWS would continue to operate in the state and implement fish and wildlife protection programs, even if they are not part of an established refuge or hatchery.

Finally, not all acres managed by the FWS are lands that were reserved from the public domain. Although the number of public domain land reservations varies by unit, 42 percent or 46,915 acres managed by the FWS in support of the NWRs and NFHs in Utah were either donated or purchased by the agency, for a total purchase price of $11.6 million.

2.2 STATE LAND MANAGEMENT

Less than 6 million acres of land in Utah are state owned and managed. Four agencies manage these lands—the Utah School and Institutional Trust Lands Administration (SITLA), the Utah Division of Forestry, Fire and State Lands (FFSL), the Utah Division of Wildlife Resources and the Utah Division of State Parks and Recreation. Of these, SITLA manages the largest share, which is composed of trust lands granted to Utah by the federal government at statehood.

Lands administered by state agencies are managed with distinct responsibilities and differing mandates. SITLA manages the state's trust lands under a commercial gain optimization and maximization model for the express benefit of trust beneficiaries. FFSL is responsible for managing state sovereign lands and providing wildland fire assistance on all state and private lands outside city limits.[65] The agency also directs programs for maintaining healthy forests. FFSL manages under a public trust doctrine.

The Utah Division of Wildlife Resources (DWR) functions as a trustee of the state's wildlife resources and manages wildlife and fishery programs on both state and federal lands. Finally, the

[65] Sovereign lands are classified as lands that lie below the ordinary high-water mark of navigable bodies of water.

Utah Division of State Parks and Recreation (SP&R) is responsible for managing state parks and museums, and is charged with conserving these resources while making them available for public use. This analysis of state agencies that manage Utah lands focuses on the operations of these four agencies.

2.2.1 Utah's Trust Lands: Early Years

Utah's trust lands were granted under its Enabling Act of 1894, and totaled almost 7.5 million acres (Matheson 1988).[66] Utah's Enabling Act outlined the state's obligations toward its school trust lands and specified what was to be done with the proceeds of those lands. Article 10 of the Act required that a Permanent State School Fund be established and that proceeds from trust land sales, other revenues generated on state lands as well as the net proceeds from federal lands in Utah be placed into the fund, the interest of which was to be expended for support of public schools (Harmer 1990). Utah's constitution further requires that the school lands granted be held in trust and disposed of only for the purposes for which they were granted.[67] Initially, state lands were managed by the State Board of Land Commissioners which included a board of elected officials (including the Governor, the Secretary of State and the Attorney General) and two resident commissioners appointed by the Governor (Banner, et al 2009).

Although the land grants were intended to create a financial base for the support of public education and other public institutions, managing these lands efficiently was difficult. Not only were the lands characterized by scattered, noncontiguous parcels, fifty years of settlement that preceded statehood meant many sections were already occupied by early settlers. Further, most of the school sections were still unsurveyed, and therefore not available for transfer to the state. According to information published by the State Board of Land Commissioners in 1897, just 1.6 of the 5.8 million acres of school lands granted in Utah's Enabling Act had been surveyed by the federal government. Of those acres, only 1.4 million were vested with the state. Preferential claims tied up at least 178,000 acres, for which the state had to select in-lieu lands.[68] These circumstances, combined with ongoing legal entanglements with the federal government over mineral rights, complicated the selection of lands granted to other trust beneficiaries, so that by the end of 1897 just 67,279 acres of grant lands had been selected and approved (State of Utah 1897).[69]

Apart from the legal mandates specified in Utah's Constitution, Congress provided little guidance as to how the state might (or should) manage its trust lands. Hence, the management of trust lands in Utah was largely determined by the State Board of Land Commissioners. While some land was retained for leasing, most was sold shortly after it was vested with the state. From

[66] After several unsuccessful attempts at statehood, Utah was admitted into the Union in 1896 under an 1894 Enabling Act (Matheson 1988).

[67] Utah Constitution, Article XX. 1 states: "All lands of the State that have been, or may hereafter be granted to the State by Congress, and all lands acquired by gift, grant or devise, from any person or corporation, or that may otherwise be acquired, are hereby accepted and declared to be the public lands of the State; and *shall be held in trust for the people*, to be disposed of as may be provided by law, for the respective purposes for which they have been or may be granted, donated, devised or otherwise acquired.

[68] Approximately 179,746 acres of school lands surveyed by December 31, 1897 had existing preferential claims. Of these acres, 65,328 were located in the counties of Salt Lake, Box Elder, Cache and Utah (State of Utah 1897).

[69] To fulfill the statehood grants for beneficiaries other than schools and for the in-lieu lands, the state board of land commissioners selected lands and submitted those selections to the General Land Office in Washington D.C. If approved, the land selected became the property of the beneficiary. In some cases, these selections took years to be approved.

1896 through 1916, 3.3 million acres of trust lands were sold, including the majority of acres granted to the non-school beneficiaries (State of Utah 1916). As lands were surveyed and selections approved, disposal of trust lands continued, and by the mid-1930s more than half of the state's original trust land grants had been sold.

Over the following decades, trust lands were managed under a seemingly endless change of structures initiated by legislative actions. With each new regime came a different set of management and investment philosophies. These changes resulted in little continuity in either managing the lands or investing the proceeds from their sale.

In the early 1990s, management of the remaining trust lands was coming under extreme criticism. It was clear there were conflicts between the different state interests in public lands with some taking precedence over the trust, royalties not being paid at market rates, and abuses in land disposal. Critics claimed that the Permanent School Trust fund had been short-changed by previous sales and leases, legislative actions and board decisions. These concerns ultimately led to the creation of a new agency known as the Utah School and Institutional Trust Lands Administration.

2.2.2 Utah School and Institutional Trust Lands Administration

The State of Utah School and Institutional Trust Lands Administration was established by legislative action on July 1, 1994 as an independent agency of state government charged with the responsibility of managing the remaining school and institutional trust lands and assets.

Trust lands are managed under the leadership of a director, appointed by a majority vote of a seven-member board that establishes the policies for trust land administration. Members of the board are appointed by the Governor, with the consent of the Utah Senate, to serve for six-year, non-consecutive terms with one member replaced annually. Individuals selected to serve on the board are required to have professional qualifications pertinent to the purposes and activities of the trust. In addition, the director and board are required to meet with an advisory committee at least three times each year. This advisory committee consists of five county commissioners appointed by the Utah Association of Counties (CULP, et al 2005). This governance structure was created to prevent the abuses of previous boards and provide a stable administrative organization that had heretofore been lacking.[70]

SITLA manages Utah's trust lands with a clear purpose: manage the lands prudently and profitably, balancing the immediate needs of the beneficiaries with long-term demands and "*optimize and maximize trust land uses for support of the beneficiaries over time*."[71] The agency is directed to administer the trust for the exclusive benefit of the trust beneficiaries, not for the benefit of other agencies or the general welfare of the state.[72]

SITLA does not manage the investment of the revenues it generates. Revenues that are not distributed directly to beneficiaries are transferred to the State Treasurer's Office and placed in the permanent funds of each beneficiary. Laws provide for the investment of these funds. Although

[70] The management and control of trust lands had been administered by at least 11 different organizational structures since the original State Board of Land Commissioners was created in 1896.
[71] Utah Administrative Code R850-2-200 1-6.
[72] U.C.A. 53C-1-1-2.

the board has a voice in the investment decisions, it does not have the unfettered control of funds of past boards.[73]

The creation of SITLA brought a new level of professionalism and stability to the administration of trust lands. Not only were the objectives and goals for managing trust lands clearly defined, but sufficient safeguards were put in place to protect trust assets from a replay of previous abuses.

Land Holdings

At present, SITLA manages approximately 3.4 million acres of mineral and surface lands and 1.1 million acres of severed mineral estate (subsurface state-owned minerals). As shown in Table 2.51, most of the state's remaining trust lands are located in rural areas of the state, with the largest holdings in Millard, Emery and Grand counties.

Since statehood, Utah has endeavored to consolidate its scattered parcels into concentrated blocks to better manage its lands. However, a look at SITLA's trust lands shows that most are still held in scattered checkerboard pattern, primarily surrounded by public lands managed by the Bureau of Land Management (Figure 2.8).

Several of the concentrated blocks of trust lands shown in Figure 2.8 are the result of successful land exchanges with the federal government. The largest of these include the Grand Staircase–Escalante Monument exchange in 1996 (finalized in 1999), the West Desert Land Consolidation in 2000 (finalized in 2001) and most recently, the Utah Recreation Land Exchange Act of 2009 (finalized in 2014).

Table 2.51
Acres of Trust Land by County, 2013

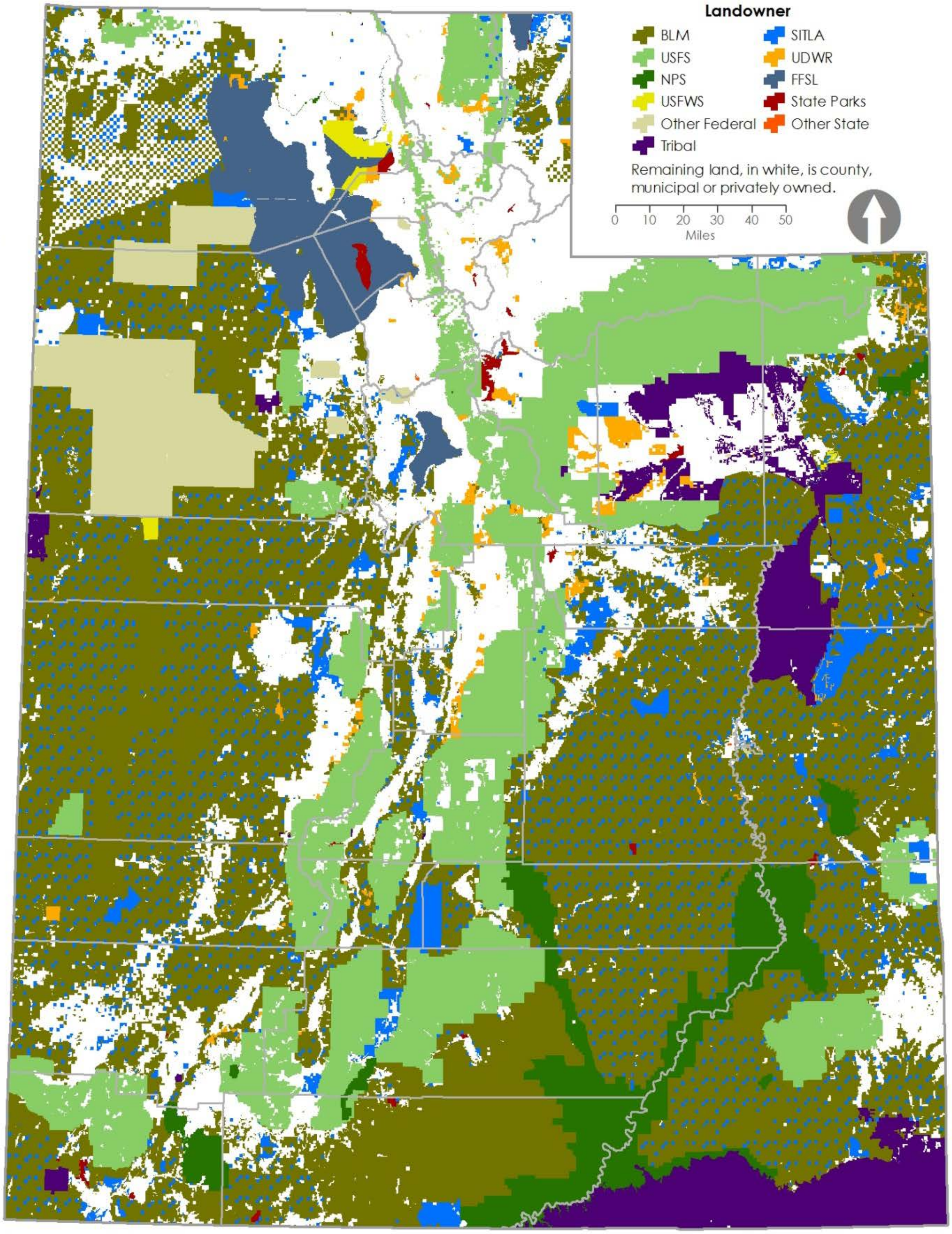
County	Surface Acres	Mineral Acres	Total Acres	County	Surface Acres	Mineral Acres	Total Acres
Beaver	157,455	25,246	182,701	Piute	57,037	11222	68,259
Box Elder	177,312	117,413	294,725	Rich	46,115	32709	78,824
Cache	16,997	20,340	37,337	Salt Lake	294	9120	9,414
Carbon	102,859	65,125	167,984	San Juan	260,785	65501	326,286
Daggett	26,791	12,394	39,185	Sanpete	28,096	39397	67,493
Davis	19	592	611	Sevier	42,109	29089	71,198
Duchesne	54,401	6,951	61,352	Summit	8,608	29411	38,019
Emery	335,390	45,252	380,642	Tooele	256,4323	88418	344,850
Garfield	156,672	13,472	170,144	Uintah	235,936	63846	299,782
Grand	343,657	38,217	381,874	Utah	45,676	55717	101,393
Iron	129,843	62,515	192,358	Wasatch	16,321	2027	18,348
Juab	167,735	76,286	244,021	Washington	76,791	35677	112,468
Kane	99,605	43,922	143,527	Wayne	169,186	8194	177,380
Millard	374,887	82,261	457,148	Weber	739	17151	17,890
Morgan	0	20,255	20,255	Total	3,387,748	1117720	4,505,468

Note: Acreage total rounded by SITLA.

Source: State of Utah School and Institutional Trust Lands Administration, email communication, March 19, 2014.

[73] Until 1981, revenue earned on trust lands was invested by the managing Land Boards. Loans were often made on terms less than satisfactory to the trust. For example, many of the farm loans made between 1896 and 1933 were fraught with fraud and abuse, ultimately ending in losses to the trust in excess of $1.0 million (State of Utah).

Figure 2.8
Land Ownership of Utah



Source: State of Utah, SGID.

Map by John Downen, BEBR | October 2014

Under the terms of the Grand Staircase–Escalante exchange, SITLA received 139,000 acres of federal land, $50 million in cash, 185 billion cubic feet of natural gas and 160 million tons of coal. In return, SITLA gave up approximately 175,000 acres of state land in the newly formed national monument and 200,000 acres of state inholdings in other monuments and national parks.

The second exchange—the West Desert Land Consolidation—traded 106,000 acres of trust lands captured inside Wilderness Study Areas for 107,000 acres of federal lands with greater income producing potential.

The most recent exchange was the Utah Recreation Land Exchange Act (URLEA) finalized in 2014, in which BLM received 58 parcels of trust land with high conservation and recreation value primarily in Grand County in exchange for 34 parcels of land with high mineral development potential primarily in Uintah County (BLM 2014).

Despite these (and other) land exchanges, there are still 497,359 acres (surface and mineral estate) of trust land inholdings in areas not open to resource development—Designated Wilderness Areas, Wilderness Study Areas, National Parks and Forests. This includes 25,589 acres of land within Designated Wilderness (some of the most protected land in the U.S.) and 345,471 acres in Wilderness Study Areas.

SITLA Operations

SITLA manages state trust lands with a staff of 64 full-time employees, 9 part-time staff and 6 seasonal/temporary employees. Total expenses in 2012 were about $12.2 million, which includes payroll costs of $6.5 million and $5.7 million in other costs such as capitalization expenses on development projects. SITLA's expenses do not include fire suppression costs. The cost of suppressing fires on trust lands is borne by the state of Utah through the Division of Forestry, Fire and State Lands.[74]

Gross revenue from operations in 2012 was about $92.1 million—an increase of $2.1 million over the previous year. In 2012, every dollar spent by SITLA to manage the state's trust lands generated $7.58 in revenue. Over the past five years, the average return on every dollar spent was $6.15. Table 2.52 summarizes SITLA's operations for 2008 through 2012.

SITLA is a for-profit enterprise, and is self-funded. While the agency's budget is legislatively approved, the money used to operate comes from generated revenues rather than from the state's general fund. If the agency spends less than its appropriation, the remaining balance is returned to the beneficiaries (Schneider 2014).

[74] In 2013, Forestry, Fire and State Lands (FFSL) paid fire suppression expenses of $10.2 million, on a total of 4,558 acres burned. The number of SITLA acres involved was 2,847 (AULT 2014).

Table 2.52
Utah School and Institutional Trust Land Administration
Summary of Revenues, Expenditures and Employment, 2008–2012

Measure	2008	2009	2010	2011	2012	Mean
Surface Acres	3,411,515	3,407,253	3,404,635	3,402,250	3,401,940	3,405,519
Surface and Mineral Acres	4,439,428	4,440,320	4,439,612	4,440,479	4,440,769	4,440,122
FTE Employment	70	73	74	71	70	72
Revenue	$114,947,174	$117,225,918	$85,187,527	$89,992,984	$92,097,247	$99,890,170
Expenses	$19,095,794	$24,238,359	$20,787,571	$10,955,684	$12,156,221	$17,446,726
Labor	$6,281,928	$6,965,870	$6,397,832	$6,424,694	$6,423,201	$6,498,705
Nonlabor	$12,813,866	$17,272,489	$14,389,739	$4,530,990	$5,733,020	$10,948,021
Profit (Loss)	$95,851,380	$92,987,559	$64,399,956	$79,037,300	$79,941,026	$82,443,444
Return per dollar spent	$6.02	$4.84	$4.10	$8.21	$7.58	$6.15
Employment-Based Productivity Measures						
Measure	2008	2009	2010	2011	2012	Mean
Acres managed per FTE	48,736	46,675	46,009	47,919	48,599	47,299
Revenue per FTE	$1,640,462	$1,605,834	$1,157,125	$1,267,507	$1,318,689	$1,397,923
Expenses per FTE	$272,525	$332,032	$282,363	$154,305	$174,058	$243,057
Profit (Loss) per FTE	$1,367,937	$1,273,802	$874,762	$1,113,201	$1,144,631	$1,154,867
Land-Based Productivity Measures						
Revenue per surface acre	$33.69	$34.40	$25.02	$26.45	$27.07	$29.33
Expense per surface acre	$5.60	$7.11	$6.11	$3.22	$3.57	$5.12
Profit (Loss)	$28.10	$27.29	$18.92	$23.23	$23.50	$24.21

Source: State of Utah School and Institutional Trust Lands Administration, 2014. Unpublished data.

SITLA is organized into four operating groups: Oil and Gas, Hard Rock Minerals, Surface, and Planning and Development. The Oil and Gas Group manages all oil and gas leasing. The Hard Rock Mineral Group manages leasing and sales of minerals such as coal, oil shale, sand and gravel. The Surface Group oversees the leasing trust land for surface uses, such as grazing, forestry, hunting access, telecommunications, farming, easements, and rights of entry. The surface group also holds two auctions each year where a limited number of trust land parcels is sold to the highest bidder. The Planning and Development Group identifies and works on tracts of land that have high potential surface value in the form of real estate. The agency also generates revenue by selling undeveloped land at public auction; however, undeveloped land sales are not a primary source of revenue. The activities within each group are discussed below.

Oil and Gas and Hard Rock Mineral Groups

These groups oversee the mineral and natural resource elements of Utah's trust lands such as oil and gas, coal, sand and gravel, potash, oil shale and a variety of metalliferous minerals. Revenue from these minerals includes fees, leases, bonuses and royalty payments.p
Revenue from mineral production provides most of the income for the Permanent Fund. According to information produced by SITLA, the trust has been primarily built on the revenue from production of oil, gas and coal (Bird 2013). Between 2008 and 2012, subsurface uses accounted for nearly 83 percent of all revenue generated on state trust lands—$412.3 million of $499.5 million. As measured by revenue generated per dollar spent, the mineral section of the agency produces the greatest return. Over the past five years, on average, every dollar spent by the agency for mineral production activities resulted in $28.69 in revenue.

Royalty payments from oil, gas and coal production are *the* major source of revenue for the trust. In 2012, income from production of these resources totaled $71.2 million on expenses of $2.6

million. The return to investment of coal and oil and gas production is extremely high. Coal generated $37.36 in 2012 and oil and gas generated $34.01 (Table 2.53).

Oil and Gas

As of 2012, 1.1 million of the nearly 4.1 million acres mineral estate owned by the trust were leased for exploration and development (SITLA 2012). These leased acres supported more than 1,900 active oil and gas leases, which generated almost $64 million in revenue.

As shown in Table 2.53, income from oil and gas production has remained stable over the past five years with the exception of a spike in 2009. This increase was due to an increase in the average price of natural gas (3.78% over 2008 prices) and a relatively high production volume (27.55%) over 2008 production (Schneider 2014).

With almost 3.0 million acres of mineral estate unleased, this asset may provide a stream of revenue for trust beneficiaries well into the future if additional resources are located and techniques are developed to recover them.

Coal

Revenue from coal production is the second largest source of income for the trust. From 2008 through 2012, coal production generated a total of $67.7 million in revenue on expenses of just $1.3 million, making it the most profitable activity on state trust lands. A large share of this revenue came from coal rights acquired through the Grand Staircase–Escalante National Monument exchange. Other producing leases include the Muddy Tract in Sevier County, Cottonwood tract in Emery County and the Westridge Tracts in Carbon County.

SITLA manages significant coal reserves and receives revenue from four coal mines with three properties available for future production. Currently the agency leases about 7,400 acres for coal production.

Table 2.53
State of Utah School and Institutional Trust Lands Administration
Minerals Group
Operating Revenue and Expenses

	2008	2009	2010	2011	2012	Mean
Activity			**Revenue**			
Oil and Gas	$63,912,883	$82,511,078	$53,235,571	$58,682,107	$60,393,653	$63,747,058
Coal	$10,546,508	$16,775,921	$16,010,301	$13,615,475	$10,791,313	$13,547,903
Other Minerals	$5,496,398	$4,188,874	$5,105,874	$5,004,054	$5,993,529	5,157,746
Totals	$79,955,789	$103,475,873	$74,351,746	$77,301,633	$77,178,495	$82,452,707
			Expenses			
Oil and Gas	$1,865,036	$1,963,244	$1,616,213	$1,767,311	$1,775,507	$1,797,462
Coal	$261,358	$270,841	$245,491	$265,882	$288,843	$266,483
Other Minerals	$689,980	$862,283	$785,639	$817,511	$896,464	$810,375
Totals	$2,816,374	$3,096,368	$2,647,343	$2,850,704	$2,960,814	$2,874,321
			Profit			
Oil and Gas	$62,047,847	$80,547,834	$51,619,358	$56,914,796	$58,618,146	$61,949,596
Coal	$10,285,150	$16,505,080	$15,764,810	$13,349,590	$10,502,470	$13,281,420
Other Minerals	$4,806,418	$3,326,591	$4,320,2353	$4,186,543	$5,097,065	$4,347,370
Totals	$77,139,415	$100,379,505	$71,704,403	$74,450,929	$74,217,681	$79,578,387
Return per dollar spent	$28.39	$33.42	$28.09	$27.12	26.07	$28.68

Source: State of Utah School and Institutional Trust Lands Administration, 2014. Unpublished data.

Revenue from coal production peaked in 2009 at $16.8 million, and has been steadily declining since that time. While there are myriad contributing factors, the most significant was the expiration of SITLA's interest in the Mill Fork Tract, which delivered about $25.6 million in income to the trust from 2000 to 2011. Additionally, permitted reserves in the Muddy and Dugout Canyon tracts and in the West Ridge Mine are nearing exhaustion and demand for coal shipped out-of-state is declining.

Oil Shale and Oil Sands

Oil shale and oil sands are found in abundance in Utah—roughly 1.5 million acres of oil shale and 1.0 million acres of oil sands. While the federal government manages the single largest share of oil shale and oil sands resources in Utah, SITLA owns a fair amount of these lands and has leases in place for production of both resources.

SITLA's largest holding are oil sands, with a total of almost 140,000 acres located primarily in the P.R. Springs Special Tar Sands Area (Keiter and Ruple 2011). SITLA has leased approximately 32,000 acres of its oil sands lands in the Uinta Basin to US Oil Sands (formerly Earth Energy Resources), including 5,930 acres in the PR Springs Project (one of the 11 federally-designated special tar sands areas) and 26,075 acres in the nearby Cedar Camp and NW Project area. Based on independent assessments, US Oil Sands reports these leases contain a resources base in excess of 180 million barrels of discovered petroleum. The Cedar Camp and NW Project leases will be assessed for future development.

The PR Springs Project is the primary area where exploration and development has been focused. Within a portion of this lease, the company has an approved mine development project on which work commenced during the second half of 2013. The initial development is targeted to produce 2,000 barrels per day (bpd) of bitumen and first oil is expected in 2015. Based on the production target of 2,000 bpd, US Oil Sands estimates that royalties paid to SITLA could be $35 million over a 10-year period (U.S. Oil Sands 2013). To date, revenue from oil sands leases have come from bonus bids on lease offerings and annual lease rental payments.

Through land exchanges and transfers, SITLA has assembled contiguous blocks of oil shale lands SITLA's oil shale holdings are estimated at 121,080 acres in the Green River Formation, of which 98,390 acres are in areas designated as Most Geologically Productive. About 78,000 acres of these lands are under lease to four companies—Ambre Energy, Red Leaf Resources, TomCo Energy and Conoco-Phillips. Of these, the Red Leaf project in Seep Ridge, Utah is closest to production.

Red Leaf Resources holds leases to 17,000 acres of SITLA lands in the Seep Ridge and Holliday Blocks and has obtained permits that will allow the company to move forward with construction of a large-scale commercial demonstration project using its proprietary technology. Red Leaf estimates it has up to 600 million barrels of recoverable oil under leases on school trust lands in Utah. To date, revenue from SITLA's oil shale resources has been from leasing actions; however, SITLA will receive royalties of 5 percent on all production from its leases to Red Leaf and TomCo.[75]

[75] SITLA currently imposes a 5% royalty on unconventional oil production.

Ongoing litigation and other impediments to commercial oil shale and oil sands development on federally managed lands make development on trust lands more desirable. The development of SITLA's holdings within the Uinta basin could eventually support a very large industry and generate significant revenue for the trust well into the future.

Other Minerals
The remaining mineral estate of the trust includes potash, sand and gravel, limestone, geothermal and a variety of metalliferous minerals. Currently, almost 560,000 acres of SITLA lands are leased or permitted for exploration, development and exploitation of solid mineral resources. These leases generated about $6 million in 2012.

Surface Group

Surface activities comprise a wide variety of uses including sales of trust land at public auction, land leases for telecommunications sites, governmental and agricultural uses, commercial and industrial sites, renewable energy projects, forestry and grazing.

Income from surface uses of trust lands totaled $7.1 million in 2012—roughly 7.8 percent of all revenue generated that year. Sales of trust lands totaled nearly $1.4 million . Expenses tied to surface activities were $3.0 million, for a return per dollar spent of $2.31. Most surface revenue programs are personnel intensive, requiring site visits and timely lease negotiations and review. Thus, the return on investment for surface activities is lower than for other activities in which the trust engages. However, these uses are extremely important to the grazing community and integral to energy and mineral production on trust lands.

Special Use Lease Agreements (SULAs) and the royalties from those leases (excluding grazing) are the primary source of revenue generated by surface uses, followed by revenues from sales, easements, grazing and finally forestry. Table 2.54 shows the revenue and expenses for surface activities.

Special Use Lease Agreements and Royalties
SULA royalties generated $4.8 million in revenue in 2012, on expenses of almost $1.7 million, for a return of $2.86 per dollar spent, making it the most profitable activity in the surface use group. Surface leases are acquired through a public competitive bidding process. SITLA is required to receive at least fair market value for all surface leases, as determined by market analysis, and to review those agreements on a regular basis. Thus, the expenses associated with negotiating, implementing and monitoring surface leases are typically much higher than for subsurface leases and therefore result in a much lower rate of return than do subsurface uses.

Grazing
SITLA's grazing program is a significant piece of the agency's management portfolio and of great importance to farmers and ranchers in almost all counties in Utah. More than 3.1 million acres of Utah trust lands are permitted for grazing. The agency administers about 1,440 grazing permits representing 195,545 Animal Unit Months (AUMs) statewide.[76] Most of SITLA's grazing permits are issued for cattle, but permits are also issued for sheep, and wildlife.

[76] Grazing fees are based on the amount of forage an animal consumes in a month. The base measurement is called an Animal Unit Month (AUM) and is defined as the amount of forage a cow and her calf (or their combined equivalent) consumes in a month.

Table 2.54
State of Utah School and Institutional Trust Lands Administration
Surface Group
Operating Revenue and Expenses

	2008	2009	2010	2011	2012	Mean
Activity			**Revenue**			
Rights of Way/Easements	$1,590,295	$1,430,010	$1,086,316	$1,172,354	$1,249,999	$1,305,795
Special Use Leases	$4,388,974	$4,663,411	$4,889,374	$4,731,585	$4,852,327	$4,705,134
Undeveloped land sales	$2,854,067	$2,906,189	$467,281	$1,753,453	$1,420,201	$1,718,238
Grazing	$857,623	$799,122	$790,761	$892,967	$864,777	$841,050
Forestry	$401,138	$334,695	$177,495	$183,707	$179,738	$255,355
Totals	$10,092,097	$10,133,427	$7,411,227	$8,734,066	$8,567,042	$8,825,572
			Expenses			
Rights of Way/Easements	$586,530	$615,227	$539,607	$643,669	$614,457	$599,898
Special Use Leases	$1,662,908	$1,708,651	$1,597,897	$1,722,579	$1,696,133	$1,677,634
Undeveloped Land Sales	$541,161	$537,284	$395,211	$447,964	$439,471	$472,218
Grazing	$542,132	$474,076	$490,454	$494,234	$470,048	$494,189
Forestry	$524,947	$297,069	$285,631	$218,887	$230,482	$311,403
Totals	$3,857,678	$3,632,307	$3,308,800	$3,527,333	$3,450,591	$3,555,342
			Profit			
Rights of Way/Easements	$1,003,765	$814,783	$546,709	$528,685	$635,542	$705,897
Special Use Leases	$2,726,066	$2,954,760	$3,291,477	$3,009,006	$3,156,194	$3,027,501
Undeveloped Land Sales	$2,312,906	$1,558,905	$72,070	$1,305,489	$980,730	$1,246,020
Grazing	$315,491	$325,046	$300,307	$398,733	$394,729	$346,861
Forestry	–$123,809	$37,626	–$108,136	–$35,180	–$50,744	–$56,049
Totals	$6,234,419	$6,501,120	$4,102,427	$5,206,733	$5,116,451	$5,270,230
Return per dollar spent	$2.62	$2.79	$2.24	$2.48	$2.48	$2.48

Source: State of Utah School and Institutional Trust Lands Administration, 2014. Unpublished data.

SITLA grazing permits are issued for a period not to exceed 15 years; however, existing grazing permit holders have a preferential right to the permit if that permit holder agrees to match or exceed the highest competing application bid.

SITLA's grazing fees are substantially higher that grazing fees on federal land, but from SITLA's perspective they are a better reflection of market conditions. In contrast to the federal grazing program, which assesses a single grazing fee of $1.35 per AUM for grazing on its lands, SITLA has a two-tiered grazing fee, which includes a standard assessment for grazing on open lands (both trust lands and federal lands) and a separate assessment for grazing animals on sections and a few blocks of trust land that are fenced separately from federal allotments.

In FY2012, the *standard assessment fee* was $4.12 per AUM, and included a grazing fee of $4.02 plus a $0.10 noxious weed fee. This rate applies to animals grazing on trust lands scattered within BLM allotments.. These are typically unfenced rangelands and grazing is managed by BLM.

The *block assessment fee* is applied to grazing that occurs on trust lands which may be fenced and/or have other attributes that make the area more desirable for permittees. In FY2012, the block assessment fee was $7.17 per AUM ($7.07 plus a $.10 noxious weed fee). SITLA staff time spent on the grazing program generally goes toward managing the SITLA blocks with little or no federal land ownership.

In 2012, revenue received from grazing permits was less than $1.0 million ($864,777). The costs associated with managing grazing are comparatively high. SITLA designates 10 percent of annual grazing revenue for use on projects that will improve grazing management. In addition, the agency spends money on a plethora of activities in conjunction with its grazing program, including water right proof surveys, cultural resource surveys, seed purchases, etc. The end result is a high level of expense associated with grazing. In 2012, SITLA spent almost $470,048 to manage its grazing program, for a return of $1.84. While grazing is important to Utah ranchers, it is an expensive program for SITLA.

Forestry

SITLA manages about 1.0 million acres of forested trust lands with species including Douglas-fir, Englemann spruce, lodge pole pine, juniper and aspen. Of these forested acres, 35,000 have commercial value (SITLA 2014). SITLA manages many small and fragmented parcels which are usually too small for timber sales. Obtaining road access to these sections and small parcels via federal lands may take too long, cost too much or be prohibited. As measured by revenue, forestry is SITLA's smallest program and the most expensive, in relation to revenue, to manage. From 2008 to 2012, the cost of managing the forestry program exceeded revenue in four of the five years. In 2012, forestry revenue totaled $179,000 on expenses of $230,000.

Although SITLA offers a number of timber sales each year, it faces many challenges in developing a profitable forestry program. According to SITLA, the primary barriers to an optimal timber harvest include a lack of demand for forest products—sawlogs in particular—and a dearth of sawmills in the state. Looking forward to future harvest levels, SITLA believes the lack of sawmills is a major limiting factor. Sawmills need a fairly consistent supply of wood, and timber sales from private and state lands are not enough. Combined with litigation/policy/funding constraints at the Forest Service, the decline in the health of Utah's forests over the past decades has resulted in reduced federal timber sales.

Planning and Development Group

Development efforts on trust lands are a relatively recent addition to SITLA's portfolio. In the late 1990s, SITLA began aggressively developing land on its own or in partnership with private developers for uses such as housing and industrial properties. p

The Planning and Development Group works to increase land values with the use of an approved capital budget. The intent is to produce higher profits for beneficiaries by allowing the development of parcels before selling them. There are currently 91 active projects in various stages of development (SITLA 2014).

Revenue from development projects is volatile, and subject to global and national real estate markets. In 2008, development projects produced $24.9 million in revenue for the trust. In the same year capital expenses were about $9.6 million. In subsequent years, revenue from development projects dropped considerably, averaging about $4.5 million annually from 2009 through 2012. From 2004 to 2013, annual expenses (including agency overhead) averaged $9.2 million while revenues have averaged $15.4 million. Expenses to manage these projects (including capitalization costs) averaged almost $10.6 million annually.

Capital projects typically have a long time horizon. For several of SITLA's projects, investments in 2008 and 2009 are now reaching fruition. These projects have significant upside potential for the agency well into the future.p

From time to time, trust lands are sold through a development project. Development sales occur when SITLA determines that profits for the beneficiaries could be optimized by adding value to parcels of land before selling them. Conservation sales are also allowed as long as the beneficiar-

ies receive full compensation for the use of the land. The lands cannot be sold for less than fair market value and the decision to sell must be in the best interest of the beneficiaries.p
In 2012, SITLA generated almost $1.4 million in undeveloped land sales. Over the past five years, sales of undeveloped trust lands have generated about $9.4 million for the various beneficiaries of trusts (Table 2.55).

Table 2.55
State of Utah School and Institutional Trust Lands Administration
Development Group
Operating Revenue and Expenses

	2008	2009	2010	2011	2012	Mean
Activity	**Revenue**					
Development	$24,899,288	$4,426,618	$3,424,554	$3,957,286	$6,351,710	$8,611,891
Total	$24,899,288	$4,426,618	$3,424,554	$3,957,286	$6,351,710	$8,611,891
	Expenses					
Development	$12,241,741	$17,509,683	$14,831,427	$4,577,651	$5,744,616	$11,017,024
Total	$12,241,741	$17,509,683	$14,831,427	$4,577,651	$5,744,616	$11,017,024
	Profit					
Development	$12,477,547	–$13,083,065	–$11,406,873	–$620,094	$607,094	–$2,405,135
Total	$12,477,547	–$13,083,065	–$11,406,873	–$620,094	$607,094	–$2,405,135

Source: State of Utah School and Institutional Trust Lands Administration, 2014. Unpublished data.

Trust Beneficiaries and the Permanent School Fund

Trust lands belong to the 12 beneficiaries shown in Table 2.56. The trust corpus consists of two main parts—land resources and fund assets. The land portfolio is managed by SITLA (with the oversight of the Board of Trustees). Net revenue generated on trust lands is deposited into 12 separate permanent trust funds—the financial portfolio—that support these beneficiary groups. These funds are then invested by the state treasurer.

Value and Distribution of the Funds

In the 19 years since SITLA was created, the aggregate market value of the permanent funds has increased from $85.8 million to $1.7 billion. As shown in Figure 2.9, the trust assets largely belong to the common schools.

In 2013, of the $1.7 billion in total assets, the Permanent Funds of the non-public school beneficiaries totaled about $86.4 million. These funds have grown much more slowly because these beneficiaries hold a smaller percentage of lands and only the revenue from land sales is placed into their permanent funds. Other revenue is distributed annually to each beneficiary. From 1994 to 2013, SITLA disbursed a total of $50.7 million to these 11 beneficiaries.

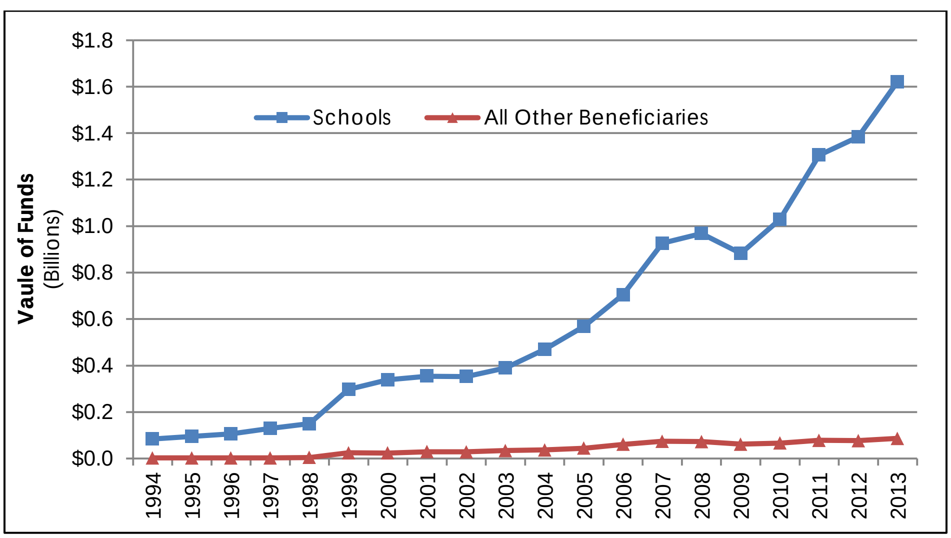
Table 2.56
Original Trust Land Grants and Current Holdings

Beneficiary	Fund	Original Land Grant	Acres Sold Since Statehood[1]	FY2013 Trust Land Acres[1]	2013 Permanent Fund Balance	2013 Distribution
Public Schools (K–12)	Schools	5,855,217	2,569,388	3,285,829	$1,621,471,170	$37,836,469
Utah Division of Water Resources	Reservoirs	500,000	457,644	42,356	$5,668,103	$364,300
Utah State University	Utah State University	200,000	171,826	28,174	$2,239,246	$729,294
University of Utah	University of Utah	156,080	139,636	16,444	$3,910,815	$726,929
University of Utah	School of Mines	100,000	92,774	7,226	$3,270,692	$219,105
University Medical Center	Miner's Hospital[2]	100,000	94,165	5,835	$45,520,623	$1,212,332
University of Utah Utah State University Southern Utah University Weber State University Dixie State University	Normal Schools[3]	100,000	94,527	5,473	$4,614,468	$246,538
School for the Deaf	School for the Deaf	100,000	94,463	5,537	$497,887	$53,780
State Youth Development Center	State Youth Development Center	100,000	99,981	19	$1,013,678	$167,679
Utah State Hospital	Insane Asylum	100,000	99,597	403	$3,062,701	$169,637
School for the Blind	Institute for the Blind	100,000	99,544	456	$16,547,620	$407,617
Division of Facilities and Construction Management	Public Buildings	64,000	63,999	1	$32,871	$3,493
Total		**7,475,297**	**4,077,544**	**3,397,753**	**$1,707,849,874**	**$42,147,636**

Note: The acreage shown is surface acreage.
1 Acres have been rounded.
2 The original grant for a Miners Hospital was 50,000 acres. By Act of Congress in February 20, 1929 this amount was increased by 50,000 acres.
3 Normal Schools: Current beneficiaries of this trust are the teacher's colleges at state universities offering teaching degrees. 2013 distribution is based on calendar year accounting.

Source: State of Utah School and Institutional Trust Lands Administration, email communication, March 19, 2014 and Annual Financial reports for each beneficiary. trustlands.utah.gov/our-agency/financial-reports-statistics/

Figure 2.9
Trust Assets



Source: State of Utah School and Institution Trust Lands, email communication, May 14, 2014.

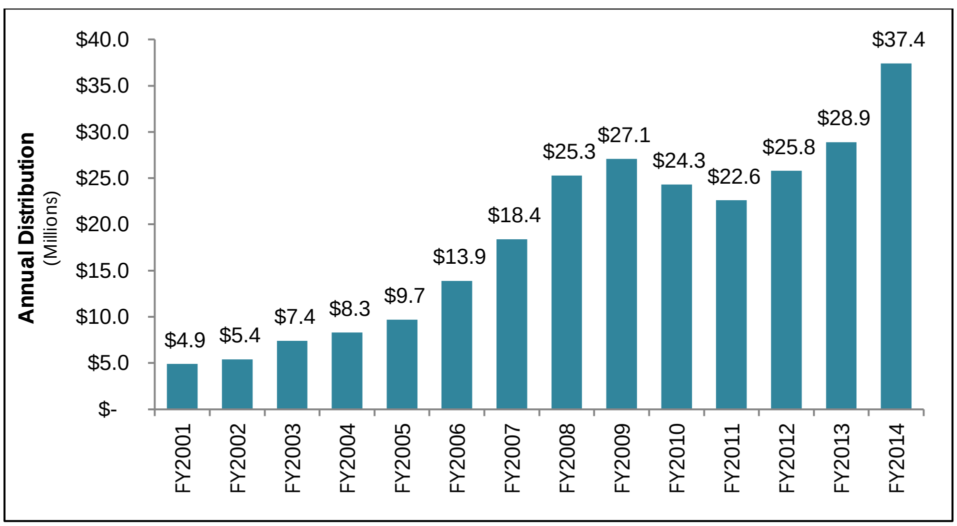
Permanent State School Fund

The Permanent State School Fund (the Fund) is for the express benefit of the state's public schools. Between 1994 and 2013, the Fund grew at an average annual rate of 16.9 percent. All net revenue generated by trust land operations and trust land sales are placed in the fund. Only the investment income (interest and dividends from the financial portfolio) is distributed to school districts. This allows the fund to grow each year and be managed like a private endowment.

Income earned from the fund is distributed annually to individual school councils using a per pupil formula. These distributions are made through the School Learning and Nurturing Development Trust Program (LAND). The School LAND Trust Program is the only source of discretionary funding available to every public school in Utah.[77]

Annual distributions to schools since FY2000 are shown in Figure 2.10. The estimated distribution for FY2014 of $37.4 million is the largest distribution to public schools in SITLA's history, providing an average of $62.27 per pupil (Donaldson 2014).

Figure 2.10
Annual Statewide Distribution to Schools, FY2001–FY2014



Source: State of Utah School and Institution Trust Lands Administration. trustlands.utah.gov/our-agency/financial-reports-statistics/

Despite impressive growth in the Permanent State School Fund, and the increasing size of the distributions to public schools, SITLA's contribution is a fraction of the total K–12 education budget. As shown in Table 2.57 in FY2102 SITLA distributed $25.8 million to Utah schools, contributing less than one percent of the $4.1 billion in current expenditures for elementary and secondary education that year as reported by the National Education Association.

Legal constraints are a contributing factor. By law, SITLA is allowed to distribute just the interest and dividend earnings of the Permanent State School Fund to Utah's public schools each

[77] For a description of the School LAND Trust Program, see *FY2012 Annual report on the School Trust to the Utah Legislature and the Utah State Board of Education.* (February 2013) (Bird 2013).

year. In contrast, other western states, including Arizona, Colorado, Idaho, Montana and New Mexico have distribution policies which allow some portion of the generated operating revenue to be distributed. While other trusts may have more liberal distribution policies, excepting New Mexico, none of the trusts provide a significant source of funding for education.

Table 2.57
Comparison of School Trust Fund Distributions, FY2012
Selected Western States
(Thousands of Dollars)

State	Surface Acres	Permanent Fund Balance	Net Operating Revenue[1]	Distribution	Current Expenditures: K–12 schools[2]	Distribution as Share of Current Expenditures
Arizona	8,088,271	$3,277,439.0[a]	$272,560.4	$122,532.9[b]	$7,170,012.0	1.71%
Colorado	2,635,019	$620,154.2	$140,048.0	$131,175.9	$8,289,102.0	1.58%
Idaho	2,078,263	$914,939.7	$24,570.1	$24,570.1	$2,409,471.0	1.02%
Montana[3]	4,628,487	$446,434.7	$83,669.4	$52,553.7	$1,439,664.0	3.65%
New Mexico	6,814,676	$10,200.0[c]	$485,785.8[d]	$544,244.9	$3,626,478.0	15.00%
Nevada	3,000	$313,246.2	$6,723.6	$2,007.2	$3,876,421.0	.05%
Utah	3,285,829	$1,383,566.5	$66,383.2	$25,847.3	$4,091,494.0	0.63%

Note: Fiscal years may differ between states.
1 Net operating revenue is exclusive of expenses and investment income.
2 Estimated current expenditures are for FY2011-2012.
3 Data for Montana is 2011.
a: Market value of the fund.
b: Distribution includes $77,832,914 paid to the state of Arizona in support of public schools and $44,700,000 distributed to the Classroom Fund Site to fund current expenses.
c: Total combined value of the Permanent Funds.
d: Estimated based on acreage.

Sources: Arizona-Arizona State Land Department, Annual Report 2011-2012, www.azland.gov/report/report2012_full.pdf; Colorado-Colorado State Board of Land Commissioners, Income and Inventory Report: Annual Review of Income by State Trust Lands. trustlands.state.co.us/Documents/fy%202011-12%20Income%20and%20Inventory%20Report%20FINAL.pdf; Idaho-Idaho Department of Lands, Idaho Department of Lands: Trusted Stewards of Idaho's Resources from Main Street to Mountain Top, Annual Report 2012. www.idl.idaho.gov/land-based/about-idl/annualreports/ar_2012; Montana-Trust Land Management Division, Department of Natural Resources and Conservation, Annual Report Fiscal Year 2011. dnrc.mt.gov/Aboutus/Publications/2011/TrustAr.pdf; New Mexico-New Mexico State Land Office, Annual Report, 2011-2012.www.nmstatelands.org/uploads/files/slo12%20all.pdf; Nevada-State Controller's Office, State of Nevada Permanent School Fund, Financial Statements for the Quarter ended June 20, 2012, unaudited. controller.nv.gov/Financial Reports/permSchoolReport/FY/4QReport12.pdf.; Utah-State of Utah School and Institutional Trust Lands Administration, Annual Financial Report, 2012. trustlands.utah.gov/our-agency/financial-reports-statistics/; National Education Association, Rankings of the States 2011 and Estimates of School Statistics 2012. www.nea.org/home/2011-12-rankings-and-estimates.html

Trust Land Management Challenges

SITLA has identified some of the challenges it faces in managing trust lands. Most are the direct result of federal land management policies. With few exceptions, Utah's trust lands are largely scattered across the state in non-contiguous parcels interspersed with private and federal lands. Where state trust lands have development potential but are surrounded by federal lands, federal agencies become the de facto managers of those lands, complicating state trust land development and resource use. Some of these challenges are discussed here. Two of the most pressing concerns of managing state trust lands effectively are parcel sterilization and wilderness.

Parcel Sterilization

One of the greatest challenges facing SITLA is parcel sterilization. Sterilization of trust lands occurs when SITLA does not have full access to its lands, or when BLM refuses to allow development on its lands that surround trust lands.

Because trust lands tend to be scattered throughout federal lands and are often too small and isolated to support energy development and exploration on their own, access to federal lands is critical. BLM can sterilize state trust lands by refusing to lease its lands or by impeding access to trust lands by imposing protracted and expensive regulatory processes.

While BLM acknowledges SITLA must be able to access its parcels, granting that access is not always expedient or direct. BLM can impose extensive information requirements depending on its level of concern about the potential effects of the project. The process of responding to BLM's information requests can take weeks or years. Further, in the event an applicant for a project on SITLA lands has to engage the BLM for any reason (rights-of-entry, access, etc), the agency can invoke a "connected action" which grants it the right to fully examine not just use on BLM lands, but the entire project, regardless of how much of that project actually involves federal lands. In that situation, all lands (including trust lands) are treated for examination purposes as though they were federal lands. This process discourages development on trust lands as the cost of complying with BLM's regulatory requirements tends to be high and the potential outcome uncertain.

The effects of sterilization apply to all energy and mineral development on trust lands, but are of particular concern with respect to oil and gas and energy projects. Typically these projects require a substantial footprint to be economically feasible. The availability of large blocks of land is more appealing to developers than are scattered sections. A potentially productive play on trust lands may go unexplored if surrounding BLM sections cannot be leased, and the potential revenue from that production will remain unrealized.

SITLA estimates that it has approximately 841,000 oil and gas acres that are sterilized because they are surrounded by unleaseable federal lands, and it believes it has a finite number of remaining acres that are suitable for traditional oil and gas development using current technologies. The loss of such a large number of acres will have negative and long-lasting effects for trust beneficiaries.

Inholdings

Trust land inholdings have occurred over the decades as a result of public land withdrawals for national parks and forests and Wilderness designations (formally designated wilderness and Wilderness Study Areas). Under the Federal Wilderness Act of 1964, Designated Wilderness is solely for primitive recreation, with motorized use, road access and mineral development generally prohibited. A total of 3.4 million acres of public lands in Utah are protected as wilderness (233,842 million acres of Designated Wilderness and 3,234,465 acres in WSAs). Although WSAs are not afforded the same protections as Designated Wilderness, they are managed as wilderness pending formal Congressional approval or removal from WSA

Table 2.58
SITLA Acreage in or Near Wilderness, National Parks and National Forests, 2012

Designated Areas	Total Acres	Acres with Minerals
Designated Wilderness	25,589	25,289
Wilderness Study Areas	345,471	341,910
National Parks[1,2]	46,866	46,866
National Forests[1,3]	79,433	65,488
Totals	**497,359**	**479,553**
America's Red Rock Wilderness Act[4]	880,535	876,138

1 Surface acres for National Parks and National Forests are trust land acres that are only within (not just near) these lands.
2 Includes acres in Golden Spike National Historic Site, Glen Canyon National Recreation Area, and national monuments administered by the National Park Service. 3 Excludes Designated Wilderness and includes Flaming Gorge Recreation Area. 4 Includes Designated Wilderness and Wilderness Study Areas.

Source: State of Utah School and Institutional Trust Lands Administration, 2014.

status. The lack of consensus in Congress has resulted in no sizeable release of these lands since their designation in 1991. Thus, these lands have been subject to the same restricted uses as Designated Wilderness, meaning all mineral development is restricted. Table 2.58 shows SITLA's inholdings on public lands deemed off-limits to resource development.

In addition to the Designated Wilderness Areas administered by the BLM and Forest Service are the wilderness recommendations proposed in the "America's Red Rock Wilderness Act" (ARRWA), most recently proposed in 2013. This bill proposes the designation of more than 10 million Utah acres as wilderness. If adopted, energy and mineral exploration would be prohibited in this vast area. Approximately 881,000 trust lands are included in the ARRWA proposal, of which 876,138 acres are mineral acres. If the ARRWA designation is adopted it effectively reduces the trust's mineral acreage by 22 percent. Given SITLA's current revenue generation model, losing access to this resource development on such large tracts of land would have significant financial consequences to the trust beneficiaries, especially public schools.

Sage-Grouse Designation

Greater sage-grouse populations in Utah, Idaho, Wyoming and Nevada have significantly decreased over the past 70 years. In response, the U.S. Fish and Wildlife Service (Service) determined in 2012 that listing the Greater sage-grouse as endangered was "warranted but precluded" as other species were in greater danger. In 2013 the Service revisited the listing and began the decision-making process whether or not to list the species under the Endangered Species (ES) Act.

Information prepared by BLM shows that 623,200 acres of state trust lands have occupied habitat of the Greater sage-grouse. Some of these lands would be affected by an ES designation. Various agencies of state government and SITLA are working on a state plan to preserve the species and prevent the listing. If these efforts are not successful and the listing occurs, SITLA believes the impact to oil and gas production, mining, and surface activities on school lands would be significant.

Wild Horses and Burros

The Bureau of Land Management has the legal responsibility to manage wild horse and burro populations on federal lands. While the BLM acknowledges there are currently more wild horses and burros roaming Utah's rangelands than the ecosystem can maintain, the agency lacks funding to address the issue. The overabundance of horses causes serious damage to SITLA's rangelands, rendering those lands unsuitable for use by domestic livestock and wildlife.

Recently, the Utah office of the BLM announced it would need $500,000 to remove 1,000 horses from BLM, private and SITLA lands in Iron and Beaver counties where the number of wild horses on the rangeland is more than double the prescribed limit. Ultimately, increases in wild horse population could reduce grazing on trust lands and result in degradation of the trust's rangeland resources.

2.2.3 Utah Division of Forestry, Fire, and State Lands

Overview

The Utah Division of Forestry, Fire and State Lands (FFSL) is the agency within the Utah Department of Natural Resources that manages the sovereign lands of Utah and provides forestry conservation and fire control activities on non-federal forest, range and watershed lands. The sovereign lands under the jurisdiction of FFSL are defined by the Utah State Legislature as "those lands lying below the ordinary high water mark of navigable bodies of water at the date of statehood and owned by the state by virtue of its sovereignty."

Title to sovereign lands transferred to Utah upon statehood under the equal footing doctrine. State sovereign lands total 1.5 million acres and include the Great Salt Lake, Utah Lake, Jordan River and portions of Bear Lake, Bear River, and the Green and Colorado Rivers. Also managed as sovereign lands are two parcels of land located near Moab, Utah and a 250-acre parcel of 'critical land' adjacent to the Jordan River in Draper, Utah.[78]

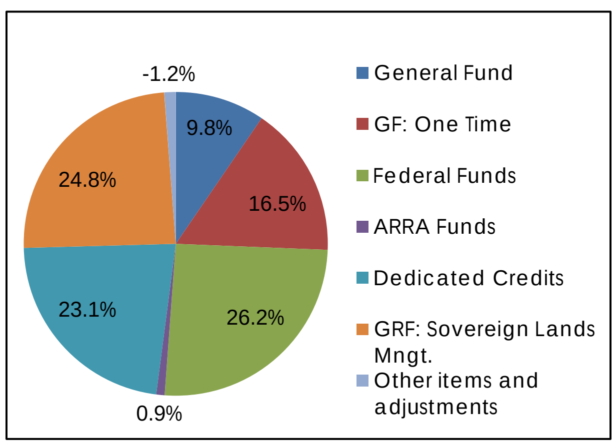
For nearly 100 years, the state's sovereign lands were managed in conjunction with the state's trust lands under the same (but changing) agency umbrella—State Land Board of Commissioners (1896–1969), Division of State Lands (1969–1988) and finally the Division of State Lands and Forestry (1988–1993). In 1994, the state legislature separated the Division of State Lands and Forestry into two organizations. State trust lands were placed under the governance of the State of Utah School and Institutional Trust Lands Administration while the renamed Division of Sovereign Lands and Forestry remained in the Department of Natural Resources. In 1995, the agency was again renamed as the Utah Division of Forestry, Fire and State Lands (Banner, et al 2009).p

FFSL manages the state's sovereign lands in accordance with a public trust doctrine—a body of common, property, case and state law that establishes the public's rights in navigable waters and shorelines. The original purpose of the doctrine was to assure public access to navigable waters for commerce, navigation, fishing and other broad uses. As stated in the Bear Lake Comprehensive Management Plan, "the overarching management objectives of FFSL are to protect and sustain resources, and to provide reasonable beneficial uses of those resources, consistent with their long-term protection and conservation (UDNR 2009).[79] While there is no hierarchy of uses protected under the doctrine, when there are competing public benefits, public trust doctrine requires those benefits that best preserve the purpose of the public trust take precedence.

Operations Analysis

FFSL receives its budget through a legislative appropriation that includes transfers from the state's General Fund, Sovereign Lands Management Account (a restricted account funded with revenues generated by mineral and surface leasing of sovereign lands), dedicated credits (reimbursements for project labor, including firefighting efforts) and federal funds (primarily grants from the U.S. Forest Service) (Figure 2.11). Total funding averaged $24.3 million annually from FY2009 through FY2013.

Figure 2.11
Forestry, Fire and State Lands Funding, FY2009–FY2013



In general, appropriations from the state's

[78] Division of Natural Resources, Division of Forestry, Fire and State Lands. Website.

[79] The framework for sovereign land management is found in the Utah Constitution, Article XX C65A-10.

General Fund are leveraged with money from non-state funds and activities. From FY2009 to FY2013, appropriations from the General Fund provided, on average, $12.4 million annually, or about half of the agency's budget.

Half of the $12.4 million came from the Sovereign Lands Management account—a restricted general fund account. Although this is a general fund account, the money in that account is generated from mineral and leasing revenue. Over the study period, annual funding from dedicated credits (also treated as revenue) and federal funds averaged $5.6 million and $6.4 million, respectively.

In FY2013, FFSL's budget totaled almost $35.3 million, which included $11.6 million in payroll costs and $23.7 million in non-payroll costs. The FY2013 budget was unusually high, driven by fire suppression costs that were more than double the 2012 total ($10.2 million compared with about $4.0 million in FY2011). Total FTE employment in 2013 was 197, with a five-year average of 184 FTEs (Table 2.59).

Table 2.59
Forestry, Fire and State Lands
Operating Budget by Funding Source, FY2009–FY2013

Funding Source	2009	2010	2011	2012	2013	Mean
General Fund	$2,461,500	$2,440,900	$2,330,900	$2,323,000	$2,338,500	$2,378,960
General Fund – One-time	$5,266,500	($1,994,700)	($369,000)	($1,600,000)	$18,748,000	$4,010,160
Federal Funds	$6,932,700	$6,880,700	$5,478,300	$5,704,200	$6,855,900	$6,370,360
ARRA Funds[1]	$0	$161,900	$505,900	$312,300	$128,700	$221,760
Dedicated Credit Revenue	$4,913,600	$4,465,800	$5,872,600	$6,185,100	$6,639,000	$5,615,220
GFR: Sovereign Lands Mngt.[2]	$4,348,200	$6,484,200	$5,163,000	$6,847,900	$7,346,200	$6,037,900
Other items and adjustments[3]	–$2,524,200	$2,832,500	$2,645,100	$2,330,500	–$6,643,600	–$271,940
Total	$21,398,300	$21,271,300	$21,626,800	$22,103,000	$35,266,000	$24,333,080
FTE Employment	180.5	169	182.1	192.3	196.5	184.1

1 American Recovery and Reinvestment Act.
2 GFR: General Fund-Restricted.
3 Other items and adjustments include transfers, pass-through funds, and lapsing and non-lapsing balances.
Source: Utah State Legislature, Compendium of Budget Information for the 2014 General Session—Forestry, Fire and State Lands. Accessed at le.utah.gov/interim/2013/lfa/cobi201/LI_RDA.htm.

Revenue

Income-producing activities on sovereign lands include mineral leases, surface use permits and reimbursements for project labor.

Mineral leases are issued for oil, gas, hydrocarbons and brines on sovereign lands and all state lands except state trust lands. Surface permits are issued for easements, rights-of-way, grazing and special uses. In 2013, revenue from mineral leases, surface leases and permits, and grazing fees totaled $12.9 million, of which 90 percent came from mineral leasing. From FY2009 to FY2013, FFSL generated an average of almost $9.8 million annually in leasing and permits revenue.

Revenue generated on sovereign lands is placed into the Sovereign Lands Management GFR and can be used by agencies other than FFSL. Since FY2009, FFSL has generated nearly $49 million in mineral lease revenue.

Reimbursements for labor are in the form of dedicated credits and include revenue collected by the division for services provided to other agencies, a large portion of which involves firefighting on non-state lands. This includes fire suppression provided by the Lone Peak Center in Utah on federal lands and in other states on federal or state lands. Revenue from dedicated credits totaled $6.6 million in FY2013. Over the past five years, revenue from dedicated credits has averaged $5.6 million annually.

In the aggregate, revenue generated by FFSL has increased steadily and significantly over the past five years. Most of the increase has come from leasing revenue, which grew from about $6.7 million in FY2009 to nearly $13 million in FY2013 (see Table 2.60).

Table 2.60
Forestry, Fire and State Lands
Revenue by Source, FY2009–FY2013

Revenue Source	2009	2010	2011	2012	2013	Mean
Mineral Leasing[1]	$6,019,644	$7,292,680	$8,640,862	$10,411,306	$11,653,757	$8,803,650
Surface Leasing[1]	$601,964	$729,268	$864,080	$1,041,131	$1,165,376	$880,363
Grazing[1]	$66,885	$81,030	$96,009	$115,681	$129,486	$97,818
Dedicated Credits	$4,913,589	$4,465,768	$5,875,627	$6,184,965	$6,638,977	$5,615,182
Totals	$11,602,082	$12,568,746	$15,473,518	$17,753,083	$19,587,596	$15,397,005

1 Estimated based on information provided by Forestry, Fire and State Lands, personal communication 2014.

Source: Utah Division of Forestry, Fire and State Lands, email communication 2014.

Forestry Fire and State Lands Programs

FFSL operates eight programs with an average of $24.3 million in funding for operating expenditures from FY2009 through FY2013 (Table 2.61). The largest program, as measured by spending, is Program Delivery, which provides funding for six area offices throughout the state that engage in fire prevention and forestry.

Table 2.61
Forestry, Fire and State Lands Operating Expenditures, FY2009–FY2013

Programs	2009	2010	2011	2012	2013	Mean
Division Administration	$856,600	$902,500	$923,500	$790,900	$895,700	$873,840
Fire Management	$788,900	$904,400	$1,163,300	$3,172,100	$780,800	$1,361,900
Fire Suppression Emergencies	$4,445,600	$3,917,900	$4,514,200	$3,986,000	$10,167,700	$5,406,280
Lands Management	$441,800	$416,300	$464,700	$544,900	$520,800	$477,700
Forest Management	$3,608,600	$2,028,800	$2,198,900	$1,774,000	$4,512,500	$2,824,560
Program Delivery	$5,145,600	$7,914,100	$6,761,500	$5,479,100	$5,854,600	$6,230,980
Lone Peak Center	$4,745,200	$4,095,700	$4,593,000	$5,197,200	$5,395,300	$4,805,280
Project Management	$1,366,000	$1,091,600	$1,007,700	$1,158,800	$7,138,600	$2,352,540
Total	$21,398,300	$21,271,300	$21,626,800	$22,103,000	$35,266,000	$24,333,080

Source: Utah State Legislature, Compendium of Budget Information for the 2014 General Session—Forestry, Fire and State Lands. Accessed at le.utah.gov/interim/2013/lfa/cobi201/LI_RDA.htm.

Several other programs (Fire Management, Fire Suppression Emergencies and the Lone Peak Center) provide fire management on state and private lands. Forestry stewardship programs are funded through the Forest Management program and sovereign lands activities are delivered through the Lands Management program.

Apart from managing the state's sovereign lands, FFSL is also tasked with promoting healthy forests and providing wildfire management and suppression. These programs are discussed briefly below.

Forest Management Program

Under its Forest Management mission, FFSL is responsible for the development and administration of the division's conservation programs. As such, the agency provides technical assistance and support to local communities, private land owners, industry professionals and citizens throughout the state. As part of its forest health program, FFSL provides financial assistance for the detection and evaluation of forest insect and disease issues, recommending appropriate actions to suppress, manage or prevent significant outbreaks on state and private lands.

FFSL does not own or directly manage forests or engage in timber sales. Most of the state's timberland is in the national forests over which FFSL has no jurisdiction. The agency works primarily with small family forests on privately owned land at the owner's request.

State funds are quite limited for projects that help private land owners or other forest managers (SITLA, local governments) make their forests more resilient to wildfire (Lewis 2014). FFSL generally relies on funding from federal agencies to carry out its forestry assistance work. Two key programs are the Forest Stewardship Program (FSP) and the Environmental Quality Incentives Program (EQIP).

In 2013, the budget for forest management programs totaled $4.5 million, nearly $4.3 million of which came from federal funds.

Fire Management Program

FFSL is responsible for managing all wildfires that occur on state lands as well as private lands that are not inside city limits. The agency administers programs related to fire suppression, fire prevention and fire mitigation, including wildland-urban interface projects, and fire-related training programs that help increase the firefighting capacity of rural Utah fire departments. Fire suppression funds are appropriated through the emergency fire suppression account and include salaries, supplies and services and are allocated on a case-by-case basis with each fire suppression effort. Fire management costs are funded through the Fire Management program.

Activities and programs directly related to fire management and suppression account for a large share of the FFSL budget. In FY2013 the combined costs of fire management and suppression totaled $10.9 million, and accounted for 31 percent of the agency's expenditures. From FY2009 to FY2013, these costs averaged $6.7 million, or 28 percent of the average annual budget over the five-year period. Since 2003, FFSL has spent almost $60 million suppressing almost 8,200 fires on state and private lands in Utah. More than 526,000 acres burned in those fires. The average cost per acre burned was $114 (Table 2.62).

Fire suppression activities are also carried out through the Lone Peak Conservation Center (LPCC)—a fire management program that provides specialized fire crews and educational services to local, state and federal agencies. In addition to wildfire suppression, LPCC engages in projects to reduce fuel hazards and provides programs to improve forest health after the fire suppression season is over.[80]

Although LPCC is not technically an enterprise function, it essentially does pay its own way. In 2013 LPCC responded to 26 incidents, only four of these were in Utah. Fourteen fires were on lands under the jurisdiction of the U.S. Forest Service and two were on lands under the jurisdiction of the BLM. Only one of these was in Utah.

Table 2.62
Utah Division of Forestry, Fire, and State Lands: Fires, Acres Burned and Fire Suppression Costs, FY2003–FY2013

Fiscal Year	Number of Fires	Acres Burned	Suppression Costs[1]	Cost per Acre Burned
2003	644	43,557	$8,542,209	$196
2004	680	9,846	$2,236,583	$227
2005	726	59,758	$4,422,235	$74
2006	935	72,905	$5,319,471	$73
2007	899	178,517	$5,724,539	$32
2008	612	9,365	$10,652,733	$1,135
2009	652	6,345	$3,903,192	$615
2010	618	5,697	$3,312,958	$582
2011	659	14,072	$3,395,666	$241
2012	1,010	107,057	$3,004,311	$28
2013	758	19,312	$9,270,417	$480
Total	8,193	526,431	$59,757,314	$114
Mean	745	47,857	$5,434,938	$114

Note 1 Includes suppression costs specific to fires in Utah. FFSL also provides fire suppression assistance in other states. These costs have been netted out of the total.

Source: Utah Division of Forestry, Fire and State Lands.

Responding to wildfires outside of Utah and on federal lands in Utah is a source of revenue for the LPCC. In 2013, LPCC generated $5.7 million in revenue from fire suppression activities on federal lands and lands outside of Utah. The unit's budget that year was $5.4 million. Over the past five years, revenue generated by LPCC has averaged $4.7 million annually while the budget appropriation has averaged $4.8 million.

Lands Management Program

The Lands Management program oversees the administration, planning and management of Utah's 1.5 million acres of sovereign lands, including 2,200 miles of shoreline and various parcels of uplands throughout Utah. This group is responsible for administering the surface and mineral estates on all state lands except trust lands.

Mineral leasing activities include leasing of oil, gas, hydrocarbons and brines. Surface leasing activities include leasing of easements, rights-of-way, general permits, grazing permits and special use leases. The lands management program is funded entirely by leasing revenue.

With a FY2013 budget of $520,800, Lands Management is the smallest program within FFSL, but it generated $12.9 million in revenue primarily from mineral leases. Revenue from leasing is placed in the sovereign lands management restricted account and is used to fund the land management operations as well as other operations within FFSL. At the end of FY2013, the balance in this account was $24.3 million and was projected to reach $32.8 million by the end of fiscal year 2017 (Utah State Legislature, nd).

[80] "2013 End of Season Report." Lone Peak Hotshots website, lonepeak.utah.gov/wp-content/uploads/2014/02/Hotshots-End-Season2013.pdf.

Summary

Table 2.63 summarizes the financial operations for FFSL from 2009 through 2013 and presents the division's performance measures in each of those years. From a budget perspective, FFSL does a remarkable job leveraging state funds. Typically, one-third (or less) of FFSL's budget come from the State of Utah General Fund. A much larger share comes from revenue generated by divisions within the agency or from federal funds. Two programs—Lands Management and the Lone Peak Conservation Center—more than cover their annual expenses. A third program, Forestry Management, covers most of its costs with federal funds.

Table 2.63
Forestry, Fire and State Lands Performance Measures, FY2008–FY2013

Measure	2009	2010	2011	2012	2013	Mean
Sovereign Lands (Acres)[1]	1,502,200	1,502,200	1,502,200	1,502,200	1,502,200	1,502,200
FTE Employment	181	169	182	192	197	184
Budget Total	$21,398,300	$21,271,300	$21,626,800	$22,103,000	$35,266,000	$24,333,080
Amount from Utah General Fund	$5,203,800	$3,278,700	$4,607,000	$3,053,500	$14,296,200	$6,087,840
Amount from revenue and federal funds	$16,194,500	$17,992,600	$17,019,800	$19,049,500	$20,969,800	$18,245,240
Return on state spending	3.1	5.5	3.7	6.2	1.5	3.0
Revenue and federal funds per employee	$89,472	$106,465	$93,515	$99,216	$106,446	$99,159
Spending per Employee	$118,223	$125,866	$118,829	$115,120	$179,015	$132,245

1 Includes sovereign lands and shoreline.

Source: Calculated by BEBR using information provided by Forestry, Fire and State Lands. Email communication, 2014.

Challenges and Opportunities of the Proposed Land Transfer

Forestry

Experts at Forestry, Fire and State Lands (FFSL) envision a level of forest management by the state that would improve stewardship of national forests in Utah while increasing utilization of forest products and decreasing the risk of wildfire. However, FFSL does not currently have the resources or staffing to take on the management of the national forests and is not equipped to estimate the cost required for the state to manage these forest lands (Cottam 2014) (McNaughton 2014).

At least initially, the transfer of Utah's national forests would result in the state losing money. FFSL does not own forest land or directly manage any forest land; therefore, the state does not have an instrument ready for the task of forest management on additional state lands. Extensive planning would be required to design such a program and estimate its cost. A viable forest program is not an engine that can be switched on readily in the event of a land transfer. Resilient, productive forests can be developed in the long term, but will require investments of time and resources (Cottam 2014) (McNaughton 2014).

Developing a forest management plan for managing the national forests in Utah will require extensive analysis and good information. Based on BEBR's analysis of forest management plans provided by the U.S. Forest Service, only 2.3 million acres of the 8.2 million acres of national forest in Utah have Land and Resource Management Plans more recent than 1986.[81] Losses from drought, beetles and hot burns have caused major declines in forest health. This information is not considered in the older plans. Forest plans prepared by the Forest Service in the 1980s reflect harvest levels that are unrealistically high given current forest conditions and weak markets.

The re-establishment of a thriving timber harvest industry is also necessary for a successful forest management program. Currently, there are no major sawmills in Utah and only a few relatively small ones. The recovery of Utah's timber industry would be aided if timber sales were consistently announced five to ten years in advance, even if the volume of timber sales is not great. This type of information would justify business investment and, combined with on-the-ground efforts to improve forest health, could help to rebuild Utah's timber industry from its current small-scale toehold.

One model of organizing forest management would be to separate forestry and fire from sovereign land management. There are different management philosophies in managing lands with a revenue objective and those addressing wildfire and landowners' forestry needs.

Although Utah's national forests may need extensive rehabilitation to achieve significant increases over current harvests, with wise investments over time—e.g. inventory, treatments and rehabilitation—these forests can become a financial resource rather than a liability without compromising the ecosystem (Cottam 2014).

Fire[82]

FFSL provides wildfire suppression on about 15 million acres of state and private lands. Under the proposed land transfer, FFSL would provide suppression and wildfire management for 47 million acres—a three-fold increase.

Currently, FFSL, BLM and the Forest Service spend almost $30 million annually on fire suppression alone. Most of this amount is borne by the Forest Service because it provides most of the aviation fire support for the federal agencies. FFSL depends on this support as it does not have aviation capacity. The large-scale transfer of lands proposed under H.B. 148 would likely result in FFSL losing access to nearby federal aircraft suitable for fire suppression.

In addition to fire suppression are the other wildfire management costs such as fire preparedness, hazardous fuels treatments and burned area rehabilitation. Over the past five years, the Forest Service and BLM spent an average of $48 million for other components of wildfire management. These are costs FFSL would assume after the transfer.

In addition to these costs would be the loss of revenue generated by the LPCC. In FY2013, the Lone Peak Center received $5.7 million in revenue for fire suppression on federal lands in Utah and lands outside the state. In the event all public lands called for under H.B. 148 are transferred, the Lone Peak Center will likely spend more time fighting fires in Utah on lands where fire suppression efforts are not subject to reimbursement.

[81] The most recent plans produced by the Forest Service are dated 2012 and include information on 72,000 acres. Plans produced between 2003 and 2006 cover a total of 2.2 million acres.

[82] The fire information presented here can also be found in Chapter 9: Wildfire in Utah.

Finally, FFSL is part of the National Interagency Coordinating Center (NICC) and contributes $550,000 annually to the operation of that center. If the federal agencies no longer have an interest in the land, the entire could would fall to that state. This could be as much as $2.5 million annually (Dunford 2014).

State Lands
The land transfer is not expected to affect the Lands Management program.

2.2.4 Utah State Parks

The Utah Division of Parks and Recreation (Utah State Parks) is the agency within the Department of Natural Resources responsible for managing the state park system. Utah State Parks operates on a total budget averaging $34.2 million during FY2009 to 2013, with declining state general fund appropriations during the period. State Parks administers approximately 121,080 acres of land, including an estimated 20,500 acres or more of federal lands owned by the Bureau of Land Management (BLM), Bureau of Reclamation or Forest Service (see Figure 2.12) (Zarekarizi 2014). The Division also operates boating and OHV programs statewide, not just within the footprint of lands it manages.

Utah's state park system began in 1957 with the creation of four heritage parks: Sugarhouse Park, Utah Territorial Statehouse, This Is the Place Monument, and Camp Floyd.[83] Today, the Division manages 43 state parks, as well as 1,655 acres of other lands for recreation. The Utah State Parks director reports to the nine-member Board of Utah State Parks and Recreation.

This section will discuss State Parks' role in managing certain Utah lands for recreation purposes in the context of the large-scale transfer of public lands in Utah outlined in H.B. 148. This section addresses State Parks' finances, operations and visitation. There is also a discussion of three areas on transfer lands that the Division has proposed to manage as state parks.

Lands administered by State Parks cost $150 to $241 per acre to manage during FY2013, offset by $117 per acre in park revenues. Land transfer would not substantially affect federal funding. Transfer may improve access to public lands for recreation and result in additional state revenues from user fees, vehicle registration and motor fuel taxes. On the other hand, land transfer would reduce federal activities to support land management.

State Parks Funding

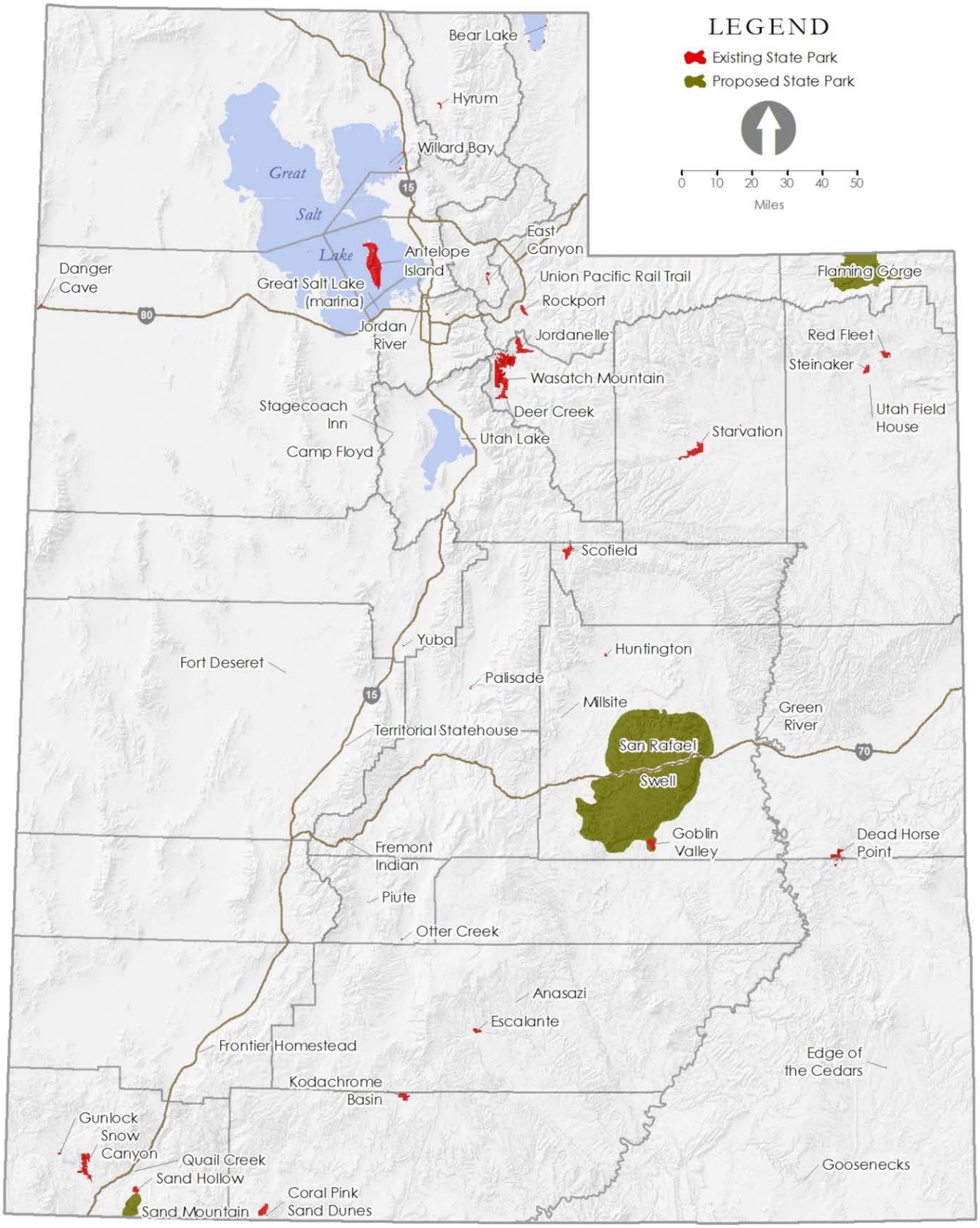
Utah State Parks receives funding from a variety of sources (Figure 2.13). These primarily include visitor fees, state general fund appropriations, federal agencies, and General Fund Restricted (GFR) accounts for the boating and Off-Highway Vehicle (OHV) programs.[84] Total funding averaged $34.2 million during FY2009 to 2013 (Table 2.64). State Parks effectively leveraged

[83] In 1998, This Is the Place State Park became This Is the Place Heritage Park under management of a foundation (Utah S.B. 114, 1998 General Session). About one-fifth of its budget to manage 500 acres is provided by the state via Utah State Parks, but otherwise the foundation now operates it independently (Kramer 2014).

[84] Shares in Figure 2.13 add to 102.1 percent due to the -$702,100 in "Other Items and Adjustments" noted in Table 2.63 and omitted from the pie chart. This negative amount reduces the average five-year budget total by exactly 2.1 percent, but the portions of -$702,100 that correspond to each of the six funding sources with positive values are not known. "Other" in the pie chart includes dedicated credits, and general fund restricted accounts related to Off-Highway Access and Zion National Park.

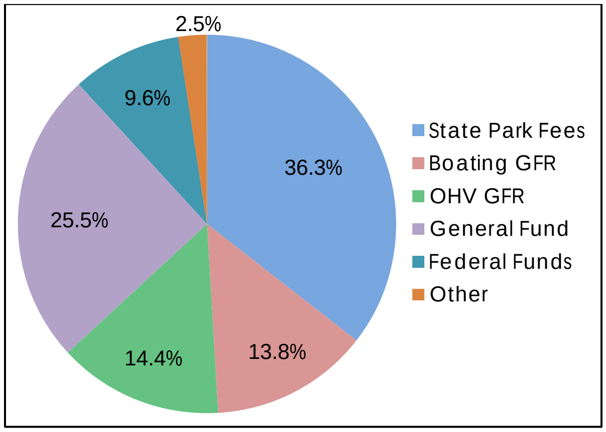
state general fund dollars, one-fourth of its total budget, with amounts from park fees, federal dollars, and GFR revenues, which collectively were nearly three times larger than general fund appropriations.

Figure 2.12
Utah State Parks



Source: State of Utah, SGID; Utah Division of Parks and Recreation.

Figure 2.13
Utah State Parks Funding, FY2009–FY2013



Source: Utah Office of the Legislative Fiscal Analyst

Table 2.64
Utah State Parks Operating and Capital Budgets by Funding Source, FY2009–FY2013

Funding Source[1]	FY2009	FY2010	FY2011	FY2012	FY2013	Average
General Fund	$13,445,700	$10,442,800	$8,583,300	$6,829,600	$4,387,000	$8,737,680
Federal Funds	$3,530,700	$2,744,100	$4,100,300	$2,977,200	$3,061,300	$3,282,720
Dedicated Credits	$848,500	$708,500	$781,300	$639,900	$1,218,700	$839,380
GFR: Boating	$4,374,900	$4,340,700	$5,325,800	$4,755,300	$4,795,400	$4,718,420
GFR: Off-Highway Vehicle	$5,383,700	$3,749,400	$4,984,300	$4,531,600	$5,930,100	$4,915,820
GFR: Off-Highway Access	$0	$0	$17,400	$17,500	$17,500	$10,480
GFR: Zion National Park Support	$0	$0	$4,000	$4,000	$4,000	$2,400
GFR: State Park Fees	$12,223,900	$11,967,300	$11,905,100	$11,750,500	$14,216,700	$12,412,700
Other items and adjustments[2]	$237,000	($94,300)	$1,134,700	($1,135,700)	($3,652,200)	($702,100)
Total Budget	$40,044,400	$33,858,500	$36,836,200	$30,369,900	$29,978,500	$34,217,500
Operating Budget	$32,032,800	$30,103,600	$30,710,900	$26,590,100	$26,622,900	$29,212,060
Capital Budget	$8,011,600	$3,754,900	$6,125,300	$3,779,800	$3,355,600	$5,005,440
Total Budget per Acre[3]	$324	$273	$298	$244	$241	$276

This table includes the line items "Parks and Recreation" and "Parks and Recreation Capital."
1. The five GFR sources are General Fund Restricted accounts.
2. Other items and adjustments include transfers, pass-through funds, and lapsing and non-lapsing balances.
3. This row is calculated as "Total Budget" minus $800,000 for This Is the Place Heritage Park, which is not managed by Utah State Parks, divided by an estimated 121,080 acres managed by State Parks. In State Parks' budget, total revenues equal total expenses.
Source: Utah Office of the Legislative Fiscal Analyst, Compendium of Budget Information

State Parks' primary revenue component, with more than one-third of the total, is the State Park Fees GFR account, which received an average of $12.4 million annually during FY2009 to 2013. During FY2013, receipts from park fees reached $14.2 million, 18.9 percent more than the average amount for the previous four years. According to a separate analysis by State Parks, revenue generated at parks amounted to $17.8 million during FY2013 (Table 2.64).

Federal funds to Utah State Parks averaged $3.3 million per year during FY2009 to 2013, largely from three sources. Under its Recreation Trails Program, the Federal Highway Administration (FHA) allocated an average of $1.5 million per year to Utah State Parks during the five-year period.[85] State Parks used these funds to award grants, primarily to local governments, for mainte-

[85] FHA obligations to Utah for the program during federal fiscal years 2009 to 2013 averaged $1,527,164. State Parks retained 7 percent of FHA receipts for administering the Recreational Trails Program and awarded 93 percent

nance and improvements in the interest of motorized and non-motorized trail uses (Haller 2014). The U.S. Coast Guard's Recreational Boating Safety Grant Program provided $1.1 to $1.3 million each year for promoting water safety (Hunter 2014). Its purpose is to reduce fatalities, injuries and accidents on U.S. waters by means of education, enforcement and improvements to facilities.[86] Finally, the National Park Service (NPS) provides recurring contributions to Utah from the Land and Water Conservation Fund (LWCF) State Assistance Program. During FY2013, State Parks distributed about $0.5 million to purchase land for new local parks or to make improvements to existing ones (Strong 2014).[87] Of State Parks' total federal funds, $1.4 million or 42.9 percent were devoted to capital spending, construction and improvements during FY2009 to 2013.

GFR account contributions for boating averaged $4.7 million per year during FY2009 to 2013. This amount came from the boating program's share of state motor fuel tax revenue and from registration and license fees for vessels. Federal funding for boating under the ongoing Coast Guard grant is in addition to GFR account revenues. State Parks is responsible for recreational boating on any navigable waters in the state, including boater education, water safety and administration costs (Hayes 2014, Utah Fiscal Analyst 2014). Boating funds are used for new construction, improvements, maintenance and operations related to state reservoirs and visitor facilities.

The OHV GFR account received an annual average of $4.9 million during FY2009 to 2013. Registration and license fees from OHVs and snowmobiles accrue to the account, as does a share of state fuel tax revenue. OHV funds are for construction, improvements, maintenance and operations for some 23,000 miles of trails and related facilities. State Parks is responsible for promoting a safety education course and protecting people, property and the environment with respect to OHV use, whether within state parks or elsewhere (Haller 2014).

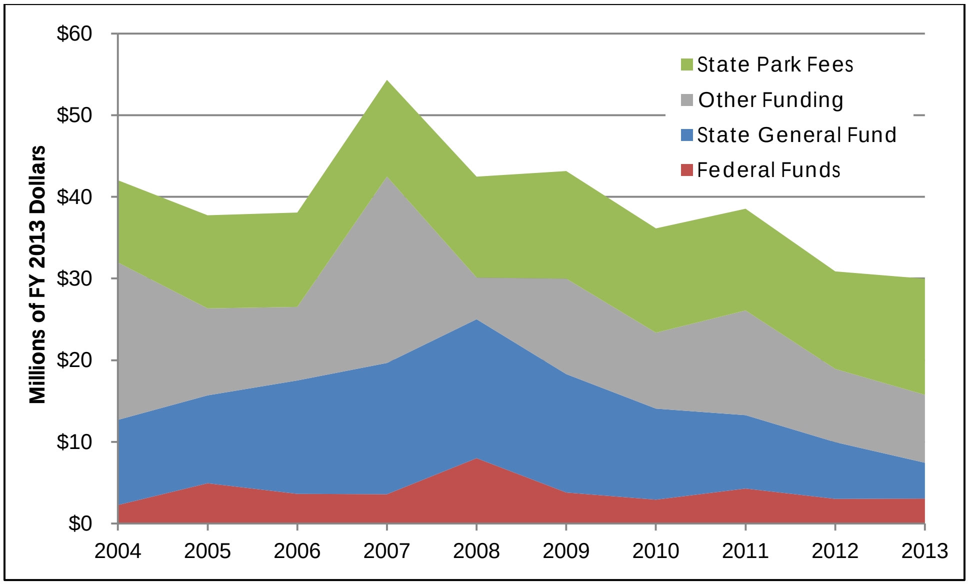
Most remaining budgetary needs of the Division during FY2009 to 2013 were covered by state general fund appropriations, which averaged $8.7 million annually. The average masks a noteworthy trend. These appropriations fell 67.4 percent from $13.4 million in FY2009 to $4.4 million in FY2013. The decline in general fund amounts is smaller relative to amounts before FY2009. For example, FY2013 funding was 47.7 percent lower than the FY2004 amount. Adjusting for inflation for better comparability between years, the five-year decline was 69.7 percent and the ten-year decline was 57.9 percent (Figure 2.14).

in grants. State Parks' awards may be spent by recipients over two years. *Source:* "Recreational Trails Program: Apportionments and Obligations," Federal Highway Administration, U.S. Department of Transportation, accessed October 10, 2014, www.fhwa.dot.gov/environment/recreational_trails/funding/apportionments_obligations.

86 "Boating Safety Resource Center: State Grants," U.S. Coast Guard, accessed October 15, 2014, www.uscgboating.org/grants/rbs_state_grants_program.aspx.

87 State Parks' average FY2009-2013 receipts from LWCF are not available, but Utah spent $460,846 from this source during FY2013, most of which was distributed as grants to county or municipal governments. *Source:* "LWCF Purchases," U.S. Forest Service, accessed October 14, 2014, www.fs.fed.us/land/staff/LWCF.

Figure 2.14
Utah State Parks Operating and Capital Funding Sources, FY2004–FY2013



Source: Utah Office of the Legislative Fiscal Analyst, Compendium of Budget Information.

Likewise, overall funding levels for Utah State Parks decreased over the five-year period, from $40.0 million in FY2009 to $30.0 million in FY2013, primarily corresponding to the steady reduction in general fund contributions (Table 2.64).[88] State park fees and federal funds were fairly stable over the period.

Returning to the ten years of State Parks funding amounts in Figure 2.14, we notice an increase in inflation-adjusted general fund contributions to State Parks from $10.4 million in FY2004 to $17.0 million in FY2008. The fact that funding declined in FY2009 may be associated with reduced state general fund revenues owing to the severe recession underway. The high total budget in FY2007, $54.3 million in FY2013 dollars is largely attributable to unusual capital expenditures funded by a transfer that amounted to 38.9 percent of the total. Federal funds peaked the following year at $8.0 million in constant FY2013 dollars, 162 percent higher than in FY2013.

One measure of State Parks spending to manage its lands is the calculated cost per acre, although the statistic has noteworthy limitations. As shown in Table 2.64, total operating and capital expenses per acre fell from $324 in FY2009 to $241 in FY2013. The five-year average was $276 per acre. "Total Budget" amounts in the table reflect spending to offer recreation opportunities statewide, besides managing park facilities and lands for the benefit of visitors. Perhaps one-third of capital expenses, in addition to as much as 31.9 percent of operating expenses, are for conducting Utah State Parks' responsibilities for recreation outside of state parks. State Parks' statewide duties primarily relate to its boating and OHV programs, which largely concern enforcement, water safety, and maintenance.[89] On the other hand, the cost per acre calculation

[88] The extent of declining funding becomes more apparent if adjustment is made for inflation: –30.5 percent from FY2009 to 2013 and –28.7 percent from FY2004 to 2013.
[89] Exact amounts are not available for the portions of capital and operating expenses that do not correspond to state parks and other lands the division manages.

based on State Parks' total budget in Table 2.64 does not capture the total cost to manage these lands. In particular, operating and capital expenses omit wildfire suppression costs, water management for 11 reservoirs, some road and trail maintenance by federal land owners, and perhaps other expenses born by federal land managers and other state agencies.

Revenues generated by Utah State Parks offset these costs by an average of $103 per acre for the five-year period, ranging from $97 to $101 per acre from FY2009 to 2012 and jumping to $117 per acre in FY2013.[90] State park fees deposited in the corresponding GFR amounted to 36.9 percent of State Parks' total operating and capital budget during FY2009 to 2013.

State Parks Programs

Utah State Parks operated six programs with an average of $29.2 million in funding for operating expenditures during FY2009 to 2013, not including capital. As shown in Table 2.65, most of these expenditures, 72.5 percent of the five-year average, were for park operations. This umbrella includes visitor services, law enforcement, maintenance, and administration at state parks, as well as some oversight and management that extend beyond the parks' footprint. Under recreation services, 9.5 percent of the total, State Parks coordinates several statewide programs, among them OHV and boating, although these two programs are also funded within "park operation management." Three categories—executive management, planning and design, and support services—can loosely be considered overhead, drawing 14.7 percent of the operating budget. These encompass a wide range of functions, such as planning, marketing, training, financial management, information technology, contract and grant administration, environmental conservation oversight, and coordination of efforts between functions. Finally, park management contracts are for the operators of This Is the Place Heritage Park, an estimated $800,000 annually, as well as Union Pacific Rail Trail State Park.

Table 2.65
Utah State Parks Operating Expenditures, FY2009–FY2013

Program	FY2009	FY2010	FY2011	FY2012	FY2013	Average
Executive Management	$1,289,000	$1,106,600	$1,740,600	$894,200	$707,700	$1,147,620
Park Operation Management	$22,841,900	$21,626,600	$21,841,500	$19,587,200	$20,047,000	$21,118,840
Planning and Design	$1,769,600	$1,232,200	$1,039,900	$952,100	$799,700	$1,158,700
Support Services	$2,047,300	$1,994,300	$1,989,700	$1,890,700	$2,018,000	$1,988,000
Recreation Services	$2,861,200	$3,298,800	$3,186,000	$2,375,600	$2,164,800	$2,777,280
Park Management Contracts	$1,223,800	$845,100	$913,200	$890,300	$885,700	$951,620
Total[1]	$32,032,800	$30,103,600	$30,710,900	$26,590,100	$26,622,900	$29,212,060
Expenditures per acre[2]	$258	$242	$247	$213	$213	$235

1. Since the amounts in Table 2.65 include only operating costs, and not capital expenditures, totals will match the "Operating Budget" row from Table 2.64.
2. Expenditures per acre equal total operating expenditures minus $800,000 in pass-through each year for This Is the Place Heritage Park, divided by an estimate of total acres managed by Utah State Parks, 121,080 acres.

Source: Utah Office of the Legislative Fiscal Analyst, Compendium of Budget Information.

Operating expenditures can be analyzed on a per acre basis, although not all operating expenditures are used to manage State Parks acreage. An estimated 68.1 percent of the operating budget is for direct management of the 121,080 acres Utah State Parks manages. In addition, some fraction of the remaining 31.9 percent corresponds to the parks. Total operating expenditures de-

[90] Revenue per acre calculations are based on amounts from the restricted (GFR) account for State Park Fees given in Table 2.64. These are divided by the land area Utah State Parks managed, estimated at 121,080 acres. For example, in FY2013 the GFR State Park Fees amount of $14,216,700 divided by 121,080 acres equals $117.42.

creased from $258 per acre in FY2009 to $213 per acre in FY2013. The five-year average cost per acre was $235.

Direct operating expenses, which exclude overhead and capital, are available only for FY2013, amounted to $150 per acre (Table 2.66).[91] Independent operating budget revenue deposited in the GFR for park fees offset operating costs by an average of $97 per acre during FY2009 to 2013.[92] This represents 41.3 percent of average annual total operating expenses of $235 per acre.

Table 2.66
Utah State Parks Expenditures for Lands Managed, FY2013

Spending Measure	Acres	Expenses	Share of Total Budget	Cost per Acre
Direct Operating expenses[1]	121,080	$18,124,941	60.5%	$150
Total Operating Expenses[2]	121,080	$25,822,900	88.8%	$213
Total Budget with Capital[3]	121,080	$29,178,500	100%	$241

1. Direct operating expenses do not include overhead or capital.
2. Total operating expenses include programs such as boating and OHV that support recreation statewide outside of lands managed by Utah State Parks. These have not been separated from the share of State Parks overhead that does correspond to these lands. The amount here is $26,622,900 minus $800,000 in pass-through to This Is the Place Heritage Park.
3. Capital expenses are added to total operating expenses for this measure of State Parks' total budget in FY2013. About one-third of capital spending was for recreation throughout Utah aside from the land State Parks manages. The expenses figure given in this row is $29,978,500 minus $800,000 in pass-through (see Note 2).
Source: State of Utah, SGID; Division of Parks and Recreation; Utah Office of the Legislative Fiscal Analyst.

Park Activities and Operations

Utah has 43 state parks divided between three regions: North, Southwest, and Southeast (see Figure 2.12). At least 31 parks provide camping opportunities, and 24 offer boating, while 17 each are amenable to OHVs and snowmobiles. Eight state parks operate museums. Four state parks include golf courses: Green River, Palisade, Soldier Hollow and Wasatch Mountain. Examples of other common visitor activities at many state parks are wildlife watching, hiking, swimming, fishing, mountain biking, snowmobiling, group events, and viewing archeological and geologic attractions. Utah State Parks also manages several areas that are not designated as state parks.

From FY2009 to 2013, State Parks employment averaged 324.6 full-time equivalent (FTE) workers (Utah Fiscal Analyst 2014). Employment declined from 350.1 FTEs in FY2009 to 306.4 FTEs in FY2013.

As of February 2014, State Parks had issued 26 contracts that involve operating facilities for the benefit of visitors within state parks (Hayes 2014). For example, long-term, exclusive agreements apply to certain marinas, stores with rentals, and food service installations. In addition, 289 businesses held operating agreements with State Parks, usually non-exclusive arrangements for commercial uses of state parks. For example, rock climbing guides from a company in the St. George area take groups to Snow Canyon with payment according to its operating agreement.

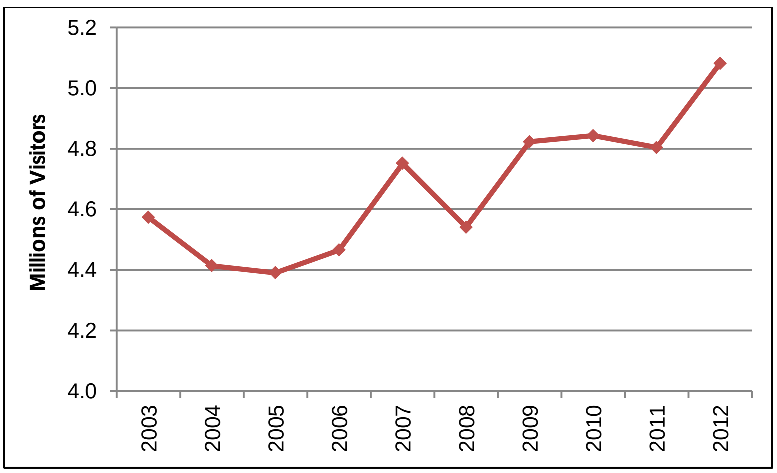
[91] Not counting museums, average direct operating costs were $135 per acre in FY2013. This figure better represents land management costs for State Parks in the sense that museums are managed facilities.
[92] State Park Fees, GFR amounts that correspond to the operating budget, average 94.6 percent of the amounts given in Table 2.64.

State parks collectively required only slightly more in direct operating expenses during FY2013 than they generated in revenue, with a loss of $337,673 that year, 1.9 percent of these expenses (Table 2.67). Aside from seven of the eight parks with museums, nearly two-thirds of Utah's state parks reported revenues in excess of direct operating expenses that year. Direct operating expenses do not include spending for capital, overhead, or the boating and OHV programs, although a portion of these expenses correspond to these lands (Strong 2014). Direct operating expenses shown in Table 2.67 amount to 68.1 percent of total operating expenditures at State Parks in FY2013 and 60.5 percent of total expenditures including capital spending.

Visitation

The Division reported 5.1 million visits to state parks in Utah during 2012 (Figure 2.15). Over a ten-year period, visitation rose 11.1 percent from 4.6 million visits in 2003. Park visits by nonresidents, with their accompanying out-of-state spending in the local economy, are most common at state parks in the vicinity of Utah's national parks, such as Dead Horse Point State Park near Arches and Canyonlands.

Figure 2.15
Utah State Parks Visitation, 2003–2012



Note: Visitation methodologies changed in 2005.
Source: Utah Division of Parks and Recreation

Visitation at Utah state parks from 2003 to 2012 varied widely among parks (see Table 2.67). The most visited state parks during this period were Wasatch Mountain, Snow Canyon, and Deer Creek, followed by five others with more than 200,000 visits each year and seven others with more than 100,000 visits annually. Wasatch Mountain State Park received an estimated 486,534 annual visits, which includes camping and event facilities, ATV and equestrian trails, and two golf courses on 20,944 acres located about 45 minutes from the Salt Lake City and Provo areas. On the other end of the spectrum, Edge of the Cedars State Park reported 14,332 visits per year to its 27-acre site in rural San Juan County, featuring a museum, interpretive trail and American Indian village. A state park with visitation just above the median for Utah, 3,728-acre Coral Pink Sand Dunes State Park near the Arizona border saw approximately 74,279 people, most of whom came for OHV riding, camping, photography or hiking.

Table 2.67
Utah State Parks Land Area, Visitation and Finances

State Park[1]	County	Acres[2]	Annual Visits 2003–2012[3]	Revenue FY2013	Expenses FY2013[4]	Profit (Loss) FY2013	Expenses per Acre
Anasazi	Garfield	6	26,652	$130,750	$241,226	($110,477)	$40,453
Antelope Island	Davis	24,533	271,903	$1,433,790	$1,319,270	$114,520	$54
Bear Lake	Rich	965	172,182	$1,117,645	$660,260	$457,385	$684
Camp Floyd	Utah	44	15,344	$62,771	$170,324	($107,553)	$3,905
Coral Pink Sand Dunes	Kane	3,728	74,279	$279,918	$279,584	$334	$75
Danger Cave[5]	Tooele	560	–	–	–	–	–
Dead Horse Point	Grand	4,339	170,257	$841,779	$476,326	$365,453	$110
Deer Creek	Wasatch	4,470	285,188	$589,681	$429,049	$160,632	$96
East Canyon	Morgan	1,137	82,354	$352,923	$337,807	$15,116	$297
Edge of the Cedars	San Juan	27	14,332	$65,362	$432,097	($366,736)	$15,822
Escalante	Garfield	1,330	42,739	$122,737	$136,985	($14,248)	$103
Fort Deseret[5]	Millard	10	–	–	–	–	–
Fremont Indian	Sevier	1,143	80,793	$117,698	$340,504	($222,806)	$298
Frontier Homestead	Iron	9	16,902	$35,421	$223,260	($187,839)	$25,091
Goblin Valley	Wayne	3,014	55,676	$318,803	$265,236	$53,567	$88
Goosenecks[5]	San Juan	10	57,699	–	–	–	–
Great Salt Lake	Salt Lake	156	187,729	$399,155	$268,790	$130,365	$1,723
Green River	Emery	135	30,308	$242,301	$440,792	($198,491)	$3,263
Gunlock	Washington	557	45,359	$51,203	$55,282	($4,079)	$99
Huntington	Emery	386	49,670	$157,898	$192,699	($34,801)	$499
Hyrum	Cache	676	83,001	$294,130	$234,465	$59,664	$347
Jordan River	Salt Lake	369	15,777	$286,090	$270,345	$15,745	$733
Jordanelle	Wasatch	5,814	240,414	$1,246,302	$830,059	$416,243	$143
Kodachrome Basin	Garfield	3,150	52,370	$210,695	$235,128	($24,433)	$75
Millsite	Emery	570	30,518	$81,388	$61,366	$20,023	$108
Otter Creek	Piute	79	58,460	$145,689	$164,821	($19,132)	$2,085
Palisade	Sanpete	240	195,624	$687,943	$827,046	($139,103)	$3,441
Piute	Piute	41	22,571	$25,954	$36,791	($10,836)	$907
Quail Creek	Washington	600	149,804	$168,832	$193,473	($24,641)	$322
Red Fleet	Uintah	2,446	33,578	$134,446	$141,864	($7,418)	$58
Rockport	Summit	1,862	147,231	$457,065	$417,488	$39,578	$224
Sand Hollow	Washington	1,670	200,673	$1,025,868	$751,747	$274,121	$450
Scofield	Carbon	3,925	86,709	$161,944	$208,856	($46,912)	$53
Snow Canyon	Washington	7,929	304,053	$480,767	$331,169	$149,598	$42
Starvation	Duchesne	7,370	72,656	$314,425	$258,152	$56,273	$35
Steinaker	Uintah	1,869	56,155	$180,533	$187,093	($6,560)	$100
Territorial Statehouse	Millard	4	33,457	$25,205	$174,536	($149,330)	$48,320
Union Pacific Rail Trail	Summit	443	–	–	–	–	–
Utah Field House	Uintah	2	49,786	$227,411	$420,052	($192,641)	$199,777
Utah Lake	Utah	146	250,410	$653,121	$511,785	$141,336	$3,505
Wasatch Mountain	Wasatch	20,944	486,534	$3,493,139	$4,463,776	($970,637)	$213
Willard Bay	Box Elder	12,649	266,331	$797,384	$726,531	$70,854	$57
Yuba	Juab	81	157,894	$369,099	$408,907	($39,807)	$5,043
Other sites[6]	–	1,639	15,013	–	–	–	
Totals[7]		121,080	4,688,385	$17,787,265	$18,124,941	($337,673)	$150

1. Formerly a state park, 500-acre This Is the Place Heritage Park serves approximately 200,000 visitors annually with a $4.2 million budget, including $800,000 from the State via State Parks. Its revenue is not publicly disclosed and does not accrue to State Parks.
2. Acres given for the following state parks are estimates by Utah State Parks for lands owned or managed by the Division: Danger, Fort Deseret, Great Salt Lake, Millsite, Quail Creek, Union Pacific Rail Trail, and Utah Lake. Other acreages are from SGID.
3. Visitors per year, ten-year average
4. Expenses are a measure of direct operating expenses without overhead or capital, 60.5 percent of all FY13 State Parks spending.
5. Revenues and expenses are not available for Danger Cave, Fort Deseret or Goosenecks. Visits are not available for the first two.
6. Several sites are administered by the Division of Parks and Recreation but are not active state parks: 640 acres of the Bonneville Salt Flats in Tooele County, 160 acres at Flight Park State Recreation Area in Utah County, 158 acres at Monte Cristo Range in Rich and Cache counties, 236 acres at Mormon Flats in Summit County, and a 445-acre site in Tooele County. Expenses and revenue are not available for these, and visitation is recorded only for Monte Cristo, 15,013 visits during 2011 and 2012.
7. Totals may not add due to rounding.

Sources: State of Utah, SGID; Utah State Legislature; Office of the Legislative Fiscal Analyst; Division of Parks and Recreation.

Proposed State Parks

Recreation is a priority among possible uses of federal lands transferred to the state. Utah State Parks has identified three recreation areas on transfer lands where new or expanded state parks would be appropriate to support recreation uses (Hayes 2014). These are in the San Rafael Swell, Flaming Gorge National Recreation Area (NRA), and Washington County's Sand Mountain (Figure 2.12). Utah State Parks could develop plans to manage these areas. The discussion here of each is provided as background information. State costs and revenues at Flaming Gorge NRA and Sand Mountain have not been estimated and may be different from Forest Service and BLM costs, respectively, at each location. Given State Parks' ability to manage many of its sites with park revenue in excess of direct operating costs, providing additional facilities and recreation opportunities in these three areas may not be a costly proposition.

Utah's most recent state park opening was Sand Hollow State Park in 2003. Ten years later, visitation had reached 217,000 visitors, and the park generated $1.0 million in revenue in FY2013, 36.5 percent higher than direct operating costs for the park that year (Utah State Parks 2014). With the creation of additional state parks, visitor trips to the new parks may come at the expense of trips to other state parks. On the other hand, new parks may supply unmet demand for the types of recreation they offer, creating a net increase in recreation activity on public lands in the state. When Jordanelle State Park opened in 1995, two nearby state parks with reservoirs, Rockport and Deer Creek, did not witness substantial declines in visitation due to interest in boating and other water-based recreation in the Wasatch Front and other areas.[93]

San Rafael Swell

A proposed state park in the San Rafael Swell would cover 640,463 acres adjacent to Goblin Valley State Park. BLM lands in the Swell are interspersed with small holdings of state trust lands. This is a sizeable area compared to existing state parks in Utah, the largest of which, Antelope Island, is just over 25,790 acres. The area includes BLM Wilderness Study Areas subject to conservation-related restrictions.

State Parks estimates an initial capital outlay of $1.03 million would provide adequate buildings, visitor facilities, vehicles, and signage (Strong 2014). With ongoing operational costs of $143,850, State Parks expects to attract enough visitors to generate $250,000 per year in state revenue. Recreation activities there include OHV riding, mountain biking, hiking in slot canyons, rock climbing, sightseeing and camping.

Currently, BLM operates the San Rafael Swell with limited facilities and user fees. Under BLM management, access is open, and camping is mostly dispersed. A developed campground at Swinging Bridge generated $2,420 in revenue during FY2013 (Roegner 2014). BLM also maintains ten restroom facilities throughout the San Rafael Swell area (Winkler 2014).

Flaming Gorge

Located in Utah and Wyoming, Flaming Gorge NRA is operated by the U.S. Forest Service as a part of Ashley National Forest. The NRA covers 201,114 acres, of which 47.9 percent is in Utah (U.S. Forest Service 2013). At 92,827 acres, the acreage of the proposed Flaming Gorge State Park is almost as large as the Utah portion of the NRA. A hydroelectric dam, excluded from the proposed land transfer, is managed by the Bureau of Reclamation.

[93] Rockport and Deer Creek state parks are about 20 miles in either direction from the Jordanelle reservoir.

Flaming Gorge gateway cities in Utah include Manila, Vernal, and Dutch John. Memorable canyon scenery and the NRA's most frequented marina at Lucerne are located in Utah (Haynes 2014). Trophy trout are caught in the reservoir's cool waters, although some of the best fishing locations are at the north end of the reservoir in Wyoming. In Utah, east of the spillway below the dam, the Green River offers rafting, kayaking, fishing, and other recreation opportunities. Most recreation in the NRA is water-based. People may bring boats or rent them on-site. Visitors also enjoy hiking, camping, horseback riding, and cross-country skiing.

The Utah portion of Flaming Gorge NRA includes the following facilities, many of which are operated by concessionaires with 5- to 10-year contracts (Roundy 2014, U.S. Forest Service 2009).

- 1 visitor center at the dam
- 2 marinas, Lucerne and Cedar Springs
- 4 paved boat ramps, the largest at Lucerne Marina, others at Cedar Springs, Mustang Ridge, Antelope Flat and Sheep Creek, the last of which does not have trailer parking
- 2 boat launches at Spillway and Little Hole on the Green River below the dam
- 2 beaches with swimming at Lucerne and Mustang Ridge
- 2 cabins, a convenience store, and a restaurant at Lucerne Marina
- 32 campgrounds with 609 campsites, including 24 group sites with capacities from 6 to 80 people[94]

The Forest Service does not count visitors entering Flaming Gorge NRA.[95] Aside from concessionaire sites, such as campgrounds, and High Impact Recreation Areas (HIRA), such as boat ramps and beaches, the NRA is open to public access without gates or fees (U.S. Forest Service 2009).

During FY2013, the Forest Service collected $63,307 in recreation revenue for HIRAs in the Utah portion of Flaming Gorge NRA (Suddreth 2014). For that year, the Forest Service also attributed to the NRA some portion of $69,274 in additional Ashley National Forest recreation revenue and a larger portion of $157,310 in Flaming Gorge District special use revenue (Roundy 2014). Special use revenue is from utility companies, outfitters and guides, recreation events, and rights of way, among other sources.

Budgeted costs for maintenance and recreation for the entire NRA in Wyoming and Utah were about $400,000 in FY2013 (Ryan 2014). Utah's share of those costs would be around $191,758 if Utah expenses happen to be proportional to the state's share of the NRA's land area. As for personnel, 27 full-time employees "play a role in the management of the NRA" in both states (Ryan 2014). Additional research would be needed to determine total resources needed to manage the NRA in all respects (not just maintenance and recreation) and to make a definitive estimate of the Utah share of expenses and FTEs.[96] It is not clear whether the Utah portion of the NRA

[94] "Ashley National Forest: Camping & Cabins," U.S. Forest Service, www.fs.usda.gov/activity/ashley/recreation/camping-cabins.

[95] During FY2012, there were an estimated 295,000 unique visits to Ashley National Forest, of which the Utah portion of the NRA constitutes 6.9 percent by land area (U.S. Forest Service 2013, U.S. Forest Service 2014). Well above 6.9 percent of National Forest visitors may spend time in the Utah portion of the NRA.

[96] Deferred maintenance needs and other costs related to NRA infrastructure in Utah would also help inform the state's planning effort related to roads, parking areas, utility pipes, electric lines, employee quarters, water craft, and other facilities and assets.

collects enough revenue to cover management costs, but it is possible that recreation and special use revenues are sufficient to cover costs for maintenance and recreation there.

Sand Mountain

Sand Hollow State Park could be expanded to include an additional 92,827 acres of adjacent lands in Washington County. Except for several isolated parcels of state trust lands, BLM owns the proposed area. BLM has designated Sand Mountain as an open OHV area from which it does not collect recreation revenue.[97] Any type of motorized and non-motorized vehicle is permitted throughout the area, whether on trails or cross-country. Routes of varying difficulty levels cross red sand dunes and slickrock sandstone. Elevations of up to 4,000 feet offer expansive views. By agreement with BLM, park rangers from Utah State Parks currently patrol about 6,000 acres at Sand Mountain, and one of the three entrances is via Sand Hollow State Park (Zarekarizi 2014). BLM does not charge a fee at the other two entry points. The interagency arrangement is generally favorable, although federal requirements can be cumbersome (Strong 2014). An expansion of Sand Hollow State Park or the creation of a separate state park at Sand Mountain post-transfer would allow State Parks more freedom to make future improvements. Federal and state expenditures from managing the lands under current practices are not available. Planning efforts would be needed to determine how to manage the new area and whether additional facilities, visitor services, or preservation undertakings are advisable.

Figure 2.16
BLM Open OHV Area, Sand Mountain

Photo credit: Bureau of Land Management

Effect of Land Transfer on State Parks

Federal-to-state land transfer as envisioned in H.B. 148 would create new options for parks and outdoor recreation in Utah. An estimated 83 percent of the land area for Utah's 43 existing state parks is owned by the state. These lands would not be directly impacted by land transfer.

Federal Involvement at Existing State Parks

Other areas may be impacted by land transfer. An ongoing collaboration exists between Utah State Parks and federal land owners to create recreational opportunities. State Parks assists the federal agencies in managing their public lands, roughly 17 percent of state park acreage in Utah. Federal agencies allow Utah State Parks to assess user fees to defray costs.

Land transfer would alter these arrangements. On the one hand, land transfer would eliminate burdensome processes that are currently required to meet state park needs in keeping with the policies and procedures of federal agencies (Strong 2014). On the other hand, Utah should expect to lose federal support to manage non-recreation matters on federal lands and bodies of

[97] "Sand Mountain OHV Area," Bureau of Land Management, accessed November 5, 2014, www.blm.gov/ut/st/en/fo/st__george/recreation/motorized_recreation/sand_mountain_ohv.html.

water used for state parks (Hayes 2014). For example, federal land managers are partners with State Parks in maintaining roads, trails and lands that are important to visitors to several state parks. Also, federal agencies are generally responsible for wildfire management and suppression on lands they own.

One aspect of federal assistance in managing state parks that would not change post-transfer is the Bureau of Reclamation's responsibility for bodies of water at one-fourth of Utah's state parks. In addition to addressing water rights, conservation and delivery, Reclamation manages dams and other facilities that regulate water flows and levels (Heath-Harrison 2014, Reed 2014).

Access

Utah State Parks expects that access to roads and trails would increase following land transfer, both within state parks and on public lands outside of state parks (Haller 2014). Such access is important for snowmobiling, mountain biking, OHV riding, and many other outdoor recreation activities. While Forest Service and BLM travel management plans already authorize motorized and non-motorized uses on much of their extensive networks of roads and trails, the state would likely be more permissive than federal land managers in this regard. The existing system of roads and trails available for recreation is the result of federal resources to build and maintain roads and trails, aided by partnerships among state and federal agencies. In the event of land transfer, the state would have more independence but perhaps more costs, depending on its own choices regarding construction, maintenance and access for roads and trails.

New or Expanded State Parks

Another result of land transfer pertaining to state parks would be the potential to create new or expanded state parks from promising natural areas outside of current acreage. Such endeavors would require expenses for construction, maintenance and operation. New or expanded parks could generate additional revenue from user fees. They may support a higher number of visits to public lands by residents and nonresidents, with the accompanying spending and economic impacts.

Federal Funding

Land transfer is not likely to significantly affect federal funding to Utah State Parks. Federal funds averaged $3.3 million per year during FY2009-2013, 9.6 percent of the total budget. In particular, Utah amounts from the FHA Recreational Trails Program, Coast Guard Recreational Boating Safety program, and the NPS LWCF State Assistance Program are not determined based on land ownership. FHA funding depends on federal motor fuel tax receipts and estimates of OHV use in Utah compared with other states. Coast Guard grants are for water safety on bodies of water throughout the state, regardless of ownership (Hunter 2014). LWCF amounts State Parks administers are primarily pass-through grants that allow counties and municipalities to acquire and develop lands for use as public outdoor parks (Zarekarizi 2014). On the whole, federal funding of State Parks is not tied to land ownership (Hayes 2014).

State Funding and Park-Generated Revenue

Land transfer may affect revenue from state parks and general fund restricted accounts. The amount of revenue generated at state parks would depend on circumstances and the state's course of action post-transfer. If improved access and facilities spur growth in visitation over time, user fees may increase. This would help offset the observed decline in general fund support for State Parks during FY2009 to 2013. On the other hand, if federal lands within and adjacent to state parks deteriorate in some way under state management post-transfer and this affects state park visitation, revenue from user fees could fall.[98] Park fees constitute the largest source of funds for the Division and park revenue from fees is subject to many variables.

As for the general fund restricted accounts for boating and OHVs, funding levels from the fuel tax, license fees, and registration fees are not likely to be directly affected by land transfer (Haller 2014). However, if the state is able to provide better opportunities for these two types of recreation post-transfer, then sales of boats, snowmobiles, dirt bikes and ATVs may rise. Such a development would lead to Utah licensing and registration revenue from these vehicles above current trends.

2.2.5 Utah Division of Wildlife Resources

The Utah Division of Wildlife Resources (DWR) manages hundreds of wildlife and aquatic species across federal, state, and private jurisdictions throughout the state.[99] DWR also administers 464,077 acres of land, mainly as Wildlife Management Areas (Figure 2.17). Of this acreage, 2.8 percent is privately or federally owned.[100] Key components of DWR's operations are improving wildlife habitat, protecting sensitive species, supporting wildlife-related recreation, and overseeing hunting and fishing.

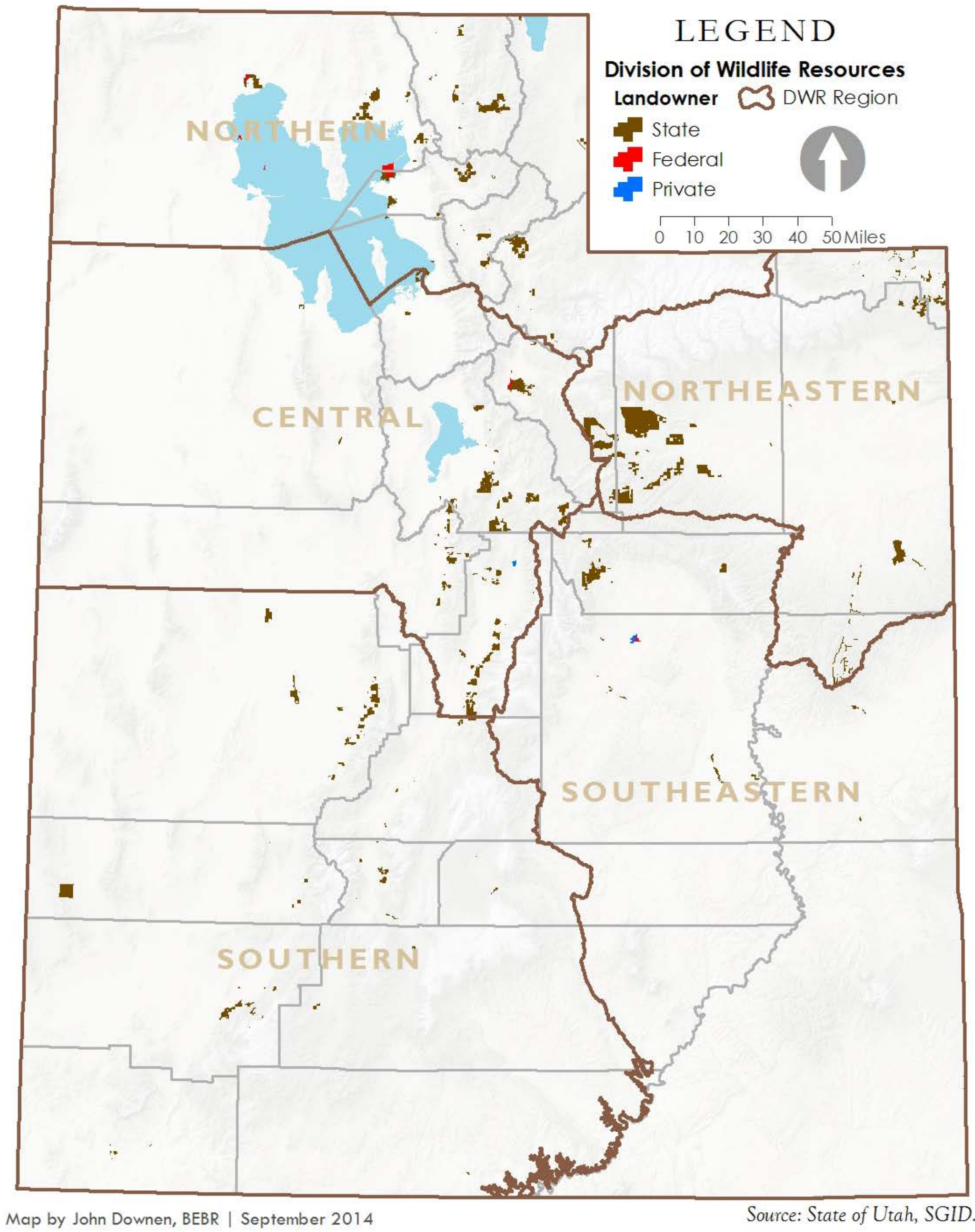
The Utah State Legislature created the Utah Department of Natural Resources (DNR) in 1967 with seven divisions. One of these was the Division of Fish and Game, DWR's predecessor. DWR is organized into the Northern, Northeastern, Central, Southeastern, and Southern regions (Figure 2.17).

During FY2009 to 2013, DWR's annual operating expenditures averaged $48.2 million in 2013 dollars (Table 2.68). Including cooperative agreements and other programs, the Division's total spending averaged $69.1 million with employment of 566 FTEs. The most significant funding source was receipts from the sale of Utah hunting and fishing licenses and permits. Federal funds were the second largest source, from excise taxes related to hunting and fishing equipment and from cooperative agreements for wildlife research and habitat improvements.

In the event of H.B. 148 federal land transfer in Utah, the continuance of $4.2 million in annual federal funding DWR received during FY2009 to 2013 would be in question. DWR and other state agencies would need to address how to replace protections and funding federal land managers provide in the state. Post-transfer, the state could re-evaluate access by hunters, anglers and DWR personnel to transferred lands, particularly WSAs and those not well served by approved travel plans. Finally, substantial DWR revenue from licenses and permits would not likely be affected, as long as populations and habitats for wildlife and aquatic species are maintained by the state.

[98] For example, state funding levels, land management approaches, and decisions about land use and development could affect recreation opportunities.
[99] DWR has limited involvement in tribal and urban areas.
[100] Federal lands DWR manages are in Box Elder, Emery, Wasatch and Weber counties. Private lands managed by DWR are in Emery and Sanpete counties. Together they make up 13,086 acres.

Figure 2.17
Lands Administered by the Utah Division of Wildlife Resources



Revenue and Expenses

During FY2009 to 2013, DWR funding of $69.1 million came from many sources: General Fund Restricted (GFR) revenues (48.5 percent), federal agencies (29.4 percent), the state General Fund (6.9 percent), dedicated credits (6.6 percent), and transfers and other balances (5.5 percent) (Table 2.68). Restricted revenues in five GFR accounts can be categorized as coming from the sale of licenses, permits and stamps, which together comprise 69.4 percent of GFR amounts, or from other sources.[101] Transfers are from other state agencies.

Table 2.68
DWR Funding, FY2009–FY2013

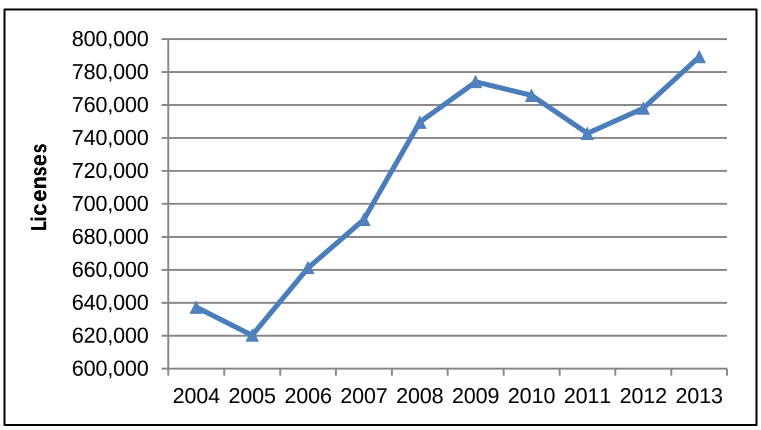
Sources of Finance	FY2009	FY2010	FY2011	FY2012	FY2013	Average
Restricted, Licenses & Permits[1]	$23,603,364	$24,134,907	$22,881,108	$22,429,025	$23,338,002	$23,277,281
Federal Funds	$19,782,700	$20,512,500	$21,694,600	$18,745,200	$21,022,300	$20,351,460
General Fund	$8,049,800	$6,743,000	$6,522,000	$6,366,400	$6,709,300	$6,878,100
Restricted, Other[1]	$7,286,236	$8,060,193	$11,512,792	$11,862,775	$12,619,198	$10,268,239
Dedicated Credits	$4,332,200	$3,079,800	$4,806,300	$4,217,300	$6,240,100	$4,535,140
Transfers and Other[2]	$5,639,100	$2,988,500	$1,472,200	($238,700)	$9,301,300	$3,832,480
Total	$68,693,400	$65,518,900	$68,889,000	$63,382,000	$79,230,200	$69,142,700
Operating Budget	$47,904,100	$45,615,200	$50,246,000	$47,322,700	$49,914,000	$48,200,400
Cooperative Agreements	$17,032,300	$17,006,900	$13,132,500	$12,557,900	$24,660,900	$16,878,100
Other[3]	$3,757,000	$2,896,800	$5,510,500	$3,501,400	$4,655,300	$4,064,200

1. Amounts in five General Fund Restricted accounts during these years were exclusively for DWR use. The portion of restricted funds accounts from the sale of licenses and permits, 69.4 percent, is given separately from all other types of restricted funds.
2. Other consists of lapsing and beginning and closing nonlapsing balances, on average negative and 8.1 percent of transfers.
3. Other includes Fisheries Capital, 62.0 percent; Contributed Research, 36.0 percent; License Reimbursement, 1.5 percent; and Range Creek, 0.6 percent.
Source: Utah Office of the Legislative Fiscal Analyst, Compendium of Budget Information.

Revenue from Licenses, Permits and Stamps

DWR revenue from hunting and fishing licenses, permits, and stamps averaged $23.3 million annually during FY2009 to 2013, 33.7 percent of the total budget (Table 2.68).[102] These funds are intended to benefit species that can be hunted. Starting at 637,257 licenses in 2004, DWR sales rose 23.8 percent, recovering from a decline following the recession that began December 2007, to reach 789,134 license sales in 2013 (Figure 2.18). For a different ten-year period, 2002 to 2011, 60.6 percent of DWR licenses were for hunting and 39.4 percent were for fishing.[103] During this period, 25.6 percent of fishing licenses and 8.7 percent of hunting licenses, permits, etc.

Figure 2.18
Utah Hunting and Fishing Licenses, 2004–2013



Source: Utah Division of Wildlife Resources

[101] GFR accounts that make up the two restricted entries in Table 2.68 with their shares of total restricted funds during FY2009 to 2013 are as follows: Wildlife Resources, 86.9 percent; Wildlife Habitat, 8.4 percent; State Fish Hatchery Maintenance, 4.0 percent; Predator Control, 0.4 percent; and Mule Deer Protection, 0.3 percent. Besides licenses, permits and stamps, DWR restricted funds include donations, wildlife license plates, miscellaneous fees, and Certificate of Registration payments to harvest brine shrimp on the Great Salt Lake.

[102] A license authorizes someone to hunt or fish in the state. A permit allows a licensed hunter to take a certain type of restricted game in a specified area. A stamp makes a fishing license from a reciprocal state valid in parts of Utah (Braithwaite 2014).

[103] "Historical License Data Index," U.S. Fish and Wildlife Service, accessed October 29, 2014, wsfrprograms.fws.gov/Subpages/LicenseInfo/LicenseIndex.htm.

were sold to nonresidents. Nonresident purchases often indicate travel, tourism, and spending that boost Utah's economy with out-of-state dollars.

Federal, State and Other Revenues

Two-thirds of DWR's $20.3 million in federal funds consist of matching grants from U.S. Fish and Wildlife Service (FWS) for fish, wildlife, and sensitive and endangered species (Table 2.69). The amount of FWS grant money DWR receives is a function of hunting and fishing license sales and the state's total land area. Six other agencies make up $6.9 million in federal funding.[104]

Table 2.69
DWR Federal Revenue, FY2009-2013

Federal Agency	Annual Average	Share
Fish and Wildlife Service	$13,482,715	66.3%
Bureau of Land Management	$3,354,654	16.5%
Bureau of Reclamation	$2,353,198	11.6%
Department of Agriculture[1]	$805,095	4.0%
Department of Defense	$170,072	0.8%
Environmental Protection Agency	$144,675	0.7%
National Park Service	$24,184	0.1%
Total[2]	$20,334,592	100.0%

1 This amount is principally from Region 4 of the U.S. Forest Service.
2. This total is within 0.1 percent of the federal funds amount reported by a different source in Table 2.67.

Source: Utah Division of Wildlife Resources

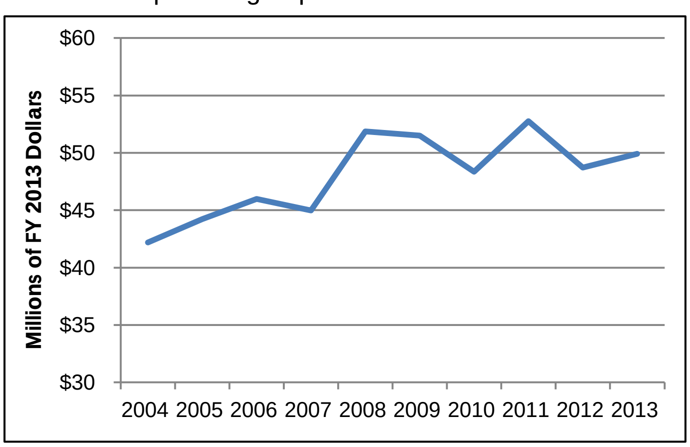
At an average of $6.9 million, the state General Fund contributed only 6.9 percent of DWR's annual budget from FY2009 to 2013 (Table 2.68). These revenues were used primarily for non-game sensitive species, wildlife depredation, and law enforcement.[105]

Operating Expenditures

Over a ten-year period, DWR's operating budget rose 18.3 percent, adjusted for inflation to 2013 dollars, from $42.2 million in FY2004 to $49.9 million in FY2013 (Figure 2.19). The size of the operating budget peaked in FY2011 at $52.8 million.

For the period FY2009 to 2013, DWR carried out several programs with an average of 502 full time-equivalent employees and $48.2 million in annual operating expenditures (Table 2.70). These amounts do not include resources for DWR's cooperative agreements and certain other programs.[106] The Aquatic Section conserves and manages fish and other aquatic species throughout the state, using 25.5 percent of the budget during the period. This section monitors populations, protects habitats, stocks sport fish, regulates fishing, produces studies, and educates the public.

Figure 2.19
DWR Operating Expenditures FY2004–FY2013



Source: Utah Office of the Legislative Fiscal Analyst

Somewhat smaller than the Aquatic Section, with 16.7 percent of DWR's operating budget, the Wildlife Section provides comparable management and

[104] FWS, BLM, Forest Service and other federal funding sources are discussed further in Chapter 5: Revenue Impacts of Federal Land Ownership in Utah.
[105] "About the DWR: Fiscal Year 2013 Financial Information," Utah Division of Wildlife Resources, accessed September 18, 2014, wildlife.utah.gov/about-us/64-what-we-do/about-us/191-financial-overview.html.
[106] The exception to this statement would be employment for $4.1 million in spending from fisheries capital, contributed research, license reimbursement, and Range Creek, all of which is apparently included in the 502 FTEs associated with operating expenditures (Table 2.71).

conservation functions for over the benefit of 350 animal species, including, big game, upland game, furbearers, waterfowl, non-game birds, and threatened and endangered species.

Table 2.70
DWR Operating Expenditures and Employment, FY2009–FY2013

Program	FY2009	FY2010	FY2011	FY2012	FY2013	Average
Director's Office	$1,609,700	$1,775,200	$2,468,300	$3,146,500	$2,904,700	$2,380,880
Administrative Services	$6,122,900	$6,973,800	$7,092,400	$7,040,300	$6,903,300	$6,826,540
Aquatic Section	$13,175,600	$12,180,300	$12,598,200	$11,462,400	$12,036,900	$12,290,680
Conservation Outreach	$2,401,900	$2,332,800	$2,396,700	$2,216,400	$2,422,300	$2,354,020
Habitat Council	$3,308,500	$2,487,600	$2,602,200	$2,600,000	$2,255,600	$2,650,780
Habitat Section	$5,291,800	$3,681,400	$6,109,800	$4,563,300	$5,190,200	$4,967,300
Law Enforcement	$8,038,500	$8,574,900	$8,902,000	$9,030,800	$8,924,100	$8,694,060
Wildlife Section	$7,955,200	$7,609,200	$8,076,400	$7,263,000	$9,276,900	$8,036,140
Total Expenditures	$47,904,100	$45,615,200	$50,246,000	$47,322,700	$49,914,000	$48,200,400
Employment (FTEs)	499	520	520	489	485	502

Note: Program expenditures are based on the two line items corresponding to DWR—Wildlife Resources and Wildlife Resources Capital. All capital spending is in the Fisheries Program. Operating spending is spread among the remaining eight programs.
Source: Utah Office of the Legislative Fiscal Analyst, Compendium of Budget Information.

Three other programs, as well as DWR administration and the Director's office, support the wildlife and aquatic sections. The enforcement function relates to laws and policies related to wildlife. A hunter education program supports enforcement efforts. The Habitat Section and associated council undertake planning, inventories, and other research and administration functions for wildlife and aquatic species. Conservation outreach involves public communications, two visitor sites, and learning and volunteer opportunities.

Non-Operating Expenditures

Substantial activities outside of DWR's operating budget comprised 30.3 percent of the Division's total spending of $69.1 million per year during FY2009 to 2013. Foremost of these were cooperative agreements for wildlife habitat improvement and other projects, receiving an average of $16.9 million during the five years and reaching as high as $24.7 million in FY2013 (Table 2.71). Cooperative agreement spending was for projects funded mostly by federal, state, and local governments. DWR devoted an average of 64 FTEs to these projects, outside of employment to support the Division's operating budget. Capital spending at DWR's 11 fish hatcheries amounted to $2.5 million. Smaller amounts supported studies with outside funding, discounts on hunting and fishing licenses, and special funding for the Range Creek site in Emery County.

Table 2.71
DWR Program Spending besides Operating Expenditures, FY2009–FY2013

Other Program	FY2009	FY2010	FY2011	FY2012	FY2013	Average
Cooperative Agreements	$17,032,300	$17,006,900	$13,132,500	$12,557,900	$24,660,900	$16,878,100
Fisheries Capital	$2,414,000	$1,398,000	$3,825,000	$2,510,700	$2,445,300	$2,518,600
Contributed Research	$1,150,100	$1,424,000	$1,610,700	$915,900	$2,210,000	$1,462,140
License Reimbursement	$74,800	$74,800	$74,800	$74,800	$0	$59,840
Range Creek*	$118,100	$0	$0	$0	$0	$23,620
Total	$20,671,200	$19,903,700	$18,643,000	$16,059,300	$29,316,200	$20,918,680

* Range Creek Canyon funding and responsibility were transferred to the University of Utah beginning FY2010.
Source: Utah Office of the Legislative Fiscal Analyst, Compendium of Budget Information.

DWR and Land Transfer

In the event of land transfer on the scale envisioned by H.B. 148, most federal revenue to DWR would be unaffected. However, $4.2 million in annual federal funding received during FY2009 to 2013 would be in question. DWR and other state agencies would need to address how to replace protections and funding federal land managers provide in Utah. Post-transfer, the state could re-evaluate access by hunters, anglers and DWR professionals to transferred lands, particularly WSAs and those not well served by approved travel plans. Finally, substantial DWR revenue from licenses and permits would not likely be affected as long as populations and habitats for wildlife and aquatic species are maintained by the state.

Federal Revenue

Funds from seven federal agencies amounted to 29.4 percent of DWR's total budget during FY2009 to 2013 (Hyatt 2014). As noted, DWR received an average of $13.5 million per year from U.S. Fish and Wildlife Service (FWS) during FY2009 to 2013, about two-thirds of DWR's federal funding and one-fifth its total budget (Table 2.69). Land transfer in Utah is not likely to affect DWR funding from FWS (Braithwaite 2014).

FWS funds are derived from federal excise taxes on hunting and fishing equipment. FWS apportions these tax revenues to states under the authority of the Pittman-Robertson Wildlife Restoration Act, the Dingell-Johnson Sport Fish Restoration Act, and supporting legislation for associated appropriations and grant programs.[107] The apportionment formula for Pittman-Robertson funds is based equally on the number of licensed hunters in a state and its total surface area. Apportionment of Dingell-Johnson funds is based 60 percent on the number of licensed anglers in each state and 40 percent on total surface area.[108]

Clearly, land transfer will not affect Utah's total surface area. However, if the transfer changes existing hunting and fishing opportunities, and if this in turn affects the number of licensed hunters and anglers, FWS would make a corresponding adjustment to DWR's share of Dingell-Johnson and Pittman-Robertson funds.

BLM was the source of the second-largest amount of federal funding from FY2009 to 2013, an annual average of $3.4 million (Table 2.69). This constitutes 16.5 percent of federal funding and 4.9 percent of DWR's total budget. This funding is for wildlife research and habitat improvement, based primarily on BLM Utah needs related to its lands in the state. DWR would likely lose some or all of the $3.4 million per year if most BLM lands in Utah were transferred to the state under H.B. 148. State land managers may rely on DWR for wildlife research and habitat improvement for similar or different amounts (Johnson 2014).

The same scenario would apply to the Forest Service, which funded $0.8 million DWR projects to benefit wildlife and aquatic populations and habitats in Utah each year during FY2009 to 2013. The Forest Service would stand to lose most of its 8.2 million acres in Utah. One example of a program that relies on these land managers is Utah's ongoing Watershed Restoration Initia-

[107] The Pittman-Robertson Wildlife Restoration Act, 16 U.S.C. 669, establishes federal assistance for hunter education and projects that benefit wildlife. The Dingell-Johnson Sport Fish Restoration Act, 16 U.S.C. 777, addresses federal funding for fishery resources. The state share for matching grants is 25 percent, with FWS providing 75 percent for authorized projects and programs.

[108] "Budget Justification and Performance Information, Fiscal Year 2014: Fish and Wildlife Service," U.S. Fish and Wildlife Service, accessed October 27, 2014, www.fws.gov/budget/.

tive, which is funded by BLM, the Forest Service, and other federal agencies to undertake extensive habitat restoration work (Canning 2014).

Proposed Utah land transfer is not expected to alter the status of three federal agencies that help fund DWR—Bureau of Reclamation, Department of Defense, and Environmental Protection Agency. Collectively, they provided $2.7 million annually during FY2009 to 2013, 13.1 percent of federal funding to DWR (Table 2.69).

Finally, National Park Service (NPS) funding, only $24,184 during the same period, may decline if it was associated with Glen Canyon NRA, which is the only NPS area considered for transfer.

Access to Federal Lands for DWR Operations

For the most part, federal agencies have been good partners as DWR carries out its responsibilities for wildlife on federal lands in Utah (Bates 2014). There have been few exceptions to a longstanding pattern of federal accommodation and collaboration with the state in this regard.

One such exception occurred in the Henry Mountains area. For at least three years, federal land managers did not approve a DWR proposal to improve habitat on 1,200 acres there. Many, but not all, stakeholders and interested parties supported the proposal. In some cases federal agencies have withheld approval for use of motorized vehicles to promote wildlife populations in wilderness areas. For example, DWR may request entrance by vehicle to improve wildlife access to drinking water in certain areas, and DWR may wish to use helicopters to capture animals for transplants and research. While designated wilderness areas would presumably remain intact post-transfer, restrictions on motorized access to Wilderness Study Areas (WSAs) may be removed or modified following land transfer.

Conservation of Wildlife and Aquatic Species

Generally speaking, federal land management in Utah has had a positive effect on wildlife and aquatic populations and habitats in the state (Bates 2014). Federal wildlife refuges are managed to promote wildlife populations. Wildlife needs are regularly considered among BLM and Forest Service multiple-use priorities, in balance with other resources uses and non-uses. Approved travel plans allow public access while limiting habitat disturbance and watershed degradation. Furthermore, the public involvement process established by the National Environmental Policy Act (NEPA) considers the wildlife impacts of proposed actions on federal lands. Other federal laws that are binding on federal and state lands benefit Utah's wildlife: Endangered Species Act, the Clean Air Act, and the Federal Water Pollution Control Act. Land transfer should not affect the express or implied protections these three laws afford to wildlife. Negative impacts to wildlife and aquatic species may occur as federal lands attract visitors and traffic to habitats.[109] However, responsible recreation is largely compatible with wildlife priorities.

Angler and Hunter Access to Federal Lands

Virtually all BLM and Forest Service lands in Utah provide access to anglers, hunters, and wildlife viewers (Bates 2014). Public access for purposes of hunting, fishing and wildlife viewing is free of charge. This has allowed DWR to manage population levels appropriately through authorized hunting and fishing, sport fish stocking from hatcheries, wildlife relocations, and other

[109] For example, National Parks, which are outside the scope of H.B. 148 transfer, are responsible for tourism which in some settings, interferes with wildlife well-being.

means. Most of DWR's concerns about sufficient access for hunting and fishing have been related to private lands.

There are two situations where hunter and angler access may be limited on federal lands proposed for transfer, often for reasons DWR supports. First, some hunting restrictions apply within federal refuges, and motorized vehicle prohibitions in federal wilderness areas limit hunting of big game and other species. Second, travel plans in certain areas do not accommodate hunters and anglers as much as DWR would prefer.[110]

Following transfer, DWR staff and state policy makers could weigh many considerations before determining how it will maintain, enhance, remove, or otherwise modify access and hunting restrictions post-transfer. For example, in the case of wilderness, the recreation and wildlife management benefits of hunting could be weighed against the impacts on visitor solitude and animal habitat from motorized access.

Access by hunters, anglers, and DWR managers to state trust lands and private lands is more limited and costly than for federal lands in Utah. DWR makes annual payments to the Utah School and Institutional Trust Land Administration (SITLA) in order to gain public access for hunting, fishing, trapping and wildlife viewing on most SITLA lands.[111] The amount was $670,048 in FY2013, rising incrementally from $500,000 seven years earlier.

DWR also has agreements to promote wildlife management on private lands based on the sharing of permit revenue generated on those lands. Cooperative Wildlife Management Units (CWMUs) are established by agreement between DWR and private landowners (Johnson 2014). At least 118 CWMUs were active as of mid-2014, primarily in Northern Utah for deer, elk or moose hunts. Landowners receive revenue based on market prices for hunting vouchers DWR authorizes them to sell. The Division receives revenue from permits sold to voucher holders and from any increment in hunting license purchases associated with additional permit offerings on CWMUs. DWR requires that a minimum of 10 to 20 percent of CWMU permits go to the public, depending on the type of game, while most of the permits are issued to those who receive vouchers from landowners. By this program, landowners agree to preserve wildlife habitat on their lands, and hunters gain access to previously closed lands.

In contrast to DWR arrangements on SITLA and CWMU lands, DWR retains all revenues from permit sales on federal lands in Utah and does not pay for hunting and fishing access. If federal lands transferred to the state under H.B. 148 were managed under public trust, multiple-use principles, post-transfer access similar to that presently enjoyed on federal lands could be expected. If transferred lands were managed as trust lands primarily to generate revenue for beneficiaries, post-transfer access may be more costly to DWR and the public. As H.B. 148 does not contemplate privatization of transferred lands, the CWMU arrangement is provided for the sake of completeness and comparison.

Revenue from Licenses, Permits, and Stamps

DWR's largest source of revenue, license and permit sales, may be affected somewhat by land transfer. DWR received an average of $23.3 million from this source during FY2009 to 2013

[110] In other locations, in the interest of struggling wildlife populations, DWR recommends travel plans be more limited than those ultimately approved by federal land managers.

[111] "Memorandum of Agreement between Utah School and Institutional Trust Lands Administration and the Utah Department of Natural Resources, Division of Wildlife Resources, February 16, 2007."

(Table 2.68). As noted, DWR would continue to manage wildlife statewide following land transfer. However, with the removal of some federal protections and funding, state regulations and finances may provide a somewhat different approach to supporting wildlife and aquatic species.

If habitat and wildlife resources were improved with additional state investments and protections, compared to those afforded by federal land managers, public lands may prompt additional hunting and fishing activity in Utah (Bates 2014). As a result, sales of hunting and fishing licenses, permits and stamps would likely increase somewhat, as well as wildlife-related spending for equipment and trips to public lands in the state.

On the other hand, state funding and wildlife protections may be more limited than those provided by federal agencies' extensive efforts in Utah. If this outcome were to occur, wildlife habitat and populations may decline, resulting in fewer or lower-quality opportunities for wildlife-related activities. This could be expected to reduce DWR revenue from the sale of licenses, permits, and stamps as well as other types of spending by hunters, anglers, and wildlife watchers.

The amount of DWR revenue from license and permit sales that would increase or decrease following land transfer cannot be reliably estimated. Change is possible, but it is not clear that there would be significant change, as long as the functions covered by the small amount of federal funding in question are able to go forward. Many factors affect wildlife populations and participation in hunting and fishing. DWR's responsibility for wildlife would largely be unaffected by land transfer.

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3 Potential Revenues and Costs of Managing Transferred Lands

H.B. 148 calls for the large-scale transfer to the state of Utah of lands that are currently managed by the Bureau of Land Management, U.S. Forest Service and U.S. Fish and Wildlife Service. It also includes the Utah portion of the Glen Canyon National Recreation Area managed by the National Park Service. In total, 31.2 million acres would be transferred to the state. This analysis estimates the potential cost to manage the lands and identifies potential revenue streams that could offset those costs.

3.1 Key Findings

Based on our analysis, the land transfer could be profitable for the state if oil and gas prices remain stable and high and the state assumes an aggressive approach to managing its mineral lease program.

By 2017—the year we assume Utah would have full access to transferred lands—we estimate the state would need to generate $248 million[112] to cover the direct land management costs. In addition to this is federal PILT (payments in lieu of taxes), which the state has indicated it would continue to pay to the counties. This increases the total to $280 million.

Our direct land management cost estimate is close to the amount federal agencies now spend to manage the lands. A cost-per-acre analysis reveals that federal agencies are relatively efficient managers. We looked at state agencies that provide similar services and programs to find cost advantages and could not; however, state agencies excel at leveraging their state appropriations with federal funds and other revenues.

In 2013, a total of $331.7 million was generated on lands managed by the BLM and Forest Service in Utah. Of this, mineral lease revenue accounted for 93 percent, or $308.0 million. Oil and gas royalties were almost $257 million (83 percent of all mineral lease revenue). Historically, oil and gas royalties account for the majority of all mineral lease revenue produced on federal lands.

The second largest royalty stream comes from coal. Although coal royalties are much more volatile than those from oil and gas, they provide a relatively steady revenue stream. From 2003 to 2013 coal royalties averaged $28.6 million annually. From this information, we expect the most direct and reliable source of revenue to cover the state's land management costs would be royalties and taxes on oil and gas production, followed by royalties on coal production.

To estimate the amount of revenue that might be generated by oil and gas production, we developed a forecasting model that allowed us to produce revenue estimates using different production assumptions. We projected coal revenues straight from production assumptions provided by the Utah Geological Survey.

[112] All the dollar amounts discussed in this summary are constant 2013 dollars.

For the oil and gas projections, we produced 10 forecasts under two different price assumptions (five forecasts under each assumption). The high price (our "Reference" price) assumed an average price per barrel for oil of $92 and gas at $5.10 per thousand cubic feet. The low price assumed an average price per barrel for oil of $62 and gas at $3.30 per thousand cubic feet.

Our projections show the state could cover the land management costs in 2017 under the assumptions in Forecasts 4, 5, 9, and 10. These forecasts include the most aggressive assumptions, including a change in the royalty revenue share from 50 percent on all production to 100 percent of all production in all four forecasts, and an increase in the royalty rate from 12.5 percent to 16.7 percent in Forecasts 5 and 10.

If oil and gas prices remain high, in 2017 the state would be able to cover its costs and realize net revenue of $109 million under Forecast 4 and $142 million under Forecast 5. If prices fall to the lower level, the state could still cover the land management costs in Forecasts 9 and 10, but net revenue declines to $66.8 million in Forecast 9 and $97.6 million in Forecast 10. Within five years of the transfer (2022) the state could cover its costs in Forecasts 2, 3, 4, 5, 9 and 10. Table 3.1 shows the revenues projected under each scenario.

Table 3.1
Summary Oil and Gas Royalties and Tax Revenues
(Millions of Constant 2013 Dollars)

	Reference Price Forecast Oil: Average $92 per barrel pGas: Average $5.10 per thousand cubic feet)					Low Price Forecast Oil: Average $62 per barrel Gas: Average $3.30 per thousand cubic feet				
Year	Baseline Forecast 1	Forecast 2	Forecast 3	Forecast 4	Forecast 5	Baseline Forecast 6	Forecast 7	Forecast 8	Forecast 9	Forecast 10
2017	$226.8	$235.1	$245.4	$389.2	$422.0	$202.7	$210.7	$219.4	$346.8	$377.6
2018	$234.7	$256.3	$270.7	$405.5	$440.9	$200.4	$219.3	$230.5	$345.9	$378.2
2019	$237.2	$270.4	$287.5	$413.4	$450.3	$198.1	$225.4	$238.8	$343.7	$375.5
2020	$245.6	$290.3	$311.1	$430.7	$468.9	$195.4	$229.0	$244.2	$340.7	$371.9
2021	$262.3	$320.2	$345.6	$462.5	$501.7	$192.2	$231.7	$248.3	$336.7	$366.5
2022	$279.4	$351.2	$381.8	$495.4	$535.6	$189.0	$231.4	$249.5	$331.9	$361.2
2023	$298.3	$385.7	$421.2	$532.0	$575.0	$185.5	$230.2	$248.8	$326.6	$355.8
2024	$318.8	$422.8	$463.2	$570.8	$617.7	$182.0	$227.4	$246.4	$321.3	$349.5
2025	$342.7	$459.5	$505.9	$616.2	$659.9	$177.9	$224.7	$243.5	$314.4	$342.7
2026	$365.0	$497.4	$547.4	$659.4	$712.4	$173.2	$221.0	$239.9	$307.2	$336.1
2027	$390.6	$537.0	$595.3	$708.5	$763.3	$169.1	$217.0	$236.1	$300.0	$329.6

Notes: Revenue includes royalties, severance taxes and sales tax.
Assumptions used in these forecasts: Forecasts 2 and 7—Oil and gas royalties remain at 12.5 percent, new wells are drilled at historic levels, the state receives 50 percent of all royalties on production from existing wells (wells that were in production prior to the transfer) and 100 percent of the royalties from production on new wells (wells that are drilled after the transfer).
Forecasts 3 and 8—Oil and gas royalties remain at 12.5 percent; the number of new wells drilled increases 15 percent over the baseline estimate; the state receives 50 percent of the royalties on existing wells and 100 percent of the royalties on new wells.
Forecasts 4 and 9—Oil and gas royalties remain at 12.5 percent; the number of new wells drilled increases 15 percent over the baseline estimate; the state receives 100 percent of the royalties on existing wells and new wells.
Forecasts 5 and 10—Oil and gas royalties increase to 16.7 percent on new wells; the number of new wells drilled is 15 percent more than the baseline estimate; and Utah receives 100 percent of the royalties on production from all wells.
Source: BEBR analysis.

Covering the land management costs with mineral lease revenue will require the state to change existing law regarding distributions. Currently, federal mineral revenues are distributed to several different agencies and funds according to state law. A portion of the mineral lease revenue is used to pay the state's PILT to counties. If the state opts to use mineral lease revenue to manage lands, the revenue allocations would be changed. Although this analysis does not directly estimate the effect of this change on the benefitting agencies, the potential effects can be inferred in the royalty projections presented in Forecasts 1 and 6. The royalties produced in those forecasts are the amounts the benefitting agencies would receive if the lands are not transferred. Within the first five years of the transfer there is not sufficient net revenue under any of our forecasts to cover land management costs without tapping into the baseline royalties.

While the primary source of revenue would be from oil and gas production, coal royalties could also provide a much smaller share of revenue. In 2017, coal could provide as much as $49 million in royalties to the state. By 2022, coal royalties are projected to range from a low of $34.5 million to $56.8 million under the most optimistic assumptions.

In addition to the oil, gas and coal royalties will be revenue from mineral lease bonus payments, rents, and other activities associated with mineral leasing. From 2009 to 2013, revenue from these sources averaged $29.1 million annually. These are potential revenue streams that would also be available to the state. We did not model these components of mineral leasing.

Other sources of revenue could come from land-based activities such as those now undertaken by the BLM and Forest Service. Examples of these revenues include mineral lease permitting, grazing fees, rights-of-way rents, and recreation fees. Over the last five years, BLM's annual land-based revenue collections have averaged $9.8 million. The Forest Service has collected an average of $7.2 million annually. These revenues would be additional funds for the state if it could replicate or maintain the programs that generate these fees.

3.2 Potential Revenue

Revenues to manage the transferred lands could come from multiple activities. Currently, the Bureau of Land Management produces the most revenue on Utah lands, primarily from mineral production. In addition, the agency generates revenue from mineral leases and permits (not included in the mineral lease revenue paid to the Office of Natural Resources Revenue), timber sales, land sales, grazing fees, rights-of-way rents, rents of land, and recreation fees. Combined land-based revenues totaled almost $331.7 million in FY2013 (Table 3.2).

As shown in Table 3.2, and noted throughout this report, royalties from oil and gas account for the largest share of revenue produced on lands in Utah. In FY2013, oil and gas royalties totaled nearly $257 million (83 percent of all mineral lease revenue), and averaged $215.2 million from FY2003 through FY2013.

Coal royalties were $35.6 million in FY2013, and averaged $28.6 million annually from FY2003 to FY2013.

Table 3.2
Total Land-Based Revenue in FY2013
(Current Dollars)

Source	Amount
Mineral Lease Revenues	$308,021,015
Oil and Gas Royalties	$256,968,418
Coal Royalties	$35,641,043
All other mineral lease revenue	$15,411,554
Bureau of Land Management	$15,655,835
Rights-of-Way rents	$9,413.503
Recreation fees	$3,351,225
Grazing fees	$1,012,285
All other revenue	$1,878,822
U.S. Forest Service	$7,988,717
Recreation fees and permits	$4,114,156
Power project rights-of-way rents	$1,265,355
All other revenue	$2,609,206
Total	$331,665,567

Source: U.S. Department of the Interior, Office of Natural Resources Revenue; U.S. Department of the Interior; U.S. Forest Service; Bureau of Land Management; Bureau of Reclamation; Utah Department of Natural Resources, Division of Oil, Gas and Mining.

Non-mineral lease activities on lands managed by the BLM produced $15.6 million in revenue in FY2013. The largest share of this came from rights-of-way rents, recreation fees and grazing fees. Revenue generated on Forest Service lands totaled almost $8 million, more than half of which came from fees associated with recreation.

Given the relative importance of oil, gas and coal revenues, we focused our efforts and resources on forecasting the production, royalty and tax revenues that could be generated from these sources. To the extent that Utah can replicate revenue-generating programs and activities similar to those of the BLM and Forest Service, potential revenues would be higher than the forecast totals.

The revenue projections for oil and gas were produced using a forecasting model developed by BEBR. The fiscal effects of coal royalties were modeled using production estimates provided by the Utah Geological Survey. A discussion of the methodology and assumptions used in both modeling efforts is provided in Chapter 13. Summary results are presented here.

3.2.1 Oil and Gas Revenue Projections

We estimated the potential revenue stream from oil and gas production under two price estimates and a combination of parameters that take into account royalty rates, the distribution of royalties and the rate of new well development. In total we modeled 10 forecasts using different parameter combinations. Detailed information about these 10 forecasts is in Chapter 13, Section 13.1. The summary results are presented here.

The outputs of the model include projections of the value and volume of production, state royalties, tax revenues associated with mineral production, conservation fees, county property taxes and royalties that would accrue to SITLA. Revenues that are included in the state total are royalties, severance taxes and taxes on mining-related sales. A detailed analysis of these taxes is provided in Chapter 6 of this report.

BEBR did not model bonus payments and rents associated with oil and gas leases. Over the past 11 years, revenue from lease bonuses and rents averaged 12 percent of all oil and gas revenue. Revenue from rents and bonus payments would provide additional income for the state.

The oil and gas forecasts assumed using two different price forecasts for oil and gas. We call these the Reference Price scenario and the Low Price scenario. The Reference Price scenario assumes an average price for oil of $92 per barrel (ranging from a low of $77 to a high of $109) and for gas, a price of $5.10 per thousand cubic feet (ranging from a low of $3.60 to a high of $6.60) over the forecast period.[113] The Low Price scenario assumes an average price for oil of $62 per barrel (ranging from a low of $40 to a high of $86) and for gas a price of $3.30 per thousand cubic feet (ranging from a low of $3.30 to a high of $3.60).[114] All price inputs to the model and the outputs presented here have been adjusted for inflation to 2013 dollars.

[113] The references prices are based on the long-term (through the year 2040) "reference" oil and natural gas price forecasts published by the U.S. Department of Energy, Energy Information Administration, in its Annual Energy Outlook 2014. BEBR adjusted these prices so as to approximate Utah wellhead prices. These adjustments are discussed in detail in Chapter 13: Transfer Scenarios, Section 13.1.

[114] The low prices were created by BEBR as a "what if" scenario to show the sensitivity of oil and gas production and revenue forecasts to future energy prices, a factor over which the state has little control.

For each price scenario, we produced a baseline forecast and four additional forecasts with different parameter assumptions. The assumptions for each forecast are shown below:

- Forecasts 1 and 6: Forecast 1 and Forecast 6 are baseline forecasts for each price assumption. The baseline forecasts assume the following parameters: (1) a royalty rate of 12.5 percent (the rate now charged by the BLM on wells drilled on federal lands); (2) royalty shares of 50 percent for the state and 50 percent for the federal government; and (3) new wells will come into production at a rate based on historic data collected from the Division of Oil, Gas and Mining.
- Forecasts 2 and 7: Forecast 2 and Forecast 7 assume the following parameters: (1) oil and gas wells come into production at historic levels; (2) the royalty rate for all new wells remains at 12.5 percent; (3) Utah will continue to receive 50 percent of the royalties on existing production (wells that were producing prior to the land transfer); on wells that go into production after the transfer, the state would receive 100 percent of all royalties from that production.
- Forecasts 3 and 8: Forecast 3 and Forecast 8 assume the following parameters: (1) the royalty rate for all new wells remains at 12.5 percent; (2) the number of new wells drilled increases 15 percent relative to the baseline number of wells; (3) Utah receives 50 percent of the royalties on existing production and 100 percent of the royalties generated from the production of new wells.
- Forecasts 4 and 9: Forecast 4 and Forecast 9 assume a more aggressive approach to managing oil and gas production. These forecasts assume the following parameters: (1) the royalty rate for all new wells remains at 12.5 percent; (2) the number of new wells drilled increases 15 percent relative to the baseline number of wells; Utah receives 100 percent of the royalties on all wells (existing and new).
- Forecasts 5 and 10: These forecasts are the most aggressive, and assume that all parameters change from those used in the baseline forecasts. In these forecasts, the royalty rate increases to 16.7 percent (the rate SITLA now charges on almost all of its wells), the number of wells drilled is scaled up by 15 percent, and Utah receives 100 percent of the royalties on all production (existing wells and new).

The outputs for each of the ten forecasts described here are presented below.

Reference Price Scenarios

Oil and Gas Forecast 1—Reference Price Baseline: 50% on Existing and 50% on New Royalty Sharing, Baseline Drilling, 12.5% Royalty Rate

In this scenario, the oil and natural gas prices assumed for the period 2014–2036 are those based on the EIA Reference case forecasts—relatively "high" oil and gas prices—the state continues to receive 50 percent of royalties generated from existing (as of the beginning of 2017) federal wells, 50 percent of royalties generated from new (after the beginning of 2017) federal wells, the number of wells drilled during the study period is the median count predicted by the model, and royalty rates applying to production from federal wells remains at their current level of 12.5 percent.

This scenario represents a "business as usual" environment with oil and gas prices climbing during the study period. Under the assumptions forecast, the median predicted inflation-adjusted royalties accruing to the state rise from $146.6 million in 2017 to $279.4 million in 2022. Revenues from severance taxes and sales taxes in these years are $80.2 million and $97.7 million, respectively. By the end of the forecast period, royalties reach $456.1 million (Table 3.3).

Table 3.3
Oil and Gas Forecast 1 Reference Price Baseline:
50% on Existing & 50% on New Royalty Sharing, Baseline Drilling, 12.5% Royalty
(Dollar Amounts in Millions of Constant 2013 Dollars)

Year	Oil Volume (million bbls)	Gas Volume (bcf)	Federal Value	Total Value	State Royalties	Severance Tax	Sales Tax	State Total	Conservation Fee[1]	County Property Taxes
2017	40.8	447.3	$2,346.1	$5,111.8	$146.6	$70.8	$9.4	$226.8	$4.8	$52.1
2018	41.4	448.9	$2,433.3	$5,265.8	$152.1	$72.9	$9.7	$234.7	$5.0	$53.6
2019	42.4	452.8	$2,455.4	$5,334.6	$153.5	$73.9	$9.8	$237.2	$5.0	$54.3
2020	43.6	458.4	$2,544.1	$5,519.6	$159.0	$76.5	$10.1	$245.6	$5.2	$56.2
2021	45.1	468.6	$2,722.8	$5,871.7	$170.2	$81.3	$10.8	$262.3	$5.5	$59.8
2022	46.9	479.5	$2,905.5	$6,231.2	$181.6	$86.3	$11.4	$279.4	$5.9	$63.5
2023	49.0	493.5	$3,106.1	$6,642.0	$194.1	$92.0	$12.2	$298.3	$6.2	$67.7
2024	51.2	509.5	$3,327.7	$7,063.9	$208.0	$97.9	$13.0	$318.8	$6.6	$72.0
2025	54.1	530.0	$3,582.7	$7,572.9	$223.9	$104.9	$13.9	$342.7	$7.1	$77.1
2026	56.4	547.5	$3,825.8	$8,026.4	$239.1	$111.2	$14.7	$365.0	$7.6	$81.8
2027	59.4	569.5	$4,099.2	$8,566.0	$256.2	$118.7	$15.7	$390.6	$8.1	$87.3
2028	62.5	592.0	$4,397.0	$9,136.4	$274.8	$126.6	$16.8	$418.2	$8.6	$93.1
2029	65.4	618.9	$4,739.2	$9,773.9	$296.2	$135.4	$18.0	$449.5	$9.2	$99.6
2030	68.8	645.7	$5,075.3	$10,454.7	$317.2	$144.8	$19.2	$481.2	$9.8	$106.5
2031	72.4	675.4	$5,457.7	$11,190.2	$341.1	$155.0	$20.6	$516.7	$10.5	$114.0
2032	76.1	709.3	$5,879.8	$12,010.7	$367.5	$166.4	$22.1	$555.9	$11.3	$122.3
2033	79.7	741.7	$6,304.2	$12,825.2	$394.0	$177.7	$23.6	$595.2	$12.1	$130.6
2034	83.9	774.9	$6,739.0	$13,705.0	$421.2	$189.8	$25.2	$636.2	$12.9	$139.6
2035	88.4	816.6	$7,297.8	$14,730.4	$456.1	$204.1	$27.1	$687.2	$13.9	$150.0

1. Revenues from the oil and gas conservation fee fund the Division of Oil, Gas and Mining.

Source: BEBR analysis.

The baseline forecast also shows the state would receive $4.8 million in conservation fees and $52.1 million in county property taxes in 2017. County property taxes are not part of the state's revenue share. These would flow to the counties where production occurs. Our model does not provide county-specific production. We have also estimated the royalty revenue that would flow to SITLA. These projections are shown in Chapter 2, Section 2.2.2.

Oil and Gas Forecast 2: Reference Prices, 50% on Existing and 100% on New Royalty Sharing, Baseline Drilling, 12.5% Royalty

This scenario departs from that of Forecast 1 only in that the state's share of royalties from new wells drilled after the beginning of 2017 on lands currently federal is 100 percent, rather than 50 percent.

Under the assumptions of this forecast, the median predicted inflation-adjusted royalties accruing to the state rise from $154.9 million in 2017 to $253.4 million in 2022, peaking at $794.1 million in 2035. Severance taxes and sales tax revenues in 2017 are expected to total $80.2 million, which increases to $97.7 million in 2022. Because we assume no increase in production in this forecast, tax revenues remain at the same level as in Forecast 1. The revenues produced in Forecast 2 are not sufficient to cover the state's land management costs in 2017; however, they are by 2023.

The benefit to the state of increasing the revenue share to 100 percent on new production is apparent in this forecast. Initially this change provides an $8.3 million premium, which increases significantly over time. By 2022 that premium increases to $71.8 million, and to $338 million by the end of the forecast period. This is because production from existing wells will naturally decline over time and that production is being replaced with new wells from which Utah receives a higher royalty share.

Table 3.4 shows the revenue projections produced under Forecast 2.

Table 3.4
Oil and Gas Forecast 2:
Reference Prices, 50% on Existing & 100% on New Royalty Sharing, Baseline Drilling, 12.5% Royalty
(Dollar Amounts in Millions of Constant 2013 Dollars)

Year	Oil Volume (million bbls)	Gas Volume (bcf)	Federal Value	Total Value	State Royalties	Severance Tax	Sales Tax	State Total	Conservation Fee[1]	County Property Taxes
2017	40.8	447.3	$2,346.1	$5,111.8	$154.9	$70.8	$9.4	$235.1	$4.8	$52.1
2018	41.4	448.9	$2,433.3	$5,265.8	$173.7	$72.9	$9.7	$256.3	$5.0	$53.6
2019	42.4	452.8	$2,455.4	$5,334.6	$186.7	$73.9	$9.8	$270.4	$5.0	$54.3
2020	43.6	458.4	$2,544.1	$5,519.6	$203.7	$76.5	$10.1	$290.3	$5.2	$56.2
2021	45.1	468.6	$2,722.8	$5,871.7	$228.0	$81.3	$10.8	$320.2	$5.5	$59.8
2022	46.9	479.5	$2,905.5	$6,231.2	$253.4	$86.3	$11.4	$351.2	$5.9	$63.5
2023	49.0	493.5	$3,106.1	$6,642.0	$281.5	$92.0	$12.2	$385.7	$6.2	$67.7
2024	51.2	509.5	$3,327.7	$7,063.9	$312.0	$97.9	$13.0	$422.8	$6.6	$72.0
2025	54.1	530.0	$3,582.7	$7,572.9	$340.6	$104.9	$13.9	$459.5	$7.1	$77.1
2026	56.4	547.5	$3,825.8	$8,026.4	$371.5	$111.2	$14.7	$497.4	$7.6	$81.8
2027	59.4	569.5	$4,099.2	$8,566.0	$402.6	$118.7	$15.7	$537.0	$8.1	$87.3
2028	62.5	592.0	$4,397.0	$9,136.4	$436.9	$126.6	$16.8	$580.2	$8.6	$93.1
2029	65.4	618.9	$4,739.2	$9,773.9	$479.7	$135.4	$18.0	$633.1	$9.2	$99.6
2030	68.8	645.7	$5,075.3	$10,454.7	$523.7	$144.8	$19.2	$687.7	$9.8	$106.5
2031	72.4	675.4	$5,457.7	$11,190.2	$568.3	$155.0	$20.6	$743.8	$10.5	$114.0
2032	76.1	709.3	$5,879.8	$12,010.7	$619.7	$166.4	$22.1	$808.2	$11.3	$122.3
2033	79.7	741.7	$6,304.2	$12,825.2	$674.7	$177.7	$23.6	$875.9	$12.1	$130.6
2034	83.9	774.9	$6,739.0	$13,705.0	$729.7	$189.8	$25.2	$944.7	$12.9	$139.6
2035	88.4	816.6	$7,297.8	$14,730.4	$794.1	$204.1	$27.1	$1,025.2	$13.9	$150.0

1. Revenues from the oil and gas conservation fee fund the Division of Oil, Gas and Mining.

Source: BEBR analysis.

Oil and Gas Forecast 3: Reference Prices, 50% on Existing and 100% on New Royalty Sharing, Baseline Drilling + 15%, 12.5% Royalty

This scenario departs from that of Forecast 1 in two ways: (1) the state's share of royalties from new wells drilled after the beginning of 2017 on lands currently federal is 100 percent rather than 50 percent, and (2) the number of new wells drilled increases 15 percent over the baseline estimate.

Under these assumptions, we project state revenues to be $245.4 million in 2017, which includes $163.0 million in royalties and $82.4 million in tax revenue. This is a net increase of $18.6 million over the estimates produced in Forecast 1. In this forecast, the volume of production increases slightly but steadily because of the scaling factor for new wells (15 percent more than the baseline forecast). This produces an increase in production that translates to more royalties and more tax revenues. Although the revenues produced in Forecast 3 are higher than those produced in Forecast 2 and in the Baseline forecast, they are not sufficient to cover the estimated land management costs. By 2022, royalties are forecast to increase to $279.6 million with tax revenues of $102.2 million. Therefore, the combination of royalties and tax revenue is sufficient to cover land management costs within five years. p

Again, as production from existing wells begins to naturally decline and a larger number of new wells come into production, the state's royalty revenue increases significantly. By the end of the forecast period total state revenues are projected to be $1.1 billion, which includes $899.6 million in royalties and $248.8 million in tax revenues. Table 3.5 shows the revenue projections produced in Forecast 3.

Table 3.5
Oil and Gas Forecast 3:
Reference Prices, 50% on Existing & 100% on New Royalty Sharing, Baseline + 15% Drilling, 12.5% Royalty
(Dollar Amounts in Millions of Constant 2013 Dollars)

Year	Oil Volume (million bbls)	Gas Volume (bcf)	Federal Value	Total Value	State Royalties	Severance Tax	Sales Tax	State Total	Conservation Fee[1]	County Property Taxes
2017	41.8	461.9	$2,454.4	$5,252.3	$163.0	$72.8	$9.6	$245.4	$4.9	$53.5
2018	42.3	465.2	$2,561.9	$5,433.7	$185.4	$75.3	$10.0	$270.7	$5.1	$55.3
2019	43.7	471.7	$2,641.5	$5,521.9	$200.9	$76.5	$10.1	$287.5	$5.2	$56.2
2020	45.2	480.3	$2,724.1	$5,745.4	$221.0	$79.6	$10.6	$311.1	$5.4	$58.5
2021	46.8	493.9	$2,930.8	$6,128.4	$249.5	$84.9	$11.3	$345.6	$5.8	$62.4
2022	48.7	506.9	$3,145.8	$6,514.6	$279.6	$90.2	$12.0	$381.8	$6.1	$66.4
2023	51.1	522.5	$3,382.5	$6,961.0	$312.0	$96.4	$12.8	$421.2	$6.5	$70.9
2024	53.5	542.9	$3632.3	$7,440.8	$346.5	$103.1	$13.7	$463.2	$7.0	$75.8
2025	56.7	569.0	$3,925.1	$8,004.2	$380.3	$110.9	$14.7	$505.9	$7.5	$81.5
2026	59.2	589.0	$4,209.2	$8,495.4	$414.1	$117.7	$15.6	$547.4	$8.0	$86.5
2027	62.4	613.4	$4,528.0	$9,081.5	$452.8	$125.8	$16.7	$595.3	$8.5	$92.5
2028	65.9	640.5	$4,871.7	$9,717.9	$493.3	$134.6	$17.8	$645.8	$9.1	$99.0
2029	69.2	670.8	$5,248.8	$10,426.1	$541.8	$144.4	$19.1	$705.4	$9.8	$106.2
2030	72.7	699.6	$5,651.4	$11,152.7	$591.5	$154.5	$20.5	$766.4	$10.5	$113.6
2031	76.8	734.6	$6,085.5	$11,978.7	$644.1	$165.9	$22.0	$832.0	$11.3	$122.0
2032	80.7	772.5	$6,586.8	$12,861.8	$700.5	$178.2	$23.6	$902.3	$12.1	$131.0
2033	84.6	809.8	$7,072.4	$13,754.3	$763.4	$190.5	$25.3	$979.2	$12.9	$140.1
2034	89.4	846.2	$7,589.5	$14,738.2	$826.2	$204.2	$27.1	$1,057.4	$13.9	$150.1
2035	94.3	894.3	$8,205.0	$15,857.1	$899.6	$219.7	$29.1	$1,148.4	$14.9	$161.5

1. Revenues from the oil and gas conservation fee fund the Division of Oil, Gas and Mining.

Source: BEBR analysis.

Oil and Gas Forecast 4: Reference Prices, 100% on Existing and 100% on New Royalty Sharing, Baseline Drilling + 15%, 12.5% Royalty

This forecast departs from that of Forecast 3 in one way—the state would receive the royalties on all production (both existing and new). This more aggressive approach produces a significant benefit to the state.

This one change increases the state's royalty payment in 2017 by $143.8 million over the amount projected in Forecast 3. With this more aggressive approach, we project the state would receive $306.8 million in royalties compared to $163 million under the more conservative royalty share assumption. By 2022, total revenue from oil and gas production climbs to $495.4 million, an increase of $113.6 million over the amount generated in Forecast 3.

In Forecast 4, the state could cover all the land management costs and realize a net benefit of almost $27 million. By 2022, the net benefit increases to $216.4 million. The effects of this more aggressive approach increase over time. Beginning in 2032, we project the state would receive more than $1.0 billion annually in revenues related to oil and gas production.

Table 3.6
Oil and Gas Forecast 4:
Reference Prices, 100% on Existing & 100% on New Royalty Sharing, Baseline + 15% Drilling, 12.5% Royalty
(Dollar Amounts in Millions of Constant 2013 Dollars)

Year	Oil Volume (million bbls)	Gas Volume (bcf)	Federal Value	Total Value	State Royalties	Severance Tax	Sales Tax	State Total	Conservation Fee[1]	County Property Taxes
2017	41.8	461.9	$2,454.4	$5,252.3	$306.8	$72.8	$9.6	$389.2	$4.9	$53.5
2018	42.3	465.2	$2,561.9	$5,433.7	$320.2	$75.3	$10.0	$405.5	$5.1	$55.3
2019	43.7	471.7	$2,641.5	$5,521.9	$326.8	$76.5	$10.1	$413.4	$5.2	$56.2
2020	45.2	480.3	$2,724.1	$5,745.4	$340.5	$79.6	$10.6	$430.7	$5.4	$58.5
2021	46.8	493.9	$2,930.8	$6,128.4	$366.4	$84.9	$11.3	$462.5	$5.8	$62.4
2022	48.7	506.9	$3,145.8	$6,514.6	$393.2	$90.2	$12.0	$495.4	$6.1	$66.4
2023	51.1	522.5	$3,382.5	$6,961.0	$422.8	$96.4	$12.8	$532.0	$6.5	$70.9
2024	53.5	542.9	$3632.3	$7,440.8	$454.0	$103.1	$13.7	$570.8	$7.0	$75.8
2025	56.7	569.0	$3,925.1	$8,004.2	$490.6	$110.9	$14.7	$616.2	$7.5	$81.5
2026	59.2	589.0	$4,209.2	$8,495.4	$526.1	$117.7	$15.6	$659.4	$8.0	$86.5
2027	62.4	613.4	$4,528.0	$9,081.5	$566.0	$125.8	$16.7	$708.5	$8.5	$92.5
2028	65.9	640.5	$4,871.7	$9,717.9	$609.0	$134.6	$17.8	$761.4	$9.1	$99.0
2029	69.2	670.8	$5,248.8	$10,426.1	$656.1	$144.4	$19.1	$819.7	$9.8	$106.2
2030	72.7	699.6	$5,651.4	$11,152.7	$706.4	$154.5	$20.5	$881.4	$10.5	$113.6
2031	76.8	734.6	$6,085.5	$11,978.7	$760.7	$165.9	$22.0	$948.6	$11.3	$122.0
2032	80.7	772.5	$6,586.8	$12,861.8	$823.4	$178.2	$23.6	$1,025.1	$12.1	$131.0
2033	84.6	809.8	$7,072.4	$13,754.3	$884.0	$190.5	$25.3	$1,099.8	$12.9	$140.1
2034	89.4	846.2	$7,589.5	$14,738.2	$948.7	$204.2	$27.1	$1,179.9	$13.9	$150.1
2035	94.3	894.3	$8,205.0	$15,857.1	$1,025.6	$219.7	$29.1	$1,274.4	$14.9	$161.5

1. Revenues from the oil and gas conservation fee fund the Division of Oil, Gas and Mining.

Source: BEBR analysis.

Oil and Gas Forecast 5: Reference Prices, 100% on Existing & 100% on New Royalty Sharing, Baseline Drilling + 15%, 16.7% Royalty
Forecast 4 assumes the aggressive approach of Forecast 3 and adds to it by increasing the royalty rate from 12.5 percent to 16.7 percent. This is the most aggressive forecast we developed. This approach produces significantly more revenue for the state in both the short term and over time.

In 2017, this aggressive approach would produce $422 million in revenue, which includes $340.1 million in royalties, $72.3 million in severance taxes, and $9.6 million in state sale taxes. This is a net increase of $195.2 million over the results produced in Forecast 1. Within five years, total revenue to the state is $535.6 million ($438 million in royalties and $97.2 million in tax revenues), for a net increase of $257.2 million over the amounts shown in Forecast 1. Under the aggressive assumptions in Forecast 5 the state could cover all of the land management costs and realize a net benefit of $142 million in 2017. By 2022, the net benefit (revenue less land management costs) increases to $256.6 million.

Revenues from all sources increase in this scenario, but most of the growth comes from changing the state's royalty share to 100 percent on all production. With that change, the state realizes a significant increase in oil and gas royalty payments immediately. Looking at the difference in production volumes under Forecast 4 and Forecast 5, it appears that increasing the royalty rate has an immediate dampening effect on production. So, although the revenue from royalties is much higher, the revenue from severance and sales taxes is lower than in Forecast 4 (Table 3.7).

Table 3.7
Oil and Gas Forecast 5:
Reference Prices, 100% on Existing & 100% on New Royalty Sharing, Baseline +15% Drilling, 16.7% Royalty
(Dollar Amounts in Millions of Constant 2013 Dollars)

Year	Oil Volume (million bbls)	Gas Volume (bcf)	Federal Value	Total Value	State Royalties	Severance Tax	Sales Tax	State Total	Conservation Fee[1]	County Property Taxes
2017	41.7	456.8	$2,437.6	$5,222.1	$340.1	$72.3	$9.6	$422.0	$4.9	$53.2
2018	42.2	456.6	$2,520.0	$5,362.0	$356.8	$74.3	$9.8	$440.9	$5.0	$54.6
2019	43.0	459.0	$2,546.2	$5,407.1	$365.5	$74.9	$9.9	$450.3	$5.1	$55.1
2020	44.0	461.3	$2,626.9	$5,568.5	$381.5	$77.1	$10.2	$468.9	$5.2	$56.7
2021	45.2	467.8	$2,791.2	$5,881.9	$409.4	$81.5	$10.8	$501.7	$5.5	$59.9
2022	46.8	474.5	$2,959.4	$6,195.1	$438.4	$85.8	$11.4	$535.6	$5.8	$63.1
2023	48.2	488.4	$3,158.3	$6,547.1	$472.3	$90.7	$12.0	$575.0	$6.2	$66.7
2024	50.3	504.4	$3,371.7	$6,964.0	$508.5	$96.5	$12.8	$617.7	$6.6	$70.9
2025	52.4	517.4	$3,583.7	$7,355.2	$544.5	$101.9	$13.5	$659.9	$6.9	$74.9
2026	55.0	539.4	$3,847.8	$7,851.8	$589.2	$108.8	$14.4	$712.4	$7.4	$80.0
2027	57.4	562.1	$4,104.1	$8,337.0	$632.5	$115.5	$15.3	$763.3	$7.8	$84.9
2028	59.6	579.2	$4,364.9	$8,796.1	$676.4	$121.8	$16.2	$814.4	$8.3	$89.6
2029	62.2	597.9	$4,660.0	$9,344.0	$725.8	$129.4	$17.2	$872.4	$8.8	$95.2
2030	65.3	618.6	$4,993.8	$9,953.5	$781.6	$137.9	$18.3	$937.7	$9.4	$101.4
2031	68.0	642.6	$5,326.3	$10,559.4	$837.2	$146.3	$19.4	$1,002.9	$9.9	$107.6
2032	71.3	670.8	$5,708.3	$11,292.5	$901.0	$156.4	$20.7	$1,078.1	$10.6	$115.0
2033	74.4	702.6	$6,126.3	$12,032.8	$970.7	$166.7	$22.1	$1,159.5	$11.3	$122.6
2034	78.2	734.4	$6,541.8	$12,854.1	$1,040.2	$178.1	$23.6	$1,241.8	$12.1	$130.9
2035	81.6	769.4	$7,018.3	$13,692.3	$1,119.6	$189.7	$25.1	$1,334.4	$12.9	$139.5

1. Revenues from the oil and gas conservation fee fund the Division of Oil, Gas and Mining.
Source: BEBR analysis.

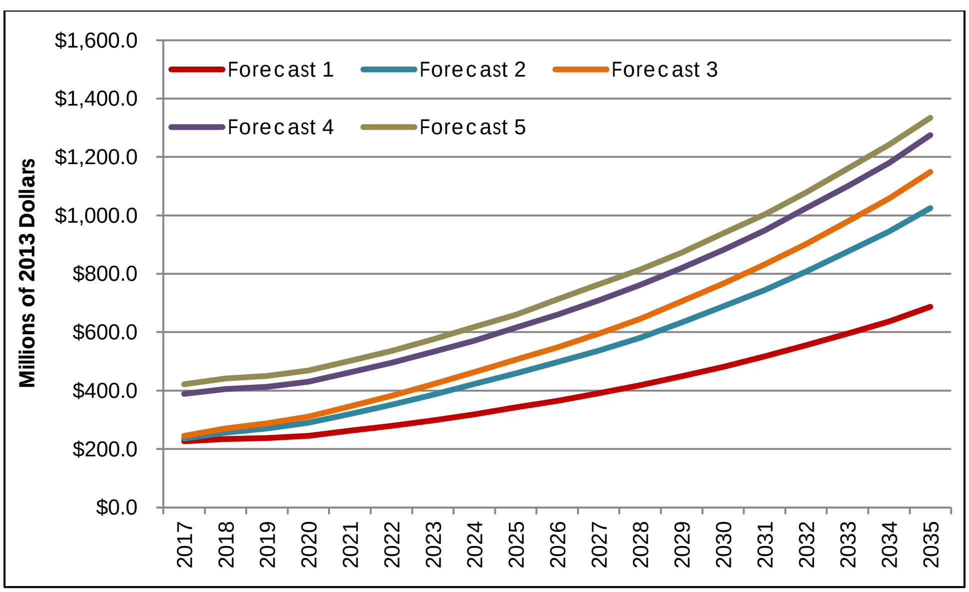
Table 3.8 and Figure 3.1 summarize the net revenues produced under all Reference Price forecasts relative to the baseline forecast.

Table 3.8
Oil and Gas Reference Price Scenarios Net Effects Summary
(Dollar Amounts in Millions of Constant 2013 Dollars)

	Forecast 1: Baseline		Forecast 2		Forecast 3		Forecast 4		Forecast 5	
Fiscal Year	State Royalties	State Total	State Royalties	State Total	State Royalties	State Total	State Royalties	State Total	State Royalties	State Total
2017	$146.6	$226.8	$8.3	$8.3	$16.4	$18.6	$160.2	$80.0	$193.5	$195.2
2018	$152.1	$234.7	$21.6	$21.6	$33.3	$36.0	$168.1	$85.5	$204.7	$206.2
2019	$153.5	$237.2	$33.2	$33.2	$47.4	$50.3	$173.3	$89.6	$212.0	$213.1
2020	$159.0	$245.6	$44.7	$44.7	$62.0	$65.6	$181.5	$94.9	$222.5	$223.3
2021	$170.2	$262.3	$57.8	$57.8	$79.3	$83.4	$196.2	$104.1	$239.2	$239.4
2022	$181.6	$279.4	$71.9	$71.9	$98.0	$102.4	$211.6	$113.8	$256.8	$256.2
2023	$194.1	$298.3	$87.4	$87.4	$117.9	$122.9	$228.7	$124.5	$278.2	$276.7
2024	$208.0	$318.8	$104.2	$104.2	$138.5	$144.5	$246.0	$135.2	$300.5	$298.9
2025	$223.9	$342.7	$116.8	$116.8	$156.4	$163.2	$266.7	$147.9	$320.6	$317.2
2026	$239.1	$365.0	$132.4	$132.4	$175.0	$182.4	$287.0	$161.1	$350.1	$347.4
2027	$256.2	$390.6	$146.4	$146.4	$196.6	$204.7	$309.8	$175.4	$376.3	$372.7
2028	$274.8	$418.2	$162.1	$162.1	$218.5	$227.5	$334.2	$190.8	$401.6	$396.2
2029	$296.2	$449.5	$183.5	$183.5	$245.6	$255.8	$359.9	$206.6	$429.6	$422.9
2030	$317.2	$481.2	$206.5	$206.5	$274.3	$285.3	$389.2	$225.2	$464.4	$456.5
2031	$341.1	$516.7	$227.2	$227.2	$303.0	$315.3	$419.6	$244.0	$496.1	$486.2
2032	$367.5	$555.9	$252.2	$252.2	$333.0	$346.4	$455.9	$267.5	$533.5	$522.2
2033	$394.0	$595.2	$280.7	$280.7	$369.4	$384.0	$490.0	$288.8	$576.7	$564.3
2034	$421.2	$636.2	$308.5	$308.5	$405.0	$421.3	$527.5	$312.5	$619.0	$605.6
2035	$456.1	$687.2	$338.0	$338.0	$443.5	$461.2	$569.5	$338.4	$663.5	$647.2

Source: BEBR analysis.

Figure 3.1
Oil and Gas Royalties and Tax Revenues, Reference Price Forecasts 1 to 5



Source: BEBR analysis.

Low Price Forecast Scenarios

Oil and Gas Forecast 6—Low Price Baseline: 50% on Existing and 50% on New Royalty Sharing, Baseline Drilling, 12.5% Royalty Rate

In this scenario, the "low" oil and natural gas prices assumed for the period 2014–2035 were created by BEBR as a "what if" scenario. For these forecasts, prices follow the EIA reference price paths until the first date at which prices are rising (this point occurs in 2015 for natural gas prices and in 2017 for oil prices). At these points, the "low" forecasts diverge from the reference forecasts, with the low forecasts decreasing at a constant rate toward $40 per barrel for oil and $3.00 per Mcf for natural gas in the year 2036. All other parameters used in this forecast are the same as those described in Forecast 1.

The relationship between price and production is exemplified in the Low Price forecasts. At lower oil and gas prices, the volume of production is substantially less than the volumes produced in Forecast 1. In Forecast 6, production ranges between 40 and 43 million barrels annually over the forecast period compared with the stepwise increases seen in Forecast 1.

Under the assumptions in Forecast 6, the median predicted inflation-adjusted royalties accruing to the state total $130.1 million (a decline of $16.5 million from Forecast 1), rising to $122.0 million by 2022 (almost $60 million less than in Forecast 1).

At the lower price forecast, royalties begin to decline immediately starting in 2018. These decreases continue over the forecast period. By 2035, royalties from oil and gas production are projected to be just $84.9 million.

Table 3.9
Oil and Gas Forecast 6 Low Price Baseline:
50% on Existing & 50% on New Royalty Sharing, Baseline Drilling, 12.5% Royalty
(Dollar Amounts in Millions of Constant 2013 Dollars)

Year	Oil Volume (million bbls)	Gas Volume (bcf)	Federal Value	Total Value	State Royalties	Severance Tax	Sales Tax	State Total	Conservation Fee[1]	County Property Taxes
2017	40.5	436.9	$2,081.9	$4,629.5	$130.1	$64.1	$8.5	$202.7	$4.4	$47.2
2018	41.1	431.9	$2,059.5	$4,570.5	$128.7	$63.3	$8.4	$200.4	$4.3	$46.6
2019	41.6	429.0	$2,038.2	$4,507.6	$127.4	$62.4	$8.3	$198.1	$4.2	$45.9
2020	42.0	427.5	$2,012.3	$4,437.2	$125.8	$61.5	$8.1	$195.4	$4.2	$45.2
2021	42.2	425.2	$1,981.5	$4,354.7	$123.8	$60.3	$8.0	$192.2	$4.1	$44.4
2022	42.5	422.0	$1,951.5	$4,275.1	$122.0	$59.2	$7.9	$189.0	$4.0	$43.5
2023	42.8	418.6	$1,915.7	$4,189.6	$119.7	$58.0	$7.7	$185.5	$3.9	$42.7
2024	43.0	416.8	$1,881.0	$4,105.6	$117.6	$56.9	$7.5	$182.0	$3.9	$41.8
2025	43.0	414.6	$1,840.8	$4,007.1	$115.1	$55.5	$7.4	$177.9	$3.8	$40.8
2026	42.9	411.7	$1,792.3	$3,901.7	$112.0	$54.0	$7.2	$173.2	$3.7	$39.7
2027	42.9	408.1	$1,752.6	$3,798.4	$109.5	$52.6	$7.0	$169.1	$3.6	$38.7
2028	42.7	404.0	$1,705.7	$3,682.7	$106.6	$51.0	$6.8	$164.4	$3.5	$37.5
2029	42.8	401.0	$1,657.3	$3,584.1	$103.6	$49.6	$6.6	$159.8	$3.4	$36.5
2030	42.7	397.3	$1,613.6	$3,477.7	$100.8	$48.2	$6.4	$155.4	$3.3	$35.4
2031	42.6	393.5	$1,565.5	$3,370.5	$97.8	$46.7	$6.2	$150.7	$3.2	$34.3
2032	42.3	390.7	$1,515.7	$3,255.6	$94.7	$45.1	$6.0	$145.8	$3.1	$33.2
2033	42.0	386.4	$1,465.4	$3,139.1	$91.6	$43.5	$5.8	$140.8	$3.0	$32.0
2034	41.7	381.2	$1,410.2	$3,021.2	$88.1	$41.9	$5.5	$135.5	$2.8	$30.8
2035	41.4	376.2	$1,357.8	$2,905.1	$84.9	$40.2	$5.3	$130.4	$2.7	$29.6

1. Revenues from the oil and gas conservation fee fund the Division of Oil, Gas and Mining.

Source: BEBR analysis.

Oil and Gas Forecast 7—Low Price Baseline: 50% on Existing and 100% on New Royalty Sharing, Baseline Drilling, 12.5% Royalty Rate

The assumptions for Forecast 7 are the same as those described in Forecast 2. The effects of price on production can be seen in the difference between the outputs in each forecast.

Under the assumptions in Forecast 7, royalties are projected to be $138.1 million in 2017, with severance taxes and sales taxes providing an additional $72.6 million. This is $16.8 million less in royalties than was projected in Forecast 2. From 2017 to 2023 royalties increase slowly, reaching $164.5 million, and then begin to decline steadily. At the lower oil and gas price forecast, there would not be sufficient revenues to cover the land management costs at any time over the forecast period.

In Forecast 7, state royalties are lower in 2035 than they were at the start of the forecast period.

Table 3.10 shows the royalties, taxes and fees generated in Forecast 7.

Table 3.10
Oil and Gas Forecast 7:
Low Prices, 50% on Existing & 100% on New Royalty Sharing, Baseline Drilling, 12.5% Royalty
(Dollar Amounts in Millions of Constant 2013 Dollars)

Year	Oil Volume (million bbls)	Gas Volume (bcf)	Federal Value	Total Value	State Royalties	Severance Tax	Sales Tax	State Total	Conservation Fee[1]	County Property Taxes
2017	40.5	436.9	$2,081.9	$4,629.5	$138.1	$64.1	$8.5	$210.7	$4.4	$47.2
2018	41.1	431.9	$2,059.5	$4,570.5	$147.6	$63.3	$8.4	$219.3	$4.3	$46.6
2019	41.6	429.0	$2,038.2	$4,507.6	$154.7	$62.4	$8.3	$225.4	$4.2	$45.9
2020	42.0	427.5	$2,012.3	$4,437.2	$159.4	$61.5	$8.1	$229.0	$4.2	$45.2
2021	42.2	425.2	$1,981.5	$4,354.7	$163.4	$60.3	$8.0	$231.7	$4.1	$44.4
2022	42.5	422.0	$1,951.5	$4,275.1	$164.3	$59.2	$7.9	$231.4	$4.0	$43.5
2023	42.8	418.6	$1,915.7	$4,189.6	$164.5	$58.0	$7.7	$230.2	$3.9	$42.7
2024	43.0	416.8	$1,881.0	$4,105.6	$163.0	$56.9	$7.5	$227.4	$3.9	$41.8
2025	43.0	414.6	$1,840.8	$4,007.1	$161.8	$55.5	$7.4	$224.7	$3.8	$40.8
2026	42.9	411.7	$1,792.3	$3,901.7	$159.8	$54.0	$7.2	$221.0	$3.7	$39.7
2027	42.9	408.1	$1,752.6	$3,798.4	$157.4	$52.6	$7.0	$217.0	$3.6	$38.7
2028	42.7	404.0	$1,705.7	$3,682.7	$154.9	$51.0	$6.8	$212.7	$3.5	$37.5
2029	42.8	401.0	$1,657.3	$3,584.1	$152.0	$49.6	$6.6	$208.2	$3.4	$36.5
2030	42.7	397.3	$1,613.6	$3,477.7	$148.7	$48.2	$6.4	$203.3	$3.3	$35.4
2031	42.6	393.5	$1,565.5	$3,370.5	$145.2	$46.7	$6.2	$198.1	$3.2	$34.3
2032	42.3	390.7	$1,515.7	$3,255.6	$141.1	$45.1	$6.0	$192.2	$3.1	$33.2
2033	42.0	386.4	$1,465.4	$3,139.1	$137.5	$43.5	$5.8	$186.8	$3.0	$32.0
2034	41.7	381.2	$1,410.2	$3,021.2	$132.9	$41.9	$5.5	$180.3	$2.8	$30.8
2035	41.4	376.2	$1,357.8	$2,905.1	$129.0	$40.2	$5.3	$174.6	$2.7	$29.6

1. Revenues from the oil and gas conservation fee fund the Division of Oil, Gas and Mining.

Source: BEBR analysis.

Oil and Gas Forecast 8—Low Price Baseline: 50% on Existing and 100% on New Royalty Sharing, Baseline Drilling + 15, 12.5% Royalty Rate

The assumptions in Forecast 8 are the same as those in Forecast 3. Under the assumptions in Forecast 8, we project royalties to be $144.9 million in 2017, or $18 million lower than in Forecast 3. Royalties increase slowly from 2017 to 2023, then begin to decline over the rest of the forecast period, driven by decreasing production of natural gas.

In this forecast, production is slightly higher than in Forecast 6 and Forecast 7 because of the increase in the number of new wells over the baseline level. However, low prices are a disincentive to drill new wells, and as production at existing wells gradually declines, they are not being replaced. Therefore, we see revenue dropping steadily beginning in 2024. By 2035, royalties are projected to be $142.8 million—$2.1 million lower than in 2017 and almost $756.8 million less than in the high-price counterpart Forecast 3.

At the lower oil and gas price forecast, there would not be sufficient revenues to cover the land management costs at any time over the forecast period in Forecast 8.

Table 3.11 shows the revenue projections produced under the moderately aggressive approach.

Table 3.11
Oil and Gas Forecast 8:
Low Prices, 50% on Existing & 100% on New Royalty Sharing, Baseline + 15% Drilling, 12.5% Royalty
(Dollar Amounts in Millions of Constant 2013 Dollars)

Year	Oil Volume (million bbls)	Gas Volume (bcf)	Federal Value	Total Value	State Royalties	Severance Tax	Sales Tax	State Total	Conservation Fee[1]	County Property Taxes
2017	41.5	449.1	$2,178.3	$4,747.3	$144.9	$65.8	$8.7	$219.4	$4.5	$48.4
2018	42.3	446.1	$2,176.5	$4,703.6	$156.7	$65.2	$8.6	$230.5	$4.4	$47.9
2019	42.9	445.5	$2,164.9	$4,655.4	$165.8	$64.5	$8.6	$238.8	$4.4	$47.4
2020	43.4	445.3	$2,148.2	$4,599.1	$172.1	$63.7	$8.4	$244.2	$4.3	$46.8
2021	43.8	444.0	$2,124.9	$4,529.4	$177.3	$62.7	$8.3	$248.3	$4.3	$46.1
2022	44.3	442.2	$2,095.5	$4,459.3	$179.5	$61.8	$8.2	$249.5	$4.2	$45.4
2023	44.5	439.2	$2,064.3	$4,368.2	$180.3	$60.5	$8.0	$248.8	$4.1	$44.5
2024	44.7	438.3	$2,032.5	$4,282.8	$179.2	$59.3	$7.9	$246.4	$4.0	$43.6
2025	44.8	436.5	$1,989.1	$4,292.1	$177.7	$58.1	$7.7	$243.5	$3.9	$42.7
2026	44.9	434.1	$1,943.8	$4,091.2	$175.8	$56.7	$7.5	$239.9	$3.8	$41.7
2027	44.9	430.5	$1,899.6	$3,984.3	$173.6	$55.2	$7.3	$236.1	$3.7	$40.6
2028	44.6	427.0	$1,850.3	$3,863.3	$170.8	$53.5	$7.1	$231.4	$3.6	$39.4
2029	44.6	424.5	$1,802.5	$3,759.4	$167.8	$52.1	$6.9	$226.7	$3.5	$38.3
2030	44.6	420.9	$1,752.6	$3,653.3	$164.2	$50.6	$6.7	$221.5	$3.4	$37.2
2031	44.4	417.0	$1,704.1	$3,533.9	$160.6	$49.0	$6.5	$216.0	$3.3	$36.0
2032	44.1	413.9	$1,649.1	$3,415.7	$156.5	$47.3	$6.3	$210.0	$3.2	$34.8
2033	43.9	410.1	$1,596.6	$3,298.8	$152.4	$45.7	$6.1	$204.1	$3.1	$33.6
2034	43.6	404.6	$1,539.6	$3,179.1	$147.5	$44.0	$5.8	$197.4	$3.0	$32.4
2035	43.2	399.6	$1,481.4	$3,054.0	$142.8	$42.3	$5.6	$190.8	$2.9	$31.1

1. Revenues from the oil and gas conservation fee fund the Division of Oil, Gas and Mining.

Source: BEBR analysis.

Oil and Gas Forecast 9—Low Price Baseline: 100% on Existing and 100% on New Royalty Sharing, Baseline Drilling + 15, 12.5% Royalty Rate

This forecast departs from that of Forecast 8 in one way—the state would receive the royalties on all production (both existing and new). This more aggressive approach finally produces enough revenue to cover the state's land management costs even at the lower price forecast.

In 2017, this change increases the state's royalty payment by $127.4 million over the amount projected in Forecast 8. With this more aggressive approach, we project the state would receive $272.3 million in royalties compared with $144.9 million under the more conservative royalty share assumption. When royalties and taxes are combined, the state would realize a total of $346.8 million in 2017, which would be sufficient to cover the land management costs.

Unfortunately, the advantages of increasing the revenue share do not outweigh the effects of low prices and we start to see an immediate decline in royalties beginning in 2018. This decline continues over the forecast period. From 2029 forward, if low prices prevail, the state would not be able to cover its land costs, even if tax revenues are added to the royalty payments (Table 3.12).

Table 3.12
Oil and Gas Forecast 9:
Low Prices, 100% on Existing & 100% on New Royalty Sharing, Baseline + 15% Drilling, 12.5% Royalty
(Dollar Amounts in Millions of Constant 2013 Dollars)

Year	Oil Volume (million bbls)	Gas Volume (bcf)	Federal Value	Total Value	State Royalties	Severance Tax	Sales Tax	State Total	Conservation Fee[1]	County Property Taxes
2017	41.5	449.1	$2,178.3	$4,747.3	$272.3	$65.8	$8.7	$346.8	$4.5	$48.4
2018	42.3	446.1	$2,176.5	$4,703.6	$272.1	$65.2	$8.6	$345.9	$4.4	$47.9
2019	42.9	445.5	$2,164.9	$4,655.4	$270.6	$64.5	$8.6	$343.7	$4.4	$47.4
2020	43.4	445.3	$2,148.2	$4,599.1	$268.5	$63.7	$8.4	$340.7	$4.3	$46.8
2021	43.8	444.0	$2,124.9	$4,529.4	$265.6	$62.7	$8.3	$336.7	$4.3	$46.1
2022	44.3	442.2	$2,095.5	$4,459.3	$261.9	$61.8	$8.2	$331.9	$4.2	$45.4
2023	44.5	439.2	$2,064.3	$4,368.2	$258.0	$60.5	$8.0	$326.6	$4.1	$44.5
2024	44.7	438.3	$2,032.5	$4,282.8	$254.1	$59.3	$7.9	$321.3	$4.0	$43.6
2025	44.8	436.5	$1,989.1	$4,292.1	$248.6	$58.1	$7.7	$314.4	$3.9	$42.7
2026	44.9	434.1	$1,943.8	$4,091.2	$243.0	$56.7	$7.5	$307.2	$3.8	$41.7
2027	44.9	430.5	$1,899.6	$3,984.3	$237.5	$55.2	$7.3	$300.0	$3.7	$40.6
2028	44.6	427.0	$1,850.3	$3,863.3	$231.3	$53.5	$7.1	$291.9	$3.6	$39.4
2029	44.6	424.5	$1,802.5	$3,759.4	$225.3	$52.1	$6.9	$284.3	$3.5	$38.3
2030	44.6	420.9	$1,752.6	$3,653.3	$219.1	$50.6	$6.7	$276.4	$3.4	$37.2
2031	44.4	417.0	$1,704.1	$3,533.9	$213.0	$49.0	$6.5	$268.5	$3.3	$36.0
2032	44.1	413.9	$1,649.1	$3,415.7	$206.1	$47.3	$6.3	$259.7	$3.2	$34.8
2033	43.9	410.1	$1,596.6	$3,298.8	$199.6	$45.7	$6.1	$251.3	$3.1	$33.6
2034	43.6	404.6	$1,539.6	$3,179.1	$192.4	$44.0	$5.8	$242.3	$3.0	$32.4
2035	43.2	399.6	$1,481.4	$3,054.0	$185.2	$42.3	$5.6	$233.1	$2.9	$31.1

1. Revenues from the oil and gas conservation fee fund the Division of Oil, Gas and Mining.

Source: BEBR analysis.

Oil and Gas Forecast 10—Low Price Baseline: 100% on Existing and 100% on New Royalty Sharing, Baseline Drilling + 15, 16.7% Royalty Rate

Under Forecast 10, all parameters change versus the baseline. The royalty rate on new wells increases to 16.7 percent, Utah receives 100 percent of the royalties on all production and the number of wells drilled is 15 percent more than the baseline estimate.

This aggressive approach provides the most royalty revenue for the state of any of the forecasts under the lower price assumption. In 2017, the state would receive $303.2 million in royalties, and generate $74.4 million in tax revenues. This is sufficient to cover the land management costs and continue until 2032.

As with all of the forecasts at the low price levels, production of oil and gas begins to decline quickly. Although royalty revenue is high under this more aggressive approach, it starts decreasing in 2019, due to a combination of low prices and the increased royalty rate. When prices are low, the higher royalty rate is a disincentive to new well production because it is an additional production cost.

By the end of the forecast period, if prices remain low, the state would receive just $205 million in royalties, or $98.2 million less than in 2017 (Table 3.13).

Table 3.13
Oil and Gas Forecast 10:
Low Prices, 100% on Existing & 100% on New Royalty Sharing, Baseline + 15% Drilling, 12.5% Royalty
(Dollar Amounts in Millions of Constant 2013 Dollars)

Year	Oil Volume (million bbls)	Gas Volume (bcf)	Federal Value	Total Value	State Royalties	Severance Tax	Sales Tax	State Total	Conservation Fee[1]	County Property Taxes
2017	41.5	449.4	$2,175.2	$4,744.8	$303.2	$65.7	$8.7	$377.6	$4.5	$48.3
2018	41.9	444.6	$2,156.9	$4,674.6	$304.9	$64.8	$8.6	$378.2	$4.4	$47.6
2019	42.1	441.7	$2,124.9	$4,584.1	$303.6	$63.5	$8.4	$375.5	$4.3	$46.7
2020	42.4	436.9	$2,090.5	$4,500.1	$301.3	$62.3	$8.3	$371.9	$4.2	$45.8
2021	42.3	433.7	$2,051.7	$4,391.6	$297.6	$60.8	$8.1	$366.5	$4.1	$44.7
2022	42.4	430.2	$2,012.8	$4,295.3	$293.8	$59.5	$7.9	$361.2	$4.0	$43.8
2023	42.6	427.1	$1,975.2	$4,202.7	$289.8	$58.2	$7.7	$355.8	$4.0	$42.8
2024	42.7	423.4	$1,934.3	$4,106.8	$285.1	$56.9	$7.5	$349.5	$3.9	$41.8
2025	42.7	421.0	$1,891.4	$4,007.3	$279.8	$55.5	$7.4	$342.7	$3.8	$40.8
2026	42.8	417.4	$1,849.7	$3,912.5	$274.7	$54.2	$7.2	$336.1	$3.7	$39.9
2027	42.9	414.3	$1,810.1	$3,814.9	$269.7	$52.8	$7.0	$329.6	$3.6	$38.9
2028	42.8	410.9	$1,766.2	$3,708.0	$263.9	$51.4	$6.8	$322.1	$3.5	$37.8
2029	42.7	406.6	$1,711.9	$3,599.1	$256.3	$49.9	$6.6	$312.8	$3.4	$36.7
2030	42.5	401.5	$1,659.7	$3,480.5	$248.9	$48.2	$6.4	$303.5	$3.3	$35.5
2031	42.3	395.9	$1,609.8	$3,364.3	$241.9	$46.6	$6.2	$294.6	$3.2	$34.3
2032	42.2	390.8	$1,560.8	$3,250.6	$234.9	$45.0	$6.0	$285.9	$3.1	$33.1
2033	41.9	387.9	$1,510.1	$3,140.7	$227.6	$43.5	$5.8	$276.8	$3.0	$32.0
2034	41.7	384.4	$1,458.7	$3,030.1	$220.1	$42.0	$5.6	$267.6	$2.9	$30.9
2035	41.4	380.3	$1,410.3	$2,915.6	$213.1	$40.4	$5.4	$258.8	$2.7	$29.7

1. Revenues from the oil and gas conservation fee fund the Division of Oil, Gas and Mining.

Source: BEBR analysis.

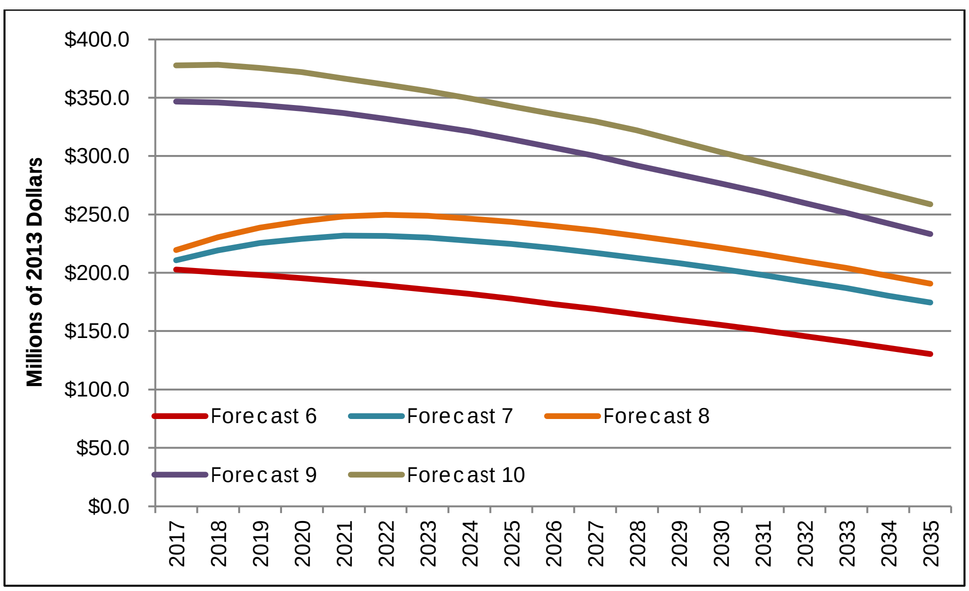
Table 3.14 and Figure 3.2 summarize the net changes from the Low Price no-transfer baseline forecast that result from the conservative and aggressive approaches to production.

Table 3.14
Oil and Gas Low Price Forecasts Net Effects Summary
(Dollar Amounts in Millions of Constant 2013 Dollars)

Fiscal Year	Forecast 6Baseline State Royalties	State Total	Forecast 7 State Royalties	State Total	Forecast 8 State Royalties	State Total	Forecast 9 State Royalties	State Total	Forecast 10 State Royalties	State Total
2017	$130.1	$202.7	$8.0	$8.0	$14.8	$16.7	$142.2	$144.1	$173.1	$174.9
2018	$128.7	$200.4	$18.9	$18.9	$28.0	$30.1	$143.4	$145.5	$176.2	$177.8
2019	$127.4	$198.1	$27.3	$27.3	$38.4	$40.7	$143.2	$145.6	$176.2	$177.4
2020	$125.8	$195.4	$33.6	$33.6	$46.3	$48.8	$142.7	$145.3	$175.5	$176.5
2021	$123.8	$192.2	$39.6	$39.6	$53.5	$56.1	$141.8	$144.5	$173.8	$174.3
2022	$122.0	$189.0	$42.3	$42.3	$57.5	$60.5	$139.9	$142.9	$171.8	$172.2
2023	$119.7	$185.5	$44.8	$44.8	$60.6	$63.3	$138.3	$141.1	$170.1	$170.3
2024	$117.6	$182.0	$45.4	$45.4	$61.6	$64.4	$136.5	$139.3	$167.5	$167.5
2025	$115.1	$177.9	$46.7	$46.7	$62.6	$65.6	$133.5	$136.5	$164.7	$164.8
2026	$112.0	$173.2	$47.8	$47.8	$63.8	$66.7	$131.0	$134.0	$162.7	$162.9
2027	$109.5	$169.1	$47.9	$47.9	$64.1	$67.0	$128.0	$130.9	$160.2	$160.5
2028	$106.6	$164.4	$48.3	$48.3	$64.2	$67.0	$124.7	$127.5	$157.3	$157.7
2029	$103.6	$159.8	$48.4	$48.4	$64.2	$66.9	$121.7	$124.5	$152.7	$153.0
2030	$100.8	$155.4	$47.9	$47.9	$63.4	$66.1	$118.3	$121.0	$148.1	$148.1
2031	$97.8	$150.7	$47.4	$47.4	$62.8	$65.3	$115.2	$117.8	$144.1	$143.9
2032	$94.7	$145.8	$46.4	$46.4	$61.8	$64.2	$111.4	$113.9	$140.2	$140.1
2033	$91.6	$140.8	$45.9	$45.9	$60.8	$63.3	$108.0	$110.5	$136.0	$136.0
2034	$88.1	$135.5	$44.8	$44.8	$59.4	$61.9	$104.3	$106.8	$132.0	$132.1
2035	$84.9	$130.4	$44.1	$44.1	$57.9	$60.4	$100.3	$102.7	$128.2	$128.4

Source: BEBR analysis.

Figure 3.2
Oil and Gas Royalties and Tax Revenues, Low Price Forecasts 6 to 10



Source: BEBR analysis.

3.2.2 Coal Projections

The future of coal mining in Utah is dependent on a complex set of economic, geological, technical and political factors. We modeled the fiscal effects of three coal scenarios provided by the Utah Geological Survey (UGS). In all three scenarios the UGS assumed there would be steady depletion at existing mines. Increases in production result from new mines opening. Under the most optimistic scenario the state gets control of the Grand Staircase–Escalante National Monument and a mine is opened in the Kaiparowits coal field. The assumptions for each scenario are provided in more detail in Chapter 13, Section 13.4.

Low Scenario Fiscal Effects

Under the Low scenario, a total of 16.4 million tons of coal are produced from Utah mines in 2017. Production drops to 11.5 million tons in 2019 and continues a slow, stepwise decline to eventually reach 5.0 million tons in 2033 through 2035.

Royalties accruing to the state (not including royalties for coal mined on trust lands) are projected to be $49.0 million in 2017. Following the production forecast, coal royalties also begin a stepwise decline, eventually dropping to $16.5 million in 2034. In addition to the coal royalties is sales tax revenue from taxable business investments. This tax is projected to generate $1.4 million in 2017, declining to less than $1 million by 2035.

Middle Scenario Fiscal Impacts

Under the Middle scenario, production dips to 15.2 million tons in 2019 then grows to 17.5 million in 2023. From that point it steadily declines, dropping to 9.0 million tons by 2035.

Royalties under the Middle scenario are projected to be $49 million in 2017 and sales tax revenues from taxable investments will be $1.5 million, for a total of $50.5 million. Coal royalties and taxable investment revenues peak in 2023 at a combined $52.2 million, then steadily decline to $30.4 million in 2035.

High Scenario Fiscal Impacts

The High scenario projects rapid production growth from 16.7 million tons in 2019 to 25.1 million tons in 2013. Growth is much slower over the next few years, with production reaching a high of 25.7 million tons in 2025. From 2025 to 2035, coal production fluctuates, falling to 23.2 million tons in 2029, then growing to 25.2 million tons in 2032 and finally declining to 23.2 million tons in 2035. This is the most optimistic scenario.

Royalties from coal production and revenues taxable sales in 2017 are projected to be the same as those in the middle scenario. Revenue increases steadily from 2017, reaching $75.6 million in 2026. From 2026 to 2035, revenues remain high, ranging from $69.6 million in 2027 to a high of $82.0 million in 2033.

The production and fiscal impacts for each scenario are shown in Table 3.15.

Table 3.15
Utah Coal Production Scenarios, 2017–2015
(Coal in Millions of Tons, Millions of Constant 2013 Dollars)

	Low Scenario				Middle Scenario				High Scenario			
Year	Coal Production	State Royalties	Taxable Investments	State Total	Coal Production	State Royalties	Taxable Investments	State Total	Coal Production	State Royalties	Taxable Investments	State Total
2017	16.4	$49.0	$1.54	$50.6	16.4	$49.0	$43.3	$50.6	16.4	$49.0	$1.54	$50.6
2018	15.3	$46.0	$1.46	$47.5	15.8	$46.0	$41.8	$47.5	15.8	$46.0	$1.51	$47.5
2019	11.5	$36.6	$1.12	$37.8	15.2	$42.0	$39.8	$43.5	16.7	$43.6	$1.62	$45.3
2020	10.8	$35.1	$1.07	$36.2	16.2	$43.3	$41.3	$44.9	20.2	$50.1	$2.01	$52.2
2021	10.4	$34.1	$1.04	$35.2	16.4	$44.5	$41.1	$46.1	21.4	$51.4	$2.15	$53.5
2022	10.0	$33.5	$1.03	$34.5	16.5	$45.8	$41.3	$47.5	22.0	$54.6	$2.26	$56.8
2023	10.0	$34.2	$1.05	$35.3	17.5	$50.4	$43.6	$52.2	25.1	$67.0	$2.63	$69.6
2024	8.0	$27.5	$0.85	$28.4	15.5	$44.1	$39.7	$45.7	25.5	$69.7	$2.73	$72.5
2025	8.0	$28.1	$0.87	$29.0	15.5	$45.0	$39.6	$46.7	25.7	$72.0	$2.81	$74.8
2026	8.0	$28.5	$0.88	$29.3	15.5	$45.5	$39.5	$47.2	25.7	$72.8	$2.84	$75.7
2027	6.5	$22.9	$0.72	$23.7	10.5	$32.5	$27.9	$33.7	23.7	$69.6	$2.64	$72.2
2028	6.5	$23.0	$0.73	$23.8	10.5	$32.6	$26.3	$33.8	23.7	$69.9	$2.65	$72.5
2029	6.5	$23.5	$0.74	$24.3	10.0	$31.3	$24.7	$32.5	23.2	$69.4	$2.65	$72.0
2030	6.5	$23.8	$0.75	$24.5	10.0	$31.7	$24.6	$32.9	23.2	$70.2	$2.68	$72.8
2031	6.5	$24.3	$0.77	$25.0	10.0	$32.4	$25.2	$33.5	24.2	$45.6	$2.85	$78.5
2032	7.0	$24.5	$0.83	$25.3	10.0	$30.6	$25.9	$31.8	25.2	$78.4	$2.99	$81.4
2033	5.0	$16.5	$0.60	$17.1	9.0	$28.8	$24.2	$29.9	24.7	$79.1	$2.96	$82.1
2034	5.0	$16.5	$0.60	$17.2	9.0	$29.0	$24.6	$30.0	24.2	$77.4	$2.91	$80.3
2035	5.0	$16.7	$0.61	$17.4	9.0	$29.3	$25.3	$30.4	23.2	$74.1	$2.83	$76.9

Source: BEBR analysis.

Table 3.16 summarizes the potential revenues projected in the oil, gas and coal scenarios described in the preceding pages.

Table 3.16
Summary of Oil and Gas Forecasts and Coal Projections
(Millions of Constant 2013 Dollars)

	Reference Price Oil & Gas Forecasts			Low Price Oil & Gas Forecasts			Coal Projections		
Year	Forecast 2	Forecast 3	Forecast 4	Forecast 6	Forecast 7	Forecast 8	Low	Middle	High
2017	$273.8	$289.5	$422.0	$243.5	$257.4	$377.6	$50.6	$50.6	$50.6
2018	$291.5	$310.2	$440.9	$246.8	$263.5	$378.2	$47.5	$47.5	$47.5
2019	$301.8	$324.6	$450.3	$249.2	$267.3	$375.5	$37.8	$43.5	$45.3
2020	$319.5	$345.7	$468.9	$250.0	$269.5	$371.9	$36.2	$44.9	$52.2
2021	$348.0	$378.1	$501.7	$249.1	$269.7	$366.5	$35.2	$46.1	$53.5
2022	$377.8	$412.3	$535.6	$248.0	$268.9	$361.2	$34.5	$47.5	$56.8
2023	$410.4	$449.9	$575.0	$245.6	$267.0	$355.8	$35.3	$52.2	$69.6
2024	$445.5	$489.6	$617.7	$243.1	$264.8	$349.5	$28.4	$45.7	$72.5
2025	$486.3	$535.9	$659.9	$239.4	$260.8	$342.7	$29.0	$46.7	$74.8
2026	$524.7	$580.0	$712.4	$234.4	$256.3	$336.1	$29.3	$47.2	$75.7
2027	$568.1	$629.8	$763.3	$230.2	$251.5	$329.6	$23.7	$33.7	$72.2
2028	$614.8	$683.2	$814.4	$224.8	$245.7	$322.1	$23.8	$33.8	$72.5
2029	$667.7	$741.6	$872.4	$219.4	$240.3	$312.8	$24.3	$32.5	$72.0
2030	$720.5	$803.4	$937.7	$214.2	$234.3	$303.5	$24.5	$32.9	$72.8
2031	$780.0	$870.8	$1,002.9	$208.4	$228.3	$294.6	$25.0	$33.5	$78.5
2032	$845.5	$947.3	$1,078.1	$202.2	$221.4	$285.9	$25.3	$31.8	$81.4
2033	$911.3	$1,021.9	$1,159.5	$195.8	$214.7	$276.8	$17.1	$29.9	$82.1
2034	$979.5	$1,102.1	$1,241.8	$188.7	$207.4	$267.6	$17.2	$30.0	$80.3
2035	$1,065.3	$1,196.4	$1,334.4	$181.9	$199.7	$258.8	$17.4	$30.4	$76.9

Source: BEBR analysis.

3.2.3 Other Revenue Sources

Apart from the oil, gas and coal royalties, there are land-based revenues collected by the BLM and Forest Service; bonus payments and rents on oil, gas and coal leases; and royalties, bonuses and rents on other minerals that are paid directly to the Office of Natural Resources Revenue. Historically, revenue from all of these sources has been minor when compared with the royalty revenue generated from oil, gas and coal production. Therefore, we have not modeled the potential revenue stream to the state of Utah from these sources but have provided a five-year series showing revenues generated from these other activities.

Mineral Lease Payments

Mineral lease payments, other than payments for oil, gas and coal royalties, are shown in Table 3.17. In additional to oil, gas and coal royalties, ONRR collects royalties on other products such as carbon dioxide, clay, gilsonite, magnesium chloride brine, manure salts, potash and salt. The agency also collects bonus payments and rents on oil, gas, coal and other mineral leases. From 2009 through 2013, the amount of revenue collected by ONRR for the activities listed above averaged almost $29.1 million annually.

Table 3.17
Mineral Lease Revenue, Except Oil, Gas and Coal Royalties, FY2003–FY2013
(Constant 2013 Dollars)

Fiscal Year	Royalties	Lease Bonus Payments	Rent Payments	Other Payments	Total Payments
2009	$2,610,348	$10,727,316	$6,279,405	$1,966	$19,619,035
2010	$2,095,600	$12,382,941	$6,254,371	$31,091	$20,764,003
2011	$3,410,483	$21,851,698	$5,795,752	$35,593	$31,093,525
2012	$3,745,145	$51,353,266	$5,163,293	$22,730	$60,284,433
2013	$6,592,593	$6,182,972	$3,748,601	$57,968	$13,582,133
Mean	$3,690,833	$20,499,639	$5,448,284	$29,869	$29,068,626

Source: U.S. Department of the Interior, Office of Natural Resources Revenue, statistics.onrr.gov/ReportTool.aspx.

Bureau of Land Management and U.S. Forest Service

The BLM generates revenue from a variety of land-based activities in addition to the mineral lease revenues. Since FY2009, revenue from other land-based activities averaged $9.8 million annually. Rights-of-way rents provide the largest share of the land-based revenue collected by the BLM, followed by recreation fees and grazing fees.

Revenue generated by the U.S. Forest Service averaged $7.2 million from FY2008 to FY2012. Most of the revenue generated by the Forest Service is related to recreation, including recreation fees and recreational special use fees.

Table 3.18 shows the revenue collected by the BLM and Forest Service over a five-year period.

Table 3.18
Bureau of Land Management and U.S. Forest Service Land-Based Revenues, by Source

Bureau of Land Management

Revenue	FY2009	FY2010	FY2011	FY2012	FY2013	Mean
Mineral Leases, permits	$713,709	$470,900	$1,392,958	$743,399	$865,194	$837,232
Timber sales	$4,909	$14,423	$15,714	$12,701	$15,329	$12,597
Sales of Land/materials	$667,956	$665,595	$1,234,071	$690,381	$937,337	$839,068
Grazing permit fees	$1,008,107	$1,059,476	$1,060,156	$1,139,825	$1,012,285	$1,055,969
Other fees	$3,764	$2,213	$1,975	$2,563	$1,940	$2,491
Rights-of-Way rents	$1,873,063	$248,579	$3,413,346	$2,933,515	$9,413,503	$4,023,801
Land rents	$17,674	$15,571	$25,578	$20,263	$25,512	$20,919
Recreation fees	$2,948,746	$2,738,602	$2,863,376	$3,061,573	$3,351,225	$3,489,820
Other	$3,340	$246	$33,892	$11,162	$33,600	$9,250
Total BLM	**$7,241,268**	**$7,452,605**	**$10,041,066**	**$8,615,382**	**$15,655,835**	**$9,801,231**

U.S. Forest Service

Revenue	FY2008	FY2019	FY2010	FY2011	FY2012	Mean
Timber sales	$74,913	$34,042	$66,643	$65,601	$77,600	$63,760
Land use fees	$305,855	$311,503	$381,951	$457,992	$612,890	$414,038
Recreation special use fees	$1,800,002	$2,151,485	$1,658,987	$2,324,274	$1,741,631	$1,935,256
Power project easements, permits, rights-of-way	$97,119	$240,710	$311,765	$481,420	$1,250,077	$476,218
Mineral lease and permits	$4,101	$5,486	$2,896	$4,950	$4,982	$4,483
Grazing fees	$608,982	$588,921	$595,791	$612,382	$577,267	$596,669
Knutson-Vandenberg Act collections	$388,428	$202,032	$97,250	$100,706	$220,841	$201,851
Timber purchased road credits	$881	$0	$0	$0	$0	$176
Specified road credits	$143,427	$191,536	$24,151	$62,265	$11,362	$86,548
Timber salvage sales	$1,223,935	$740,382	$548,208	$432,809	$630,910	$715,249
Timber Sale Pipeline Restoration Fund	$0	$0	$14,936	$19,331	$56,679	$18,189
Recreation fees	$2,057,719	$2,406,916	$2,186,598	$2,101,933	$2,322,951	$2,215,223
Botanical products	$4,025	$25,334	$62,573	$58,220	$36,129	$37,256
Land use fees	$25,273	$25,636	$35,899	$15,934	$27,288	$26,006
Commercial filming fees	$4,050	$14,636	$14,005	$8,046	$12,080	$10,563
Cost recovery projects	$103,012	$267,689	$1,261,251	$298,709	$241,374	$434,407
Other	$20,879	$32,274	-$5,188	$15,646	$68,301	$26,382
Total Forest Service	**$6,862,601**	**$7,238,582**	**$7,257,716**	**$7,060,218**	**$7,892,363**	**$7,262,276**
GRAND TOTAL	**$14,103,869**	**$14,691,187**	**$17,298,782**	**$15,675,600**	**$23,548,198**	**$17,063,507**

Source: Bureau of Land Management, Utah Office, Freedom of Information Act request, 2013. U.S. Forest Service, Regional Office, Freedom of Information Act request, 2014.

3.3 Estimating Land Management Costs

This cost estimate analysis is based on information from various sources. Information on spending by federal agencies was obtained through Freedom of Information Act requests filed with the BLM, Forest Service and U.S. Fish and Wildlife Service in 2013 and 2014. Data from state agencies was collected directly from those organizations and from the State of Utah Office of the Legislative Fiscal Analyst. Information on programs in other states was collected through telephone and email communications.

The lands identified for transfer have disparate characteristics and are now managed for different purposes. Because the state cannot tell us how it will manage the transferred lands, in developing the management cost estimate we assumed the lands would continue to be managed for their current purposes. This cost analysis recognizes these different uses and avoids a "one-size-fits-all" approach to estimating the potential management costs. Instead, we estimated the costs to manage lands under four separate land uses: rangelands, forests, wildlife refuges and fish hatcheries, and a recreation area. For all but one land use—rangelands—we identified an existing state agency that could manage portions of the transferred lands.

The estimated costs take into account the amounts spent by federal agencies that currently manage the lands and incorporate alternative costs using information from other agencies. While good examples are available of Utah agencies that manage parks, and fish and wildlife programs, we turned to other states to develop a cost estimate for managing Utah's forests. To the extent possible, we limited our analysis to states with timber resources similar to those in Utah.

The costs developed for each land use exclude wildfire management costs. These are treated separately. With state ownership of the lands, we assume Utah would consolidate wildfire management under one agency.

3.3.1 Federal Agencies

Four federal agencies manage the lands identified for transfer in H.B. 148. The largest of these is the BLM, which manages 22.8 million acres of rangelands in Utah under a multiple-use, sustained-yield regulatory framework.[115] H.B. 148 calls for the transfer of all BLM lands except 260,356 acres of designated Wilderness Area. In FY2012, the BLM employed 774 people and spent almost $120 million to manage its lands.

The U.S. Forest Service is the second key land management agency in Utah, overseeing 8.15 million acres of national forests in the state. The Forest Service also manages under a multiple-use, sustained-yield mandate, but takes an ecosystem approach to managing for those uses. Under H.B. 148, all forest lands would be transferred to Utah with the exception of 747,228 acres of designated Wilderness. In 2012, we estimated the Forest Service employed 1,041 FTEs and spent $107.3 million to manage forest lands in Utah.[116]

The U.S. Fish and Wildlife Service (FWS) has jurisdiction over 112,696 acres in Utah, of which 104,480 are managed as wildlife refuges and fish hatcheries. Approximately 58 percent of the FWS lands are lands reserved from the public domain. The remaining 42 percent have been donated to FWS by other federal agencies or private individuals or purchased by the FWS. Language in H.B. 148 does not indicate if the non–public domain lands are included in the transfer; therefore this analysis assumes they would be and that refuges and hatcheries tied to those acres would transfer to the state of Utah.

The FWS has a primary-use mission—to conserve plants and animals. The agency employs an average of 65 FTEs and spends about $24.8 million annually to manage its programs in Utah; however, the land-based portion of the FWS budget is 35 FTEs with spending of $4.6 million.

The Glen Canyon National Recreation Area (GCNRA) is managed by the National Park Service (NPS). The GCNRA spans 1,250,250 acres in two states: Utah and Arizona. The Utah portion includes 1,203,656 acres, of which 1,193,338 is public land that would transfer to the state. The remaining acres are sovereign lands already owned by the state.

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115 For a broader discussion of the BLM, Forest Service and U.S. Fish and Wildlife Service, see Chapter 2, Section 2.1.

116 The estimates for the U.S. Forest Service were made using information on five Utah forests that are wholly, or primarily located in Utah. A discussion of the Forest Service and its spending can be reviewed in Chapter 2: Management of Utah's Lands, Section 2.1.2.

In FY2013, 155 FTEs worked in the GCRA. The total cost to manage the recreation area (both the Utah portion and Arizona portion) was almost $17 million. Shares allocated to Utah include 149 FTEs and $16.1 million in spending. We have not assigned any of the revenues collected by NPS to Utah. A summary of federal agency efficiency measures is shown in Table 3.19a. Table 3.19b summarizes the productivity measures for the BLM and Forest Service excluding wildfire management costs.

Table 3.19a
Federal Land Management Agencies Efficiency Measures

Efficiency Measure	Bureau of Land Management[1]	U.S. Forest Service[1,2]	U.S. Fish and Wildlife Service[3]	Glen Canyon NRA[4]
Acres in Utah	22,854,555	8,153,642	112,696	1,203,656
Designated Wilderness or other	260,356	775,568	0	10,318
Acres transferred	22,594,199	7,378,074	112,696	1,193,338
FTE Employment	774	1,041	35	149
Revenue	$339,112,002	$7,582,887	$42,256	Na
Spending	$123,263,854[a]	$107,301,929	$4,599,302	$16,170,128
Net cost	$215,848,148	–$99,719,042	–$4,557,046	Na
Revenue per dollar spent	$2.75	$0.07	$0.009	Na
Land-Based Efficiency Measures				
Revenue per acre	$14.84	$0.93	$0.38	Na
Spending per acre	$5.39	$13.16	$40.81	$13.43
Net cost	$9.45	–$12.23	–$40.43	
Acres managed per FTE	29,528	7,834	3,220	8,078
Employment-Based Efficiency Measures				
Revenue per FTE	$438,129	$7,285	$1,207	Na
Spending per FTE	$159,256	$103,094	$131,409	$108,362
Profit/Loss per FTE	$278,874	–$95,809	–$130,202	Na

Na – Not available. a. Includes ONRR spending of $3.2 million. 1 Costs are actual spending in FY2012. 2 The estimate of costs and revenue for forest acres in Utah is based on information developed in Chapter 2, Section 2.1.2. 3 Costs are actual spending in FY2011. 4 Costs are actual spending in 2013.

Source: BEBR analysis.

3.3.2 State Agencies

The state agencies included in this analysis were the State of Utah School and Institutional Trust Lands Administration (SITLA), the Division of Forestry, Fire and State Lands, State Parks and Recreation, and the Division of Wildlife Resources.

SITLA manages 3.4 million acres of state trust lands. The agency operates under a profit-maximization model and generates revenue for the 12 trust land beneficiaries. In 2012, SITLA employed 70 people and spent $12.2 million to manage trust lands under its jurisdiction.

Table 3.19b
BLM and Forest Service Efficiency Measures
Excluding Wildfire Management, FY2012

Measure	BLM	Forest Service
Acres in Utah	22,854,555	8,153,642
Designated Wilderness or other	260,356	775,568
Acres transferred	22,594,199	7,378,074
FTE Employment	540	640
Wildfire Management Costs	$39,913,606	$47,347,435
Spending less WFM	$83,350,248	$59,954,494
Revenue	$339,112,002	$7,582,887
Profit/Loss	$255,761,754	–$52,371,607
Revenue per dollar spent	$4.07	$0.13
Land-Based Efficiency Measures		
Acres managed per FTE	42,362	12,744
Revenue per acre	14.84	0.93
Spending per acre	$3.65	$7.35
Profit per acre	$11.19	–$6.42
Employment-Based Efficiency Measures		
Revenue per FTE	$628,563	$11,852
Spending per FTE	$154,494	$93,709
Profit/Loss per FTE	$474,069	–$81,857

Source: BEBR analysis.

Table 3.20
State Agencies Efficiency Measures

Efficiency Measure	SITLA[1]	Forestry, Fire State Lands[2]	State Parks and Recreation[2]	Division of Wildlife Resources[2]
Acres	3,401,940	1,502,200	121,080	464,077
FTE	70	197	306	485
Revenue	$92,097,247	$20,969,800	$23,099,700	$34,927,600
Expenses/Budget	$12,156,221	$35,266,000	$26,622,900	$48,200,400
Net Cost	$79,941,026	–$14,296,200	–$3,523,200	$14,986,400
Revenue per dollar spent	$7.58	$0.41	$0.87	$0.70
Land-Based Efficiency Measures				
Acres per FTE	48,599	–	396	957
Revenue per acre	$27.07	–	$190.78	$75.26
Spending per acre	$3.57	–	$219.88	$107.56
Net per acre	$23.50	–	–$29.10	–$32.29
Employment-Based Efficiency Measures				
Revenue per FTE	$1,315,675	$106,446	$75,489	$72,016
Spending per FTE	$173,660	$179,015	$87,003	$102,915
Net Cost per FTE	$1,142,015	–$72,570	–$11,514	–$30,900

1 Information for SITLA is calendar year 2012.
2 Information is for Fiscal Year 2013.
Source: BEBR analysis.

The Division of Forestry Fire and State Lands (FFSL) is an agency within the Utah Department of Natural Resources that manages the state's sovereign lands (roughly 1.5 million acres). FFSL manages under a public trust doctrine that allows public access to the state's navigable waters. The agency is also responsible for fire suppression on all state and private lands that are outside of city limits. In FY2013, FFSL employed 197 FTEs and spent $35.3 million to manage its lands and programs.

State Parks and Recreation (State Parks) is also a division within the Utah Department of Natural Resources. This agency manages the state park system, which covers 121,080 acres of land, including 20,500 acres of federal lands. In FY2013, the agency employed 306 FTEs and spent $26.6 million to manage the parks, museums and attractions under its jurisdiction.

The Division of Wildlife Resources (DWR) functions within the Utah Department of Natural Resources. DWR manages 464,077 acres of state lands, but has responsibility for fish and wildlife on all lands within the state of Utah, not just those under its jurisdiction. In FY2013, DWR employed 485 FTEs and operated on a budget of $48.2 million.

Table 3.20 summarizes agency costs, revenue, employment and acres managed.

3.3.3 Cost Estimate of Managing Transferred lands

Rangeland Management

The rangeland management cost analysis is based on productivity measures for SITLA and the BLM (excluding wildfire management costs) developed from the operating expenses of each agency. Because SITLA lands are interspersed with BLM lands they have identical characteristics.

The operating costs per acre of each agency are almost the same; in FY2012, the BLM spent $3.65 per acre to manage its lands (net of wildfire management costs) compared with SITLA's $3.57 per acre. As shown in Table 3.21, the estimated cost to manage rangelands is $81.6 million to $83.4 million in 2013 dollars. Although the management cost per acre for each agency is similar, SITLA generates almost twice as much

Table 3.21
Estimated Cost to Manage Rangelands
(Amounts in 2013 Dollars)

Bureau of Land Management Acres	22,855,390
Acres in Designated Wilderness Areas	–260,356
Number of transferred acres	22,595,034
SITLA management cost	$81.6 million
BLM management cost	$83.4 million
Cost estimate (average of BLM and SITLA)	$82.5 million

Source: BEBR analysis.

revenue per acre as the BLM ($27.07 and $14.84, respectively). SITLA's management philosophy explains this difference.

SITLA manages under a profit-maximization model with the express objective of generating income for Utah's 12 trust land beneficiaries. The public at large cannot freely access or recreate on trust lands. In contrast, BLM must accommodate the needs of many users. The agency allows unfettered and mostly free access to its lands for recreation and for other uses, as required by law. To achieve the management efficiencies of SITLA's operations (1 FTE per 48,599 acres) the state would need to cut employment and/or eliminate programs. Currently, there is not a state agency that could assume the management of transferred rangelands.

Forest Management

Other than forest lands managed by SITLA, Utah does not own or manage forests. Because of Utah's diminished timber industry, SITLA's forestry program is not a good example of the potential cost to manage a thriving forest program. Therefore, the forestry management cost analysis is based on information collected from other states with active forestry programs and timber resources similar to Utah's. These states include Arizona, Idaho, Montana and Eastern Washington.[117,118] Information about the operational metrics for these states is shown in Table 3.22.

Table 3.22
State Forestry Programs Employment, Spending and Revenue, FY2013

	Arizona	Idaho	Montana	Eastern Washington
State-Owned forest acres	1,583,702	1,212,713	780,000	897,898
Agency employment	63	114	53	58
Agency budget[1]	$7,118,600	$17,153,106	$5,662,690	$11,628,600
Management cost per acre	$4.50	$14.14	$7.26	$12.95
Revenue	$0	$72,500,000	$10,504,738	$28,010,982
Revenue per acre	$0	$59.78	$1.85	$2.35

Source: See Appendix C: State Forest Management and Timber Programs

Excluding wildfire management costs, the Forest Service spends $7.35 per acre to manage forests in Utah and generates less than $1.0 per acre in revenue. As shown in Table 3.22, only Montana and Arizona spent less to manage forests than the Forest Service. Arizona faces challenges managing its forests that are similar to those in Utah; that is, a high level of federal land ownership and federal forestry management practices which have caused a decline in the state's timber industry and resulted in deteriorating forest health. Arizona now focuses its efforts on maintaining forests, rather than managing for revenue.

Arizona spends $4.50 per acre to maintain its forests and does not produce revenue. At the other extreme is Idaho, which spends $14.14 per acre to manage its forests and generates almost $60 in revenue per acre. Within this range is Montana, which spends slightly less than the Forest Service but generated $10.5 million in revenue. Managing forests for revenue is not inexpensive.

Given the similarity in timber resources, if the state manages simply for maintenance, the Arizona model would be the low-cost estimate. If managing for revenue, we expect Montana would be the most appropriate comparison (Table 3.23).

117 Information on forest management was collected for Colorado but is not presented here because it is part of Colorado State Forest Service. That agency was not able to separate costs and employment information about the forest management program from its other activities.

Table 3.23
Estimated Cost to Manage Forest Lands
(2013 Dollars)

U.S. Forest Service Acres	8,153,642
Acres in Designated Wilderness Areas	–747,228
Number of transferred acres	7,406,414
Montana cost @ $7.26 per acre	$53.8 million
Cost estimate	$53.8 million

Source: BEBR analysis

The state agency most able to develop and implement a forestry management plan would be the Division of Forestry, Fire and State Lands (FFSL). Although FFSL does not currently manage forests, it does have a well-developed forestry stewardship program and with the appropriate resources could manage the lands productively.

The first step in developing a forestry program would be to evaluate the health of Utah's forests. For the 8.15 million acres of national forests in Utah, Land and Resource Management Plans more recent than 1986 are available for just 2.3 million acres. Over the past 25 years, devastating crown fires, insect infestations and disease have taken a toll on Utah forests. Developing forest management plans can be expensive, by some estimates about $3.00 per acre.

According to executive staff at FFSL, extensive analysis and planning would be required to design a forestry program and estimate its cost. According to their feedback, reforestation will be costly, and although it is possible to restore the health of Utah's forests, it will take time and resources before a forestry program could become self-funding.

Wildlife Refuges and Hatcheries

Under H.B. 148, all acreage under the jurisdiction of the U.S. Fish and Wildlife Service would transfer to the state of Utah. Included in those acres are the Bear River Migratory Bird Refuge, the Fish Springs National Wildlife Refuge, Ouray National Wildlife Refuge and Fish Hatchery, and the Jones Hole National Fish Hatchery. This analysis assumes the state continues to manage these operations after the transfer.

Of the $21.2 million appropriated for the Utah operations of the U.S. Fish and Wildlife Service, almost $4.6 million was spent in actively managing the fisheries and refuges listed above. Of the remaining $17 million, $14.2 million was grants to the state of Utah and $2.8 million was for programmatic services not tied to lands.

The state agency most likely to manage the transferred hatcheries and refuges would be the Division of Wildlife Resources, which currently maintains 11 production hatcheries and manages several waterfowl management areas.

Estimating costs on a per-acre basis is not a reliable method in this case because DWR's costs include managing fish and wildlife on both state and federal lands, not just the state-owned lands under its direct jurisdiction. Instead, we based the cost estimate on DWR's actual costs of managing its 11 production hatcheries. Cost information was not available for the waterfowl management areas, so we assume that DWR can manage the transferred refuges for the same cost as the FWS.

In FY2013, the budget for the aquatics section of the DWR was $12 million. We estimate that managing the hatcheries under that budget translates to about $1.0 million per hatchery, with the understanding that other activities that are not directly related to the hatcheries may also be funded within that budget. Based on

Table 3.24
Estimated Cost to Manage Hatcheries and Fisheries
(2013 Dollars)

Fish Hatcheries	$2.0 million
Wildlife Refuges	$3.3 million
Cost estimate	$5.3 million

Source: BEBR analysis.

the assumptions shown here, we estimate the cost to manage the transferred hatcheries and refuges will be $5.3 million (Table 3.24).

Glen Canyon National Recreation Area

The Glen Canyon National Recreation Area (GCNRA) covers 1.25 million acres, of which 1.19 million would transfer to the state of Utah. Managing the Glen Canyon NRA will require both recreation program management and general land management. The state agency most likely to manage the GCNRA is the Division of State Parks and Recreation.

The NPS spent $17 million to manage GCNRA in FY2013, or about $13.65 per acre. This is significantly less than the $220 per acre spent by State Parks to manage Utah parks and other facilities. However, State Parks does manage some of its facilities for much less than this per-acre estimate. For example, the cost per acre to manage Starvation State Park in FY2013 was $35.

The challenge in estimating the cost to the state of managing the GCNRA is the sheer size of the area. GCNRA is almost ten times the number of acres currently managed by State Parks. Such a large land transfer would exceed that agency's resources. In FY2013, the NPS employed 155 FTEs to manage the GCNRA, or roughly one FTE for every 8,066 acres. At this ratio, transferring 1.19 million acres to the state of Utah would require 148 FTEs—a 50 percent increase in State Park employment. If State Parks manages the area as efficiently as the NPS, it would cost the state $16.3 million and require 148 additional employees.

Utah may be able to generate revenue to offset these costs. In FY2013, the NPS collected a total of $7.36 million in user fees and concession franchise fees for the area as a whole; however, the NPS was not able to estimate how much of this revenue could be assigned to Utah. Table 3.25 shows the estimated cost to manage the Glen Canyon National Recreation Area.

Table 3.25
Estimated Costs to Manage Glen Canyon National Recreation Area
(2013 Dollars)

Glen Canyon National Recreation Area	1,250,250
Number of acres of Utah sovereign lands	–56,912
Number of transferred acres	1,193,338
Estimated Cost at NPS rate:	$16.3 million

Source: BEBR analysis.

Wildfire Management

Wildfire management (WFM) is a significant cost of land management in Utah. The three agencies with primary responsibility in managing WFM in Utah are the BLM, Forest Service and FFSL. From 2003 to 2012, the combined spending by these agencies for WFM averaged $85.6 million annually (adjusted to 2013 dollars). Of this total, suppression costs averaged $30.5 million and non-suppression costs averaged $50.2 million. Table 3.26 shows the average 10-year costs for each agency.

The variability in WFM costs by agency shown in Table 3.26 is more a reflection of aviation capability than it is of efficiency. FFSL has no aviation capability and relies on federal land managers for aviation support essential to its fire-suppression efforts. In general, the BLM provides small engine aviation capability while the Forest Service bears the cost for large tanker capabilities. These costs are not insignificant, which explains the high suppression costs reported for the Forest Service.

Suppression is not the largest component of WFM, but it is the most volatile and most difficult to anticipate. The majority of wildfires in Utah are ignited from natural causes. Drought conditions, combined with insect infestations and climate change contribute to not just fire ignition, but fire spread, severity, duration, and ultimately cost. Most of these conditions are outside the control of human intervention.

Table 3.26
Wildfire Management Costs, FY2003–2012 Average
(2013 Dollars)

	BLM	Forest Service	FFSL	Total
Acres burned	108,104	37,118	47,857	193,079
Fire Suppression	$10,419,781	$17,142,070	$6,121,176	$33,683,027
Non Suppression	$31,501,735	$19,468,808	$941,410	$51,911,953
Total	$41,921,516	$36.610.878	$7,062,586	$85,594,980

Note: For more detail on wildfire spending see Chapter 9: Wildfire in Utah.
Source: See Chapter 9: Wildfire in Utah.

Although WFM costs in other states are not readily available, wildfire trends for the western states show that the wildfire situation in Utah is comparatively mild. From 2003 to 2012, Utah ranked seventh of 11 western states in number of wildfires and eighth in terms of acres burned.

We expect the 10-year average cost of $86.6 million to manage wildfire in Utah is representative of the costs going forward. Over time, this amount could decrease if the state took a less aggressive approach to suppression and increased investments in fire preparedness and mitigation (reducing hazardous fuels). However, growing fire risks from the bark beetle epidemic, trends towards a drier climate, and development in the wildland-urban interface may increase the costs of fire suppression in excess of current levels.

Cost Estimate Summary

Based on information presented in Tables 3.18 through 3.23, we estimate the *direct*, current cost to manage transferred lands to be approximately $248 million annually (in 2013 dollars), including wildfire management. These costs are summarized in Table 3.27. By 2017, we estimate these costs will be $248 million (in constant 2013 dollars) and $250 million by 2022.[119]

Table 3.27
Estimated Cost to Manage Transferred Lands in 2017 and 2022
(Millions of 2013 Dollars)

Total acres transferred	31,278,307	
Direct Land Management Costs	**2017**	**2022**
Rangelands	$83.9	$84.5
Forests	$54.7	$55.1
Refuges and Hatcheries	$5.4	$5.5
Glen Canyon National Recreation Area	$16.6	$16.8
Wildfire Management Costs	$87.4	$88.1
Grand Total Land Management	**$248.0**	**$250.0**
Federal PILT	$31.7	$29.3
Total with Land Management, Wildfire Management, and Federal PILT	**$279.7**	**$279.3**

Source: BEBR analysis.

In addition to the direct land management costs are federal payments to counties. These include PILT and SRS. Payments for PILT declined 7 percent between FY2013 and FY2014. We estimate they will continue to decline over the study period. Our assumption is a decrease of 3.5 percent annually. We estimate PILT payments would be $31.7 million in 2017 and $29.3 million in 2022. We have not included SRS payments in this analysis because the future of the program is uncertain. The most current information suggests that Forest Service payments to counties will revert to the pre-SRS disbursement policy, which provided counties with 25 percent of net forest receipts. This change would have a significant effect on Utah counties. To illustrate, in 2013 Utah counties received a total of $10.9 million. Under the proposed distribution policy, Utah counties would have received $1.12 million.

119 These costs were estimated using inflation data for the state and the national deflator provided in REMI PI+.

If the state continues to provide counties with the equivalent of federal PILT, the total cost increases to $279.7 million in 2017, then dropping to $279.3 million in 2022. These amounts are in constant 2013 dollars.

3.3.4 Other Cost Considerations

Changing the Distribution of Mineral Lease Revenues

In FY2013, Utah received $138.3 million in mineral lease disbursements. This money is distributed to several different agencies and funds according to state law. The largest recipients are the Utah Department of Transportation and the Permanent Community Impact Fund (Table 3.28). The state also funds its version of PILT with mineral lease funds. The upshot is that the current state share of mineral royalties is already spoken for.

The agencies and organizations shown in Table 3.28 are accustomed to receiving these disbursements. Reducing or eliminating them in order to cover the cost of managing transferred lands would have a significant and negative impact.

Table 3.28
Distribution of Federal Mineral Revenues In Utah

Recipient	Share
All mineral lease money *except* categories below	
Department of transportation	40.0%
Permanent Community Impact Fund	32.5%
Department of Workforce Services	5.0%
State Board of Education	2.25%
Utah Geological Survey	2.25%
Water Research Laboratory	2.25%
Counties w/SITLA, DPR, DWR lands	81¢ per acre*
Permanent Community Impact Fund	Remainder
Mineral Lease Bonus Payments	
Permanent Community Impact Fund	70.0%
Mineral Bonus Account	30.0%
Money received from the United States attributable to royalties from the extraction of minerals on federal land that, on September 8, 1996, was located within the boundaries of the Grand Staircase–Escalante National Monument.	
Department of Transportation	40.0%
State Board of Education	40.0%
State School Fund	17.75%
Utah Geological Survey	2.25%

*As of 2013, Amount is adjusted annually by the annual change in the CPI.

Source: Utah State Code, Title 59, Chapter 21.

Potential Liabilities

In addition to the ongoing management costs there are liabilities that come with the transferred lands. Two known liabilities are deferred maintenance and abandoned mines.

The BLM owns more than 6,000 assets in Utah and has estimated the deferred maintenance backlog to be $26.4 million. Although a large share of this backlog (47 percent) is deferred maintenance on linear assets such as roads, the BLM estimates that it has $10 million in deferred maintenance for dams and other structures. Deferred maintenance is also a continuing problem for the Forest Service. The agency owns and maintains about 1,300 assets in Utah and estimates its deferred maintenance backlog is $72.8 million. Thirty-seven percent of the estimated backlog is classified by the Forest Service as "critical," which it defines as, among other things, posing a serious threat to public health or safety.

Another liability is abandoned mines on public lands. The BLM estimates there are 8,000 to 11,000 openings on its lands that need to be inventoried, field validated and remediated. The agency estimates that 5 to 10 percent of these openings will have an associated water quality issue. The BLM has identified 2,882 mines it considers to be immediate physical safety hazards because they are in close proximity to populated areas. The estimated cost to field validate and remediate these mines is almost $26 million, or about $9,000 per mine. Currently, the Utah Division of Oil, Gas and Mining (DOGM) has a cooperative agreement grant with the BLM totaling $4.3 million for mine reclamation work on BLM lands in Utah. Because the funding is tied to land ownership, DOGM is not certain this money would be available after the land transfer.

4 Public Lands and Economic Growth

The extractive and productive uses of natural resources—fertile soil, abundant timber, fossil fuels, and minerals—have played in the economic development of communities and regions has long been a focus of economic research. In Utah, the fortunes of many counties, especially Carbon, Duchesne, Emery, and Uintah counties, have waxed and waned as markets for energy resources have waxed and waned. The rapid economic growth recently experienced by Duchesne and Uintah counties is tied directly to recent advances in oil and gas drilling techniques that have allowed expanded extraction of fossil fuels found in those counties. Carbon and Emery counties have also pinned many economic development goals to their reserves of fossil fuels.

Recent research has noted that economic development need not be tied directly to extractive uses of the land. For example, Beaver, Iron, and Millard counties have recruited a number of energy firms to build large, utility-scale solar energy arrays to exploit the abundant sunshine available in these counties, with the first arrays coming online in 2015 (Maffly, 2014). In October of 2013 C7 Data Centers, which provide data backup in the event of natural disasters, opened a new 95,000-square-foot data recovery complex in Bluffdale (Economic Development Corporation of Utah, 2014). The site selection was based on a number of factors, some of which may not readily come to mind when thinking about firm location. Bluffdale is located in a cold desert, and the high elevation of the region allows the firm to use cool ambient air to keep its data banks at an optimum temperature for much of the year rather than using relatively expensive air conditioning.

Economic development of communities can also exploit natural amenities as well. As it approached the end of a lease for its distribution facilities in 2010, Specialized Bicycle Components considered moving its operations out of the Salt Lake valley, where it had been located for the previous 11 years (Gorrell, 2010). In the end, the firm decided to stay in the Salt Lake area in a larger facility. The company noted the advantages of Salt Lake city for its distribution center: the region had relatively low warehousing costs, a location near the intersection of two interstate freeways and easy access to an international airport. The facility manager offered one final comparative advantage, "…Utah is a fantastic place to live and raise a family, with unlimited outdoor recreation opportunities." As another example, the employee recruitment webpage of Black Diamond—an outdoor gear and clothing manufacturer—extols the virtues of ready access to Utah's public land for skiing, climbing, and other outdoor pursuits. The recruitment page helps assure the company that they will have job applicants who possess the requisite technical skills and a passion for an active outdoor lifestyle mirroring that of its customers.

These illustrations demonstrate the role that natural resources and natural amenities can play in the economic growth of a region. Some industries are directly tied to resources present in the land and have little ability to re-locate elsewhere whereas others are "footloose" and are free to locate in places with the optimal, profit maximizing mix of transportation and communication infrastructure, labor pool and wages, and tax climate. Increasingly, firms are also looking at the very factors mentioned by the manager of the Specialized Bicycle Components distribution center: good locations to raise families and recreate. Further, the examples illuminate the interconnections between migration, employment, and income, three key measures of economic vitality within a region. Development of oil, gas, and mineral resources on public land leads to employment growth, which then leads to increased migration and higher incomes in the region. Maintaining high quality recreational opportunities allows firms to encourage migration of skilled employees to a region. Migrants, in turn, increase the demand for other goods and services within the region, thus increasing employment and income growth.

The ability of communities to make the most of the natural endowments available to them depends upon the ownership and management of those natural resources. In the mountain west, the federal government is the dominant landowner, and public land management is a key driver of the economic well-being of western communities. States and local governments also own public land, though in much smaller proportions relative to the federal government. Public land provides extractive use benefits such as mining and logging, productive use benefits such as grazing, consumptive use benefits such as recreation and visitation, and conservation or preservation benefits. Given the multiple uses to which public land may be put, these lands contribute differentially to migration, employment and income growth. Because of the influence that public land has on economic growth, several studies have explored the impact of public land on the common economic measures of growth. But none of these studies has examined the multiple combinations of public land ownership and management on these measures of economic vitality; that is, does land owned and administered as a national park contribute to economic growth differently from, say, land owned by the state and managed for multiple-use purposes?

The modeling approach used in this study—a county-level regional adjustment model—has been used by many to examine regional economic growth. Thus, the analysis reported here fits comfortably within the established literature. Our study reviews this literature and builds upon it to explore the impact of both public land ownership (e.g., State or Federal ownership) and public land management (e.g., land managed for preservation, for general and multiple uses, etc.) on migration, employment growth, and income growth. We directly test the hypothesis that state ownership and management of public land is more effective at fostering economic growth than is federal ownership and management. To test this hypothesis, we combine economic, geographic, and demographic data at the county level for eight mountain states, all of which have large tracts of public land. Further, we test for the presence of spatial spillovers from neighboring counties located within a common labor market, comparing the results between models that explicitly model spatial spillovers with those that do not.

The details of our modeling approach, described in the next several sections of the study, are written for those with an interest in the theoretical and empirical foundations of our model. Though such an approach may appear to obfuscate the analysis, the provision of detail is essential to allow others to judge the manner in which we have conducted the study and reached our conclusions. Readers with less interest in the technical details may skip directly to our Conclusions in Section 4.5.

4.1 Background on Public Land in the Mountain West

The federal government owns and manages a significant amount of land in the mountain west and other western states, averaging 48% of the total acreage in the eight mountain states of Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah and Wyoming.[120] This is the result of early settlement laws and patterns, treaties, and the requirement that states surrender claim to federal land to be admitted to the Union. As part of the General Land Ordinance of 1785 and the Northwest Ordinance of 1787, State Trust Land (STLs) were granted by the US Congress to states upon statehood with the principal purpose of generating revenue for beneficiaries, primarily public schools. The eight mountain states all achieved statehood between 1864 and 1912 (Table 1). Depending on the year of statehood, STLs generally consist of specific one-square mile sections located within each 36-square mile township. In cases where a section of land designated for state ownership was already appropriated an alternate section was designated after negotiation between the state and federal authorities (Table 4.1).

Table 4.1
Mountain West Year of Statehood and State Trust Land Sections

State	Year of Statehood	Sections Granted	Current Acres (millions), 2014	Current, As % of Original Acres
Arizona	1912	6, 16, 32, 36	9.47	117%
Colorado	1876	16, 36	2.86	78%
Idaho	1890	16, 36	2.40	81%
Montana	1889	16, 36	5.13	99%
Nevada	1864	16, 36	0.00	0%
New Mexico	1912	6, 16, 32, 36	9.22	106%
Utah	1896	6, 16, 32, 36	3.74	64%
Wyoming	1890	16, 36	3.60	104%

Source: The State Trust Land (Souder and Fairfax, 1996), available online at www.ti.org/statetrusts.html (accessed April 30, 2014).

During the 19th century the federal government encouraged settlement in the West, with a number of federal initiatives that eased migration to and settlement of often inhospitable areas in the West. Under President Lincoln, the U.S. Department of Agriculture (USDA) was formed in 1862 to aid farmers. In 1887 the Hatch Act was passed, providing federal funding for agricultural experiment stations in each state to pursue improvements in agricultural production and develop markets. Other significant federal initiatives during the mid- to late-nineteenth century include the Homestead Act of 1862 and the construction of transcontinental telegraph lines and railroads, all of which facilitated westward expansion. The Homestead Act provided an avenue for private land ownership under which applicants could acquire up to 160 acres of unappropriated federal land. A homesteader was required to live on the land, build a home, and make improvements for a minimum of five years. The Enlarged Homestead Act of 1909 allowed settlers in the most arid states to claim larger amounts of land, up to 320 acres.[121] The various Railway Acts of the mid- to late-nineteenth century also facilitated settlement of the west. Land grants from the federal government to railway companies allowed federal land to be used as collateral

[120] The eight states comprise Census Division 8.
[121] Homesteading ceased in 1976 with the Federal Land Policy and Management Act (FLPMA).

to finance construction of railways. Upon completion of a railway segment, land was conveyed to the private domain, with railway companies often selling the land to encourage settlement. Almost 43 million acres in the eight mountain states—just under eight percent of the total land area—were granted to railroads (Henry 1945). Ninety seven percent of western land transfers to private ownership occurred before 1940 (Gorte et al. 2012).

Despite these efforts at western settlement, land was not privatized as quickly as land in the East and, to this day, the federal government remains the largest land holder in the mountain west. Limerick (2001, 24) notes,

> The West contains the bulk of the land still under federal control. The Eastern states privatized the public domain, and privatized it *fast*. The Western states followed another track entirely—in part because the aridity, or sometimes the elevation, of much of Western land made it unsuitable for conventional Anglo-American economic development and in part because the federal government made a massive swing toward permanent ownership of the public domain, beginning with the creation of the forest reserves in 1891.

By the late 1800s, a conservation movement began to push for management of public land for preservation and recreation. The first National Park, Yellowstone, was established in 1872. In 1891 Forest Reserves (renamed National Forests in 1907) were created, driven by concerns that timber harvests and grazing posed threats to water supplies and downstream flooding (Johnson 2003). In 1934 President Roosevelt signed the Taylor Grazing Act to manage grazing on the public range. By the early 20th century emphasis shifted from, "…the disposal and conveyance of title to private citizens to the retention and management of the remaining federal land" (Gorte et al. 2012, 2).

4.1. Cultural and Formal Institutions

Many informal and formal institutions of the mountain west evolved from western expansion. The notion of a Cowboy economy—free, open, and never-ending land—continues. The natural resource-dependent industries of mining, farming, and ranching were the initial pillars supporting settlement of the region and, indeed, in many communities these industries remain a primary source of jobs and income—though by the late 20th century many communities and counties had transitioned away from reliance on natural resource industries (Power and Barrett 2001). Still, agriculture, ranching, logging, and mining remain at the core of the cultural identity of the "Old West" (Lybecker, Shields, and Haefele 2005). With the large tracts of public land—and conflict over the uses of that land—the economic well-being of counties is closely tied to public land management.

Public land may be managed by state or federal authorities to achieve different objectives. State land consist of state parks, STLs, and other land such as those administered by the state divisions of forestry, or fish and game agencies. Geographic conditions and/or environmental policy often make it difficult to access or use STLs. State land management actions must abide by federal environmental policies including the Endangered Species Act, the Clean Air Act, the Clean Water Act, and associated amendments to these bills. Indirectly, the National Environmental Policy Act (NEPA) of 1970 has impacts on the use of state land if any management objective would involve using federally owned land (e.g., a road across federal land is needed to access state land).

The primary Federal land management agencies are the Bureau of Land Management (BLM), the U.S. Forest Service (USFS), the National Park Service (NPS), and the Fish and Wildlife Service (FWS).[122] The land held by each entity may be managed for a variety of purposes, including the development of mining resources, harvest of timber, provision of recreation, and preservation. The map in Figure 4.1 shows current land ownership status in the eight mountain states. Tables 4.2 and 4.3 present the breakdown of current federal land ownership and management by state.

Table 4.2
Percent of Federal Land Ownership in 2010

State	Total federal land acreage	Total acres in state	State land as Share of federal land
Arizona	30,741,287	72,688,000	42.3%
Colorado	24,086,075	66,485,760	36.2%
Idaho	32,635,835	52,933,120	61.7%
Montana	26,921,861	93,271,040	28.9%
Nevada	56,961,778	70,264,320	81.1%
New Mexico	27,001,583	77,766,400	34.7%
Utah	35,033,603	52,696,960	66.5%
Wyoming	30,043,513	62,343,040	48.2%
Total	263,425,535	548,448,640	48.0%

Gorte et al. 2012.

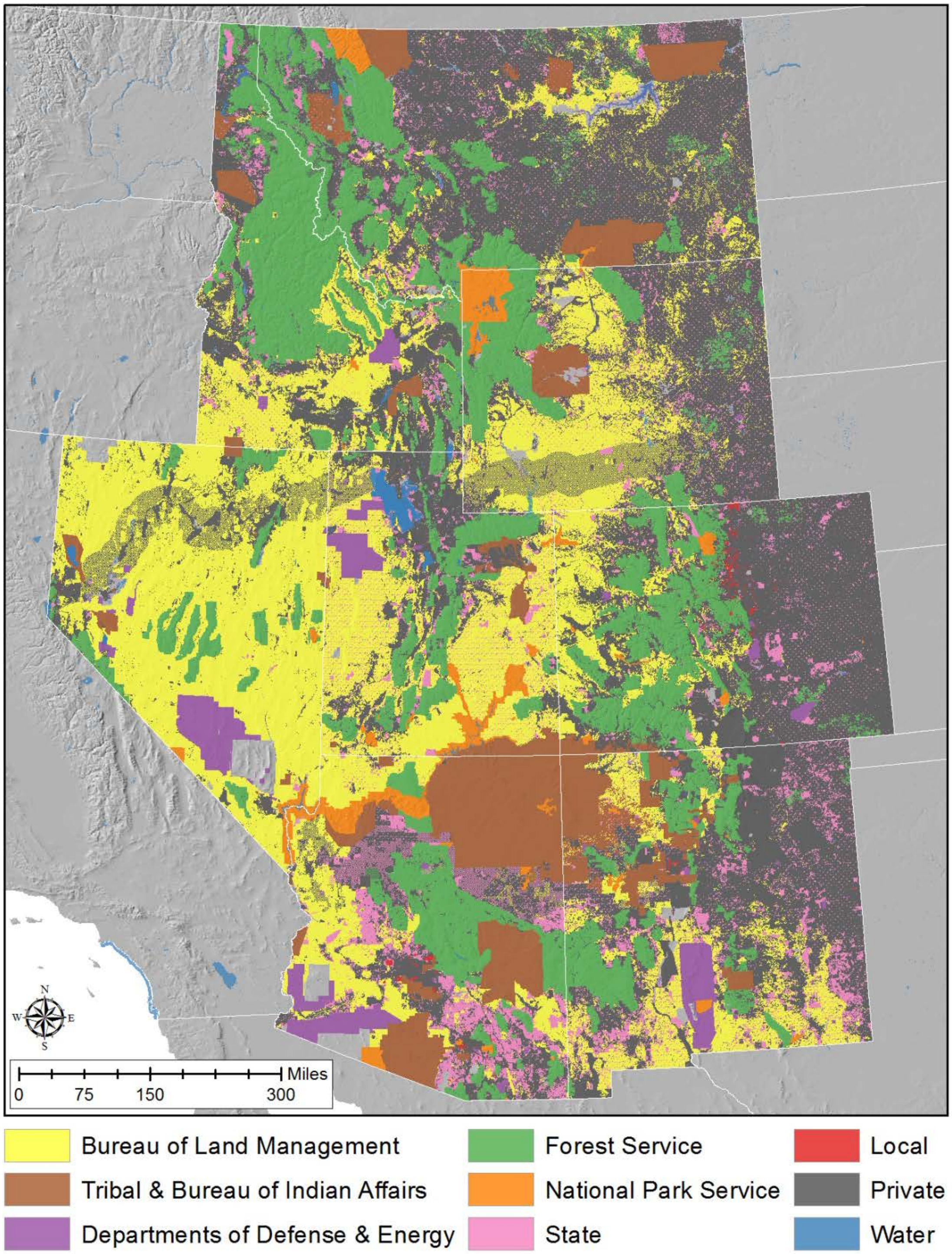
Table 4.3
Federal Acreage by Land Management Agencies, 2010

State	USFS	NPS	FWS	BLM	DOD	Total by state
Arizona	11,264,619 (36.6)[a]	2,618,735 (8.5)	1,683,269 (5.5)	12,203,495 (39.7)	2,971,169 (9.7)	30,741,287
Colorado	14,520,965 (60.3)	609,880 (2.5)	173,265 (0.7)	8,332,001 (34.6)	449,964 (1.9)	24,086,075
Idaho	20,465,014 (62.7)	507,585 (1.6)	48,947 (1.6)	11,610,111 (35.6)	4,178 (0.01)	32,635,835
Montana	17,082,821 (63.5)	1,214,184 (4.5)	635,066 (2.4)	7,981,452 (29.7)	8,338 (0.03)	26,921,861
Nevada	5,764,262 (10.1)	774,751 (1.4)	2,335,400 (4.1)	47,805,923 (83.9)	281,442 (0.5)	56,961,778
New Mexico	9,417,975 (34.9)	376,849 (1.4)	327,264 (1.2)	13,484,405 (49.9)	3,395,090 (12.60)	27,001,583
Utah	8,207,415 (23.4)	2,097,106 (6.0)	107,885 (0.3)	22,854,937 (65.2)	1,766,260 (5.0)	35,033,603
Wyoming	9,241,610 (30.8)	2,344,852 (7.8)	70,674 (0.2)	18,370,351 (61.2)	16,025 (0.1)	30,043,512
Total by federal Management	95,964,681 [36.4]	10,543,942 [4.0]	5,381,770 [2.0]	142,642,675 [54.2]	8,892,466 [3.4]	263,425,534 [100.0]

[a] Proportions of total federal land by state in parentheses. USFS land in Arizona constitutes 36.6% of total federal land in Arizona.
[b] Figures in brackets represent the proportion of land relative to the total amount of federal land in the eight states.
Source: Gorte et al. 2012.

[122] The Department of Defense manages large blocks of federal land in both Arizona (9.7%) and Utah (5.0%).

Figure 4.1
Land Ownership and Administration, Eight Mountain States



The state with the largest proportion of federal land is Nevada at 81.1%. The state with the least is Montana at 28.9%, which is still significantly greater than federal ownership of land in a typical state located in the East, Midwest, or South. The USFS and the BLM are the dominant federal land management agencies. In Nevada, the BLM manages 83.9% of the federal land in the State, and in Montana the USFS manages 63.5% of the federal land in the State. Across the eight mountain states, the USFS manages 36.4% and the BLM manages 54.2% of the federal land.

Some key federal land and environmental policies that govern the use of federally owned land consist of the Multiple-Use Sustained-Yield Act (MUSYA) of 1960, the Federal Land Policy and Management Act (FLPMA) of 1976, and the National Forest Management Act of 1976. Other significant environmental federal policies include NEPA, the Endangered Species Act, and the Clean Air and Water Acts, and amendments. The MUSYA directs the USFS to manage national forests for multiple uses including timber, water, range, recreation, and wildlife, ensuring that current harvests do not impede the future production of renewable resources. A primary feature of the FLPMA is that it expanded the allowable uses to include recreation and preservation of natural and cultural resources on BLM land. Under FLPMA, the BLM is required to establish a planning process for the management of public land and must manage public land for multiple uses and sustained yield.

While the set of federal land and environmental policies provide broad land management guidelines, interpretation and implementation of policies are subject to the philosophical principles of Cabinet secretaries and agency directors. Further, there is significant controversy surrounding NEPA (Tabb 1997). NEPA requires federal agencies to evaluate the potential environmental effects of proposed federal actions. Federal land agencies are thus constrained by NEPA requirements when attempting to change the use(s) of public land. By comparison, the process of changing land use for state land agencies is generally more streamlined and less burdensome. Little information exists on the cost of complying with NEPA and completing NEPA analyses, yet according to the U.S. Government Accountability Office (GAO 2014), environmental impact statements completed in 2012 took over 4 years, on average, to prepare.

4.2 Literature

4.2.1 Initial Models of Regional Growth

Numerous studies address the question of what drives regional growth in migration (or population), employment, and income, the three measures of economic growth typically used to assess a region's economic vitality and health. Traditionally, employment growth was believed to be an exogenous determinant of population growth, and that the availability of jobs was the primary reason people moved to an area. Later, an alternative hypothesis posited that people first decide where to live based on amenities in the area and then focus on finding employment. Profit-maximizing firms may locate to such areas to capitalize on a stronger or growing labor force. Modern improvements in transportation and telecommunications support the notion that both firms and people are footloose and may locate where they wish. Thus, many began investigating this premise by asking, 'do people follow firms, or do firms follow people,' and have concluded that regional growth must address the interdependence among measures of economic growth (Muth 1971; Steinnes and Fisher 1974; Steinnes 1977; Greenwood and Hunt 1984; and Mills and

Price 1984).[123] The theoretical basis for the analysis is known as a partial adjustment model, or a regional adjustment model.

A regional adjustment model (RAM) is rooted in the idea that both firms and households are geographically mobile and will move to regions that yield the highest level of profits (firms) or utility (households). In deciding the region in which to locate (or continue operations), firms consider all aspects of the decision including the appropriate skill level of the region's workforce, the wages it must pay, its access to supplies of other inputs, and access to the markets in which it sells its product. Households also make a similar regional location decision, considering the cost of living in an area, employment opportunities, the wage that may be earned, and a host of other factors such as proximity of family members and natural or cultural amenities. All of these elements are included in an adjustment model.

The theoretical structure of RAMs was originally borrowed from a portion of the finance literature concerned about the speed at which an economic variable approaches its equilibrium value (Carruthers and Mulligan, 2007). Let the value of an economic variable of interest at time t be given by E_t and its lagged value at time $t-x$ be given by E_{t-} , where the subscript $t-$ simply denotes that this value could be lagged by any value of x, such as a day, a week, a month, a year, or several years. The difference in the value of E observed at time t and any previous value is given by,

$$\Delta E_t = (E_t - E_{t-}) = \theta_E(E^* - E_{t-})$$

where E^* is the (unknown) equilibrium value of E. The speed of adjustment parameter, θ_E, is bounded by zero and one, implying that only a portion of the adjustment toward the equilibrium value occurs over any given time period. This may be seen by rewriting the equation as,

$$E_t = \theta_E E^* + (1 - \theta_E)E_{t-} \tag{1}$$

Any observed value of E_t represents only a fraction of the adjustment toward its equilibrium value. If θ_E has a value close to one then the speed of adjustment is quick and the observed outcome at time t, E_t , is near its equilibrium value; if θ_E is close to zero then the speed of adjustment is quite slow and the observed outcome is still some distance from its equilibrium value.

Now consider two jointly determined (endogenous) economic variables, E^1 and E^2; an economic system of these related variables at equilibrium would be given by,

$$E^{1*} = \beta_1 E^2 + \gamma_1 X_1 \tag{2}$$
$$E^{2*} = \beta_2 E^1 + \gamma_2 X_2 \tag{3}$$

where the * superscript means an equilibrium value, and X_1 and X_2 are exogenous factors believed to influence the endogenous variables of the system. Substituting (2) and (3) into the appropriate versions of equation (1) will yield the basic structure of the regional adjustment model,

$$E_t^1 = \theta_1\beta_1 E_t^2 + (1 - \theta_1)E_{t-}^1 + \theta_1\gamma_1 X_1 \tag{4}$$
$$E_t^2 = \theta_2\beta_2 E_t^1 + (1 - \theta_2)E_{t-}^2 + \theta_2\gamma_2 X_2 \tag{5}$$

[123] This is by no means an exhaustive list of early regional adjustment publications.

Here, each economic variable is functionally related to the contemporaneous value of the other endogenous variable(s), its own lagged value, and a set of exogenous factors.

Since the 1970s, economists have used a form of the structural model given in (4) and (5) to explain migration of people and firms across regions (e.g., Muth, 1971; Steinnes and Fisher, 1974; Greenwood and Hunt, 1984; Carlino and Mills, 1987.) This literature has found that standard measures of regional economic health—increased in-migration, employment growth, and wage or income growth—are related to one another (i.e., endogenous) and are constantly adjusting toward an unknown equilibrium. The endogenous nature of the model also implies that each economic variable of interest is related to the contemporaneous outcome of the other economic variables of interest. Formally, let MIG_t, EMP_t, and INC_t represent net migration, employment, and income at time t, with similar notation for the same variables observed at some time in the past, $t-$. We now have a system of three jointly determined equations,

$$
\begin{aligned}
MIG_t &= \alpha_1 + \beta_{12}EMP_t + \beta_{13}INC_t + (1-\theta_1)MIG_{t-} \\
EMP_t &= \alpha_2 + \beta_{21}MIG_t + \beta_{23}INC_t + (1-\theta_2)EMP_{t-} \\
INC_t &= \alpha_3 + \beta_{31}MIG + \beta_{32}EMP_t + (1-\theta_3)INC_{t-}
\end{aligned}
$$

The first equation of the model shows that people move in response to employment and income opportunities, whereas the second equation shows that firms respond to changes in population and income (as it relates to shifting product demand). Income includes non-wage income, which is particularly important in regions with concentrations of retirees who often enjoy investment income in addition to Social Security transfers. Increased non-wage income has effects on the demand for services in a region, leading to more employment growth and net migration.

Carruthers and Mulligan (2007) note that this model occupies a middle ground with regard to the assumption of regional equilibrium in migration and employment. That is, a regional equilibrium can theoretically exist but is never achieved. If equilibrium were achieved, then the spatial distribution of people, firms and income is such that there is no longer any incentive to relocate. Households will have achieved their maximum level of satisfaction; any wage and employment opportunities elsewhere would not compensate for the loss of non-pecuniary benefits of staying in place. Firms could no longer gain a competitive advantage because all opportunities to exploit differences labor force skills, wages, access to inputs and markets for its output will have been exhausted.

Of course, this equilibrium is never achieved; a significant proportion of people and firms are on the move at any given time. Households move when they observe regional differences in, for example, the cost of housing and the wages that may be earned, in addition to the natural, environmental, and cultural amenities that may be offered by a region. Some households may choose to locate in low wage regions in exchange for recreational amenities, whereas others may choose to accept the greater housing costs of a central city in exchange for the cultural opportunities offered there. Firms may decide that an appropriate workforce may exist elsewhere, or that another region has improved access to suppliers or lower product distribution costs. In both cases, households and firms consider regional differences in both economic and non-economic factors in the decision to relocate.

Why is an equilibrium never achieved? New shocks to the system affect the path toward equilibrium: increased congestion on freeways may cause households and firms to reconsider their transportation costs, or a region may experience a change in environmental amenities as environmental quality improves or degrades. The places in which people and firms choose to locate are, in essence, bundled goods that offer a mix desirable and undesirable attributes. As the mix of those attributes change, then households and firms are pushed from their utility (households) and profit (firms) maximums and they begin to re-consider their location. Exogenous shocks occur constantly, pushing our economic measures off the initial paths and onto new paths toward (presumably) new equilibrium values. Eichman et al. (2010, p. 318) succinctly summarize the theory behind the modeling strategy:

> First, county economies in the United States resemble small open economies embedded in free-market areas. This implies an elastic supply of mobile factors in response to spatial variations in firm profitability and household utility. The dependent variables [*ed., our economic growth measures*] reflect regional factor quantity adjustments induced as county economies adjust to evolving spatial general equilibrium. Second, inter-county profitability and utility variations depend on differences in county amenities, amounts of immobile factors, industry mix, forward and backward linkages, extant agglomeration, and policy.

The early empirical literature supports the claim that measures of economic growth are interdependent and simultaneously determined. For example, Greenwood and Hunt (1984) used a simultaneous model to understand the interrelationship between net migration and employment growth, examining how changes in incremental jobs have an impact on employed net-migrants (employed before and after a move), and how many extra jobs are created from changes in net migration. They also gauge impacts from national employment trends on regional economies, and find that national employment effects have a greater impact on employment in the South and West, areas which, at the time, were experiencing greater in-migration. The regional effects uncovered by Greenwood and Hunt hint at how locational amenities may impact growth, or more generally, how factors that affect quality of life attract workers to an area.

Carlino and Mills (1987) analyze the effects of economic, demographic, climatic, geographic indicators (e.g., metro area, region of the country), and policy-related variables on population and employment densities during the 1970s. Their study demonstrates the extent to which people follow jobs and jobs follow people, and explores trends in population shifts from the frostbelt region to the sunbelt region, and from metropolitan areas to nonmetropolitan areas (see also Clark and Murphy 1992). Following Mills and Price (1984), who suggest that population and employment adjust to equilibrium values with substantial lags, Carlino and Mills include one-period lagged population and employment densities in each respective equation. Similar to prior studies, they find that population and employment densities are positively related. Additionally, they find that both population and employment are positively related to their lagged terms. Results show that employment density is positively related to interstate highway density, median family income, and counties with a central city. Population density is statistically related to regional differences (counties located in sunbelt states are more attractive than colder areas), interstate highway density, and median family income. They do not find statistical evidence that policies often used to promote growth (measured by tax rates, crime rates, or development bonds) impact population or employment growth.

4.2.2 Regional Adjustment Models, Land Use, Natural Amenities

Since 1970s the mountain west has experienced declines in traditional natural resource based industries such as logging, mining, and agriculture. Mills (1995) and Walzer and Deller (1996) discuss changes in the rural landcape from extractive and manufacturing activities to non-market based activities such as recreation. One explanation links the decline in traditional natural resource industries to greater emphasis by the Federal government on protecting federally-owned public land and natural resources, a trend that has prompted significant concern that this trend harms employment d income in communities as well as contributing to a loss of cultural identity. Others contend that preservation of land enhances the amenity value of local economies and attracts workers and businesses, potentially offsetting the negative effect associated with reduced resource extraction (e.g., Deller et al. 2001).

Beginning in the late 1990s, a number of studies used regional adjustment or growth models to investigate how public land uses or specific land use policies affect economic vitality. Does preservation of land, in the form of reduced extraction of minerals, oil, gas, or timber, harm or aid economic growth? Do people place a high value of natural resource-based amenities and relocate to enjoy these attributes? Table 4.4 provides a summary of the results from the regional adjustment model literature as it pertains to public land policy or natural resource characteristics.

Table 4.4
Review of the Literature on the Environment, Public Land, and Economic Growth: Direct Effects

		Impact on dependent variable		
Author(s)	**Environmental, resource, or geographic variable**	**Net migration or population**	**Employment**	**Wage or income**
Duffy-Deno (1998)	Designated wilderness	NS[a]	NS	
	Designated wilderness on nonresource based employment		+	
Deller et al. (2001)	Principal component analysis to construct:			
	Recreation infrastructure	+	+	+
	Land	+	+	NS
	Water	+	NS	+
	Winter Recreation	+	+	+
Lewis, Hunt, and Plantinga (2003)	Multiple-use land	+		
	Preservation land	NS		
	Timber sales	NS	NS	NS
Eichman et al. (2010)	BLM and USFS land reserved for species preservation	+ (and minimally offsets the decline in employment growth)	–	
Carruthers and Vias (2005)	USDA natural amenities index	+		
	Percent of agricultural land	+		
Wu and Mishra (2008)	USDA natural amenities index	+		
	Natural resource dependency		–	

NS indicates that no statistically significant relationship was found.

What we find is that the major efforts to gauge the effect of public land management on economic growth are inconclusive. Most studies find that non-extractive uses of public land or natural amenities have a positive effect on population and/or net migration growth; yet there is also evidence that movement toward these amenity uses can harm employment growth. The next section describes, in detail, several key studies on regional growth, public land policy, and natural resources, with a particular—though not exclusive—emphasis on studies conducted in the Mountain West.

4.2.3 Regional Growth and Public Land: The Literature in Detail

Duffy-Deno (1998)

Duffy-Deno (1998) explores the impact of designated wilderness areas on employment and population densities in the mountain west. Using data from 250 nonurban counties in eight mountain states (AZ, CO, ID, MT, NV, NM, UT, WY), Duffy-Deno finds no statistical evidence that the percentage of county area designated as wilderness has an impact on employment or population densities or growth between 1980 and 1990. The lack of statistical evidence between the percentage of wilderness designation and total employment may be due to a positive effect on employment in the non-resource sector offsetting a negative employment effect in the resource sector. But this may not present a complete story. Households and firms are assumed to be geographically mobile, yet this may not be true for resource-based firms with limited ability to change locations. Duffy-Deno notes that under this assumption using population to help explain changes in employment density in the resource sector is inappropriate because people can only follow jobs, and jobs cannot follow people. The author expands upon the basic regional adjustment framework by specifying an equation for resource-based employment density as a function of its lagged value, not of population. In addition, to explore spillovers from changes in resource-based employment on other employment sectors, Duffy-Deno examines the impact of resource-based employment density in an equation representing employment density in non-resource sectors. Duffy-Deno is unable to find statistical evidence of a negative relationship between wilderness designation and resource-based employment, nor could he uncover any negative employment spillovers from the resource-based sector to the overall economy. Rather, he finds that wilderness designation is positively associated with employment density in non-resource based sectors.

Deller, Tsai, Marcouiller, and English (2001)

Deller et al. (2001) begin to explore the impact of area amenities on regional economic growth in the rural United States. Drawing on the premise that people migrate to capture higher wages and income, they build upon the Carlino and Mills (1987) study by including per capita income. Thus, their model of regional economic growth includes three (not two) interrelated measures of economic growth between 1985 and 1995 in the U.S.: population, employment, and per capita income. Following Carlino and Mills (1987) they also posit that these three measures of economic growth adjust to equilibrium conditions with substantial lags or initial conditions.

The primary focus of their analysis is to test whether growth is conditional upon regional amenity factors. To do this, they construct five measures—climate, recreational infrastructure, land, water, and winter recreation—to capture amenity or quality of life attributes. Each of the five measures are constructed from a principal component analysis; a method by which an analyst may reduce a collection of many variables into a single measure. For instance, the land measure is constructed from 16 land variables including things like BLM public domain acres, USFS forest and grassland acres, state park acres, number of guides services, etc. Recreational infrastructure is comprised of 13 variables including things like number of parks, fairgrounds, amusement places, private and public golf courses, etc. Deller et al. (2001) also include a host a variables to capture the demand side of markets such as market size and consumptive ability, the supply and quality of the labor market, and government revenues and expenditures.

The authors find that all five amenity measures positively affect growth in population. Recreational infrastructure and winter recreation also positively affect growth in employment and per capita income. The land measure positively affects employment growth, and the water measure positively affects growth in per capita income. Not one of the five measures was negatively related to any of the three measures of economic growth (population, employment, or per capita income). What appears to be a clear outcome of their analysis is that people will relocate to areas with greater area amenities, and that these areas will experience higher overall levels of economic growth.

Lewis, Hunt, and Plantinga (2003)

Similar to Duffy-Deno's study, Lewis, Hunt and Plantinga (2003) explore the role that public land management had on local wage growth during the 1990s. The motivation for their study is based on claims that management of public land for preservation (rather than extraction) will cause a shift in economic structure from high-wage jobs in resource-based industries to low-wage jobs in the service sector. To study the impacts on wage growth, the authors simultaneously estimate changes in employment growth, net migration, and wage growth for 71 non-metropolitan counties in the Northern forest region (Great Lakes region, Northeastern New York, and Northern New England) during the period 1990 to 1999 when timber sales declined.

To test whether preservation diminishes wage growth, the models include 1990 (beginning of period) shares of county land base that are publicly owned and managed for extractive as well as non-extractive (preservation) uses, such as national and state parks, wilderness areas, and wildlife refuges. They further include shares of multiple-use land in state and national forests. The authors find no statistical evidence to support the claim that shifts from extractive to non-extractive uses of public land cause a shift from high- to low-wage jobs. On the other hand, multiple-use land is found to have a positive impact on the net migration rate, whereas no statistical relationship is found with land in preservation. Lastly, they did not find a significant effect of the decline in timber sales on net migration, employment, or wage growth.

Eichman et al. (2010)

Eichman et al. (2010) explore the impact of changes in forest management on employment growth and net migration rates in the Pacific Northwest. In 1994, the BLM and the USFS adopted the Northwest Forest Plan (NWFP) in response to concerns and lawsuits brought about under the Endangered Species Act regarding the effects of timber harvest on the habitat for northern spotted owls and other species in old-growth forests. The debate is no different from what has been expressed thus far; protection reduces commodity production and hence employment, while others contend that protection will attract individuals to an area. Similar to Lewis, Hunt, and Plantinga (2003), the management change provides a natural experiment to measure the NWFP's impact on county employment growth as well as net migration rates. Thus, a primary objective of the study is to determine whether positive in-migration effects attenuate negative employment effects.

Eichman et al. (2010) use data from 73 counties containing land impacted by the NWFP or adjacent to such counties (counties in the San Francisco Bay area are excluded because of striking differences in economic structure). The authors use two time periods, the decade preceding the spotted owl controversy (1980–1990) and the decade following the adoption of the NWFP (1994–2003), to jointly estimate employment growth and net migration rates. They exclude the 1991–1993 time period—a period the authors characterize as marked by regional economic upheaval, political controversy, judicial intervention, information gaps, and scientific uncertainty—arguing that it is "…unlikely that firm profitability and household decisions were strongly operative" (p. 319). They find that BLM and USFS land reserved for species preservation does indeed have a negative impact on employment growth during the 1994-2003 period. Specifically, Eichman et al. find that employment growth falls by 0.2% for each 1% of total county land area that is preserved. In contrast, the impact of the NWFP on net migration is positive. Though the positive effects of in-migration offset some of the negative effect on employment growth, the authors calculate a net negative effect of the NWFP on total employment.

Carruthers and Vias (2005)

Carruthers and Vias (2005) use a regional adjustment model of population and employment growth to determine the relationship between zoning laws and low-density urbanization in 277 counties located in eight mountain states. They created a panel data set with three, five-year time periods (1982–1987, 1987–1992, and 1992–1997). To test their hypothesis, Carruthers and Vias define the dependent variables as percent changes in employment and population densities, where density is based on developed land area in a county, which changes over time, rather than total county area. By defining density in this manner, they are essentially evaluating economic growth in areas that provide economic development, an important adaptation of the regional adjustment model in the sparsely populated mountain west.

Carruthers and Vias include a host of variables to represent housing, demographic, political, economic, and geographic characteristics as well as government spending and revenue figures. In particular, they use the USDA's natural amenity score to proxy for location-specific demand to test whether amenities promote denser development by compensating residents with such amenities. They find significant evidence that population and employment density growth are jointly determined in the mountain states and that natural amenities positively impact population density. If households indeed base their locational decisions on an area's attractiveness, then economic growth is linked to the maintenance of natural amenities.

Wu and Mishra (2008)

Wu and Mishra (2008) estimate the impact that natural amenities, accumulated human and physical capital, and economic geography have on three spatially-related county level indicators of economic growth between 1990 and 2000: net migration rates, job growth, and income growth.[124] Recognition of spatial relationships has led to econometric methods that explicitly control for spatial autocorrelation and spatial error correlation. Spatial econometric models capture the degree to which, for instance, economic growth in one county is statistically related to growth in its neighboring (contiguous) counties.

To account for spatial relationships and cross equation correlation of error terms, Wu and Mishra use a generalized spatial three-stage least squares method (GS3SLS) developed by Kelejian and Prucha (2004). The spatial weights matrix is based on shared county boundaries to define neighbors. Wu and Mishra account for spatial correlation in the error terms, testing that the random modeling error in a county is related to the random modeling errors in all adjacent counties. The system of simultaneous equations is estimated using 119 counties from Oregon, Washington, and Idaho. Wu and Mishra find that the error terms in the three equations (net migration, income, and employment) are, indeed, spatially autocorrelated. Further, they find that factors

[124] Gebremariam, Gebremedhin, and Schaeffer (2011) also use a spatial lag and spatial error model in a simultaneous equation model to explore growth in Appalachia between 1990 and 2000.

that capture an area's attractiveness (the USDA natural amenity index, government spending on education, home ownership, and percent of population with a college degree) are found to be positively related to percent changes in net migration. This suggests that both socio-economic factors and natural amenities attract migrants. Employment growth is found to be positively related to human capital skills measured by college degree and population density. They find an inverse relationship between employment density and employment growth, suggesting that some crowding out exists. They also find an inverse relationship between natural resource dependency (as measured by the percent of total personal income derived in the farming, fishing, and forestry industries) and employment growth during the 1990 and 2000 time period. Income growth is inversely related to median household income and the degree to which the county is considered "remote".

4.3 Econometric Modeling

We use a regional adjustment model to evaluate the effects of public land ownership and management on county level growth; the model assumes that households and firms are footloose and free to locate to where they want. As part of the analysis, we construct four hypotheses:

H1. Three measures of economic growth—migration, employment, and income—are interrelated.
H2. Economic growth is conditioned upon initial conditions; that is, growth adjusts toward equilibrium levels with substantial lags.
H3. Economic growth is conditioned on current indicators of natural resource dependency.
H4. Economic growth is conditioned on public land ownership and management.

H4 is our central hypothesis, which will be explored in detail in the results section (Section VI).

The theoretical structure of our three-equation econometric model of migration growth, employment growth, and income growth for county *i* from time *t*– until time *t* is:

$$MIG_{it} = \alpha_1 + \beta_{12}EMP_{it} + \beta_{13}INC_{it} + (1-\theta_1)MIG_{it-} + \gamma_1 X_{i1} + \tau_1 PL_i + \mu_{i1}$$
$$EMP_{it} = \alpha_2 + \beta_{21}MIG_{it} + \beta_{23}INC_{it} + (1-\theta_2)EMP_{it-} + \gamma_2 X_{i2} + \tau_2 PL_i + \mu_{i2}$$
$$INC_{it} = \alpha_3 + \beta_{31}MIG_{it} + \beta_{32}EMP_{it} + (1-\theta_3)INC_{it-} + \gamma_3 X_{i3} + \tau_3 PL_i + \mu_{i3}$$

where MIG_{it}, EMP_{it}, and INC_{it} denote population growth due to migration, employment growth, and income growth in county *i*, at time *t* (or time *t*–), respectively. PL_i is a vector of public land ownership and management variables for county *i* whereas X_{1i}, X_{2i}, and X_{3i} are vectors of exogenous variables believed to influence each equation in county *i*. The parameters a, β, θ, γ, and τ are estimated econometrically using methods that incorporate the simultaneous nature of the system. The error terms μ_{1i}, μ_{2i}, and μ_{3i} associated with each equation are typically assumed to have mean zero and constant variance across all counties. We also require the error terms to be uncorrelated across observations (counties) and equations—an issue to which we return shortly.

For simplicity, suppress the county subscript *i* and note the simultaneous nature of the model: employment (EMP_t) and income (INC_t) are on the right-hand side of the first equation, implying that migration (MIG_t) is determined, in part, by these variables. Similarly, migration growth appears on the right-hand side of the second and third equations, implying that migration explains a portion of employment growth and income growth. Thus, the model is consistent with the early regional adjustment models presented by, for example, Muth (1971), Greenwood and Hunt (1984), and Carlino and Mills (1987).

Public land variables appear on the right-hand side of all equations, putting the model in line with the more recent literature of Duffy-Deno (1998), Lewis et al. (2003), and Eichman et al. (2010), for example, all of whom developed models that examined, to one degree or another, the effect of public land management on measures of economic growth. The different subscripts on the public land parameters (τ) in each equation allow the effect of any one measure of public land ownership and management (say, the percent of a county administered and managed by the federal government for general use) to differ across equations; that is, public land ownership and management may have a stronger effect on one economic measure and a weaker effect on another.

The estimation procedure for this form of the model is the well-known three-stage least squares (3SLS) approach to simultaneous equations. We capture the endogeneity of the dependent variables by using first-stage instrumental variable models for each endogenous variable, followed by a second-stage three-equation model that generates a consistent estimator of the covariance matrix for the model's errors. The third-stage uses the second-stage covariance matrix to estimate generalized least squares estimates for the model. The three-stage approach also accounts for cross-equation error correlation, resulting in more efficient parameter estimates.

The three-stage least squares method (or a two-stage version known as Seemingly Unrelated Regression) has been the standard approach used in the literature; the only exception in the papers discussed above was that of Wu and Mishra (2008). Wu and Mishra take advantage of recent advances in economic geography, which have revealed spatial dependencies among economic locations that may help explain variation in economic development. For example, when a firm relocates to a particular county, it is not only that county that benefits from economic growth—neighboring counties may benefit as well if, say, workers locate in a neighboring county because of better amenities than the county in which they are employed. Another form of "spatial spillover" could occur if housing prices in the original county were driven up by in-migrants, causing migrants arriving later to locate within commuting distance of their jobs but not necessarily in the same county. We can accommodate these effects by adopting a "spatial lag" for the dependent variable in each equation. We do so by applying a spatial weight matrix, W, to the dependent variables. Details of our spatial weight matrix are included in the data section which follows, but our theoretical model is fundamentally based upon a labor market transitioning toward equilibrium as migrants move in and out of counties in response to employment and income opportunities, as well as the amenity contributions of public land. Thus, our weight matrix is based upon commuting zones in the year 2000 (USDA, 2012).

Again suppressing the county subscript, the model then becomes,

$$MIG_{it} = \alpha_1 + \beta_{12}EMP_{it} + \beta_{13}INC_{it} + (1-\theta_1)MIG_{it-} + \gamma_1 X_{i1} + \tau_1 PL_i + \lambda_1 WMIG_{it} + \mu_{i1}$$
$$EMP_{it} = \alpha_2 + \beta_{21}MIG_{it} + \beta_{23}INC_{it} + (1-\theta_2)EMP_{it-} + \gamma_2 X_{i2} + \tau_2 PL_i + \lambda_2 WEMP_{it} + \mu_{i2}$$
$$INC_{it} = \alpha_3 + \beta_{31}MIG_{it} + \beta_{32}EMP_{it} + (1-\theta_3)INC_{it-} + \gamma_3 X_{i3} + \tau_3 PL_i + \lambda_3 WINC_{it} + \mu_{i3}$$

where W is an $n \times n$ spatial weights matrix (and n is the number of counties in the analysis); and λ_1, λ_2, and λ_3 are spatial parameters to be estimated along with the parameters mentioned previously. The diagonal elements of W are zero, meaning the value of the dependent variable for county i is not included on the right-hand side. Further, W is constructed as a row-standardized matrix so that *WMIG, WEMP,* and *WINC* are the average of the dependent variables (migration, employment and income, respectively) for all other counties in the same commuting zone that includes county i.

Another potential spatial spillover could occur in the error terms; that is, the modeling error in the model for county i may be spatially related to the modeling errors for all other counties in county i's commuting zone. This may occur if, for example, a key factor influencing economic growth within the commuting zone were omitted from the model. In that case, the error terms μ_j are comprised of a spatially related component and a purely random component,

$$\mu_j = \rho_j W \mu_j + \varepsilon_j$$

where W is once again the $n \times n$ spatial weight matrix; ρ_j is a spatial error parameter to be estimated; and ε_j is a random error component for any equation j that possesses the desired properties: a mean of zero, a constant variance, and uncorrelated with any other observation.

The econometric properties and method of estimating this general system of spatially related equations have been analyzed by Kelejian and Prucha (2004). There are three important econometric issues to consider:

1. Whether a spatial lag exists in the dependent variable,
2. Whether a spatial lag exists in the error terms and,
3. Whether the errors are correlated across equations.

The Generalized Spatial Three-Stage Least Squares (GS3SLS) adapts the 3SLS model to include spatial lags in both the endogenous dependent variables and the modeling errors.[125] GS3SLS also controls for cross-equation error correlation by using multiple stages. After first estimating each growth model using equation-by-equation Ordinary Least Squares (OLS), the spatial correlation parameter is generated by application of a Generalized Method of Moments procedure to the OLS errors. The estimated error correlation is then used to transform all variables similar to a Cochrane-Orcutt procedure for autocorrelation, where the link between observations is given by the spatial weight matrix. Finally, the transformed variables are used in a seemingly unrelated regression model. If spatial errors are not present, the model simplifies by leaving the original variables untransformed. Regardless of the GS3SLS model used (spatial lag, spatial error, or both), one must still account for the endogenity of the dependent variables (migration, employment and income growth) and the spatial lag variables (*WMIG*, *WEMP*, and *WINC*).

Some economists consider spatial econometric models to be fairly restrictive. First, spatial relationships are captured in only one or two parameters (the λ for spatial lags and the ρ for spatial errors) and the spillovers are assumed to be the same for all observations in a sample. Essentially, the spatial parameter(s) imposes a "smoothness" on the data that may or may not be warranted if spatial spillovers are heterogeneous within a region. In these cases, spatial relationships may be measured best using a spatial fixed effects approach.[126] Second, spatial models require all space within the region to be accounted for; that is, we can have no unaccounted space in the middle of the study region (i.e., no holes) nor can we have an observation that is not spatially

[125] Bhandari et al. (2010) provide an excellent summary of the GS3SLS model.
[126] See, for example, Kuminoff et al. (2010), with a response from Anselin and Arribas-Bel (2013).

connected to at least one other observation (i.e., no islands). In practical terms, this means that a spatial econometric model cannot drop potentially influential observations to gauge the sensitivity of modeling results to those observations. For example, suppose we wish to see how the public land ownership and management parameters change if we were drop counties with large, Census-designated central cities such as Denver, Las Vegas, Phoenix, and Salt Lake City from the analysis. Such an approach would not be permitted with a spatial model. We do not know which econometric approach—spatial fixed effects or spatial dependence—is warranted *a priori*. In practice, we will run our initial specifications using both modeling approaches, and conduct statistical tests to decide which is appropriate.

4.3.1 Data

The primary focus of our study is to determine the impact of federal land ownership and management on measures of economic growth at the county level. Our attention is focused on 276 counties the eight mountain states in U.S. Census Division 8, consisting of Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, and Wyoming, all of which have large tracts of federally-owned land within their borders. The eight states have roughly similar economies, especially in regards to rural economies that rely heavily on farming, mining, and recreation. Our sample does not include five Front Range [Colorado] counties because a new county (Broomfield) was formed in 2001 using land sliced from four other counties (Adams, Boulder, Jefferson, and Weld). It was not possible to calculate growth rates for the time periods of our study (2000–2007 and 2000–2010) for these counties.

We measure growth over two time periods: 2000 to 2007 and 2000 to 2010. The reason for looking at both periods is to examine any effect of the Great Recession, which began in December 2007, on the growth relationships. Table 4.5 presents annual migration, employment and income growth rates for the eight mountain states.

Table 4.5
Annualized economic growth rates between 2000 and 2007, and 2000 and 2010

	2000 through 2007			2000 through 2010		
State	**Net migration growth[a]**	**Employment growth[b]**	**Personal income growth[b]**	**Net migration growth**	**Employment growth**	**Personal Income growth**
AZ	1.69%[a]	3.24%	4.12%	1.38%	1.38%	2.40%
	[–1.23%; 1.53%][c]	[0.64, 4.87]	[1.84, 9.70]	[–0.85; 1.11][b]	[–2.04, 4.07]	[.77, 8.14]
CO	0.55%	1.41%	2.27%	0.67%	0.70%	1.64%
	[–1.14; 4.87]	[–1.75, 7.03]	[–2.22, 7.14]	[–0.42; 3.95]	[–1.54, 5.83]	[–1.77, 6.31]
ID	1.19%	2.53%	3.68%	1.05%	1.05%	2.18%
	[–2.52; 2.18]	[–2.37, 9.73]	[–0.31, 9.68]	[–1.96; 1.82]	[–1.86, 5.52]	[–0.02, 6.02]
MT	0.56%	1.93%	3.37%	0.57%	1.00%	2.47%
	[–0.53; 2.76]	[–3.38, 7.27]	[–1.01, 6.04]	[–0.36; 2.07]	[–0.93, 4.74]	[0.20, 5.54]
NV	2.73%	4.06%	5.05%	2.42%	1.72%	2.28%
	[–0.41; 3.70]	[–0.79, 15.29]	[0.27, 6.23]	[–0.28; 2.88]	[–0.86, 11.53]	[–0.09, 3.58]
NM	0.45%	1.95%	3.54%	0.51%	0.94%	2.70%
	[–2.26; 1.17]	[–1.11, 3.77]	[–3.23, 5.51]	[–1.67; 1.05]	[–1.36, 5.59]	[–1.83, 4.81]
UT	0.36%	2.81%	4.04%	0.50%	1.57%	2.60%
	[–0.38; 4.62]	[0.24, 6.83]	[–0.03, 8.54]	[–0.17; 1.16]	[0.16, 6.27]	[0.56, 6.22]
WY	0.53%	2.49%	4.99%	0.75%	1.60%	3.34%
	[–0.75; 1.84]	[0.13, 9.89]	[1.10, 13.33]	[–0.36; 2.16]	[0.02, 7.41]	[1.67, 10.08]

[a] Net migration is found by solving for net migration in the equation, $P_t = P_0 + \sum births - \sum deaths + net\ migration$. The annual net migration rate is found by dividing net migration by P_0, and dividing by t.
[b] All dollar figures are converted to 2012 dollars using the CPI, and then the annualized growth rate is calculated by solving for r in the following formula, $E_t = E_0(1+r)^t$, where E_t represents the value in the year t (t = 0 for 2000) or (t = 7 for 2007 or t = 10 for 2010).
[c] Figures in brackets represent the minimum and the maximum rates, [min, max], across each State's counties.

For the 2000–2007 time period, average annual growth in employment and income was greatest in Nevada. The state of Arizona was ranked second and third for employment growth and income growth, respectively. In contrast, annual growth for the 2000–2010 period finds these states—which were hardest hit by the Great Recession—falling to the bottom half of the region for income growth Our two time periods allow us to compare the two time horizons to examine how the Great Recession may have affected the public land management-economic growth relationship.

Table 4.6 provides a description of dependent and independent variables used in our study. The primary data on which our measures of economic growth—migration, employment, and income—are obtained from the Bureau of Economic Analysis (BEA), and the U.S. Census.

Table 4.6
Data, Descriptions, Sources and Time Period of Data

Dependent Variable	**Description**	**Source**
MIG	Natural log of the ratio of population density at time period *t* to population density at time period *t*=0, net of births and deaths over the time period.	Bureau of Economic Analysis (BEA) and 2001, 2006, 2011 National Resources Inventory (NRI) to obtain developed land area to calculate density.
EMP	Natural log of the ratio of employment density at time period *t* to employment density at time period *t*=0.	BEA and NRI
INC	Natural log of the ratio of total personal income (i.e., the sum of wage and nonwage income) density at time period *t* to employment density at time period *t*=0.	BEA and NRI
DEVAREA	Used to calculate economic growth density figures. The sum of acres of four developed land classes from the National Land Cover Dataset. The four areas include developed open space, developed low intensity (impervious surfaces account for 20% to 49% of total land cover, mostly single family housing), developed medium intensity ((impervious surfaces account for 50% to 79% of total land cover, mostly single family housing), and developed high intensity (impervious surfaces account for 80% to 100% of total land cover, and people live and work in high numbers).	National Land Cover Dataset from the NRI
Independent Variable	**Description**	**Source**
MIG07, MIG10	Natural log of the population in 2007, 2010 divided by developed area in 2006, 2011.	BEA, NRI
EMP00, EMP07, EMP10	Natural log of employment in 2000, 2007, 2010, divided by developed area in 2001, 2006, 2010	BEA, NRI
INC00, INC07, INC10	Natural log of total personal income in 2000, 2007, and 2010, divided by developed area in 2001, 2006, and 2011	BEA, NRI
MIG00	Natural log of the population in 2000 plus all births between 2000 and 2007 (or 2010) less the sum of all deaths between the same time period, all divided by developed area in 2001.	BEA, NRI
EMP00	Natural log of employment density in the base year 2000	BEA, NRI
INC00	Natural log of income density in the base year 2000	BEA, NRI
FEDGEN	The proportion of total county land area held by the federal government for general use. GAP status code 3 and 4. Does not include land administered by the National Park Service, Dept. of Energy, or Dept. of Defense.	PADUS
STGEN	The proportion of total county land area held by the state government for general use. GAP status code 3 and 4.	PADUS
PROTECTED	The proportion of total county land area that is publicly owned and managed in a protected class. Includes state parks. GAP status 1 and 2, regardless of ownership.	PADUS

(continued)

Table 4.6
Data, Descriptions, Sources and Time Period of Data

Independent Variable	Description	Source
NPS	The proportion of total county land area administered by the National Park Service. Any land regardless of GAP status managed by the park service.	PADUS
OTHER	The proportion of total county land area administered by tribal authorities, the Department of Energy, or the Department of Defense.	PADUS
FARMING	Dummy variable equaling 1 if the county is dependent on FARMING, zero else. A farming dependent county is defined as having either 15 percent or more of average annual labor and proprietors' earnings derived from farming during 1998-2000 or 15 percent or more of employed residents worked in farm occupations in 2000.	USDA Economic Research Service (ERS)
MINING	Dummy variable equaling 1 if the county is dependent on MINING, zero else. Mining dependent counties have 15 percent or more of average annual labor and proprietors' earnings derived from mining during 1998-2000.	ERS
RECREATION	Dummy variable equaling 1 if nonmetro recreation county, zero else. Recreation counties are classified using a combination of factors, including share of employment or share of earnings in recreation-related industries in 1999, share of seasonal or occasional use housing units in 2000, and per capita receipts from motels and hotels in 1997.	ERS
AIRPORT	Distance (minutes) to nearest primary airport. Primary airports have a minimum of 10,000 annual enplanements.	Federal Aviation Administration
HWYDEN	Miles of S1100 primary roads divided by county land area. These are divided, limited access highways within the interstate highway system or under state management, and are distinguished by the presence of interchanges. Accessible by ramps; may include some toll highways.	GIS, TIGER shape files
CDD	Cooling degree days, 10 year average	National Oceanic and Atmospheric Administration
COLLEGE	Percent of population in a county with a 4 year college degree.	U.S. Census 2000
WAGEINDX	Annual average weekly wage for a county in 2000 indexed to annual average weekly wage for US	Bureau of Labor Statistics
HOUSVAL	Median county housing value in 2000, adjusted to constant $2012	BEA

Table 4.7 provides standard descriptive statistics of all dependent and independent variables.

Table 4.7
Descriptive Statistics

Variables[a]	Mean	Standard Deviation	Minimum	Maximum
MIG 2000-2007	0.04	0.10	-0.18	0.46
MIG 2000-2010	0.05	0.11	-0.23	0.63
EMP 2000-2007	0.11	0.13	-0.24	0.99
EMP 2000-2010	0.11	0.15	-0.26	1.07
INC 2000-2007	0.20	0.13	-0.23	0.77
INC 2000-2010	0.22	0.13	-0.22	0.78
DEVAREA 2001	46.09	67.36	2.62	918.79
DEVAREA 2006	47.90	74.87	2.62	1030.17
DEVAREA 2011	48.96	79.63	2.62	1114.36
MIG00	6.22	1.07	3.39	8.56
EMP00	5.59	1.07	3.08	8.48
INC20	16.49	1.13	13.94	19.35
FEDGEN	32.35	22.97	0	90.53
STGEN	6.38	5.58	0	34.56
PROTECTED	7.47	9.09	0	56.66
NPS	1.16	4.23	0	44.06
OTHER	8.84	15.16	0.09	81.01
FARMING	0.24	0.43	0	1
MINING	0.12	0.32	0	1
RECREATION	0.32	0.47	0	1
AIRPORT	77.20	48.26	3	213
HWYDEN	0.10	0.09	0.02	0.98
CDD	580.95	630.82	0	4069.65
COLLEGE	19.95	9.00	8.70	60.50
WAGEINDX	67.85	15.93	41.38	154.34
HOUSVAL	139,521.30	87,213.81	36,309	997,500

[a] See Table 4.6 for variable definitions.

Following Carruthers and Vias (2005) and Carruthers and Mulligan (2007), the endogenous dependent variables are first converted to densities. Because so much of the land in the mountain west is in the public domain, opportunities for development are constrained; thus, we use developed land area (which changes over time, unlike county land area which is constant throughout time) in a county to calculate densities. As noted by Carruthers and Vias (2005) measuring densities in this way simulates land use change over time. To calculate the density of an economic variable, E, we divide E (migration, employment, or income) by developed land area at a particular point in time. When calculating the density in the year 2000, 2007, and 2010, we use developed land area in 2001, 2006, and 2011, respectively, simply because data on developed area were available for those years and not 2000, 2007, and 2010.

Early applications of the regional adjustment model used the "level" form of variables; that is, changes in employment, for example, were not converted to growth rates. Lewis, Hunt and Plantinga (2003) and Hunt (2006) find that level forms of the endogenous dependent variables were nonstationary over time and that empirical results may be spurious. Subsequent studies have used growth rates, which have been found to be stationary. Further, the use of growth rates rather than levels has been found to reduce the potential for heteroskedasticity among the observations. Our endogenous dependent variables are converted to percent changes using the natural logarithm formulation:

$$growth\ rate = ln\left(\frac{E_t}{DEVAREA_t}\bigg/\frac{E_{2000}}{DEVAREA_{2000}}\right),$$

where E represents some measure of economic performance at time t, and DEVAREA is developed land area at time t. Henceforth, we will simply refer to our density growth measures as migration (MIG), employment growth (EMP), and income growth (INC).

To define land ownership and management classes, we use GAP status codes from the PADUS database (see Appendix 1 for the formal GAP definitions) to create the following land classes: (1) PRIVATE land; (2) FEDGEN for federally-owned land (e.g., BLM and USFS) that can be used for multiple-use (i.e., general purposes) with few, if any, restrictions governing land cover change; (3) STATEGEN for state-owned land that can be used for general or multiple purposes, again with few land cover change restrictions (e.g., STLs); (4) PROTECTED land which includes all federal, state, and private land with some legal mandate preventing land cover change that negatively affects the natural state of the land (e.g., wilderness areas and state parks, or private land owned by conservation groups such as The Nature Conservancy); (5) land managed by the NPS (e.g., National Parks and Monuments); and (6) OTHER land which includes Department of Defense, Department of Energy, and land administered by tribal authorities. Each land class is calculated as a percentage of total land area in a county. [127] Table 4.8 shows, on average, how much land cover in the eight states is comprised of the six land classes described above.

Table 4.8
Percent of Land Type, by State[a]

	Federal General Use	State General Use	National Park Service	Protected	Other	Private
Arizona (15 counties)	30.4%	13.4%	2.2%	9.2%	27.7%	17.0%
Colorado (59)	27.8%	4.6%	0.7%	9.7%	3.3%	53.8%
Idaho (44)	41.6%	4.8%	0.2%	6.8%	8.7%	37.9%
Montana (56)	22.0%	6.7%	0.9%	4.9%	9.7%	55.7%
Nevada (17)	62.3%	0.4%	0.8%	10.4%	6.2%	19.9%
New Mexico (33)	20.9%	11.1%	0.7%	5.5%	13.6%	48.3%
Utah (29)	43.7%	6.2%	2.7%	10.5%	8.7%	28.3%
Wyoming (23)	32.6%	6.3%	3.1%	5.1%	4.1%	48.8%
All (276)	32.3%	6.4%	1.2%	7.5%	8.8%	43.8%

[a] Rows may not total to 100.0% due to rounding.

We note that the current pattern public land ownership and management was not the outcome of a random process: various factors influenced where public land is located, who owns it, and how it is managed. If the amount of public land in a county is not random (that is, public land is endogenous rather than exogenous), then econometrically estimated parameter estimates that fail to account for this are inconsistent.[128] Our empirical work included efforts to model our various

[127] Each category may include small areas of water (a pond, lake, or stream) that are not the primary classification of the 90 m² pixels used in our GIS analysis. Larger areas covered by water are excluded from all calculations of percentage area in a county. This distinction is critical for counties with large bodies of water such as Davis county, 53% of which is covered by the Great Salt Lake.

[128] Eichman et al. (2010) is the only study we know of to explore this difficult issue.

land ownership and management variables using instrumental variables that captured conditions during the period prior to, or just after, statehood for the states in our region. Our basic motivation was to identify factors that explain which land had been settled and/or claimed (and thus ended up privately owned) and which land had not been settled (unappropriated) and turned over to the federal government for disposition. Potential instruments included soil quality, proximity to U.S. Cavalry forts and Indian battles, the number of sections received as part of each state's Enabling Act, and the routes of the various Land Grant railroads. Our efforts found some promising instruments but, by and large, we cannot conclusively determine if the land ownership and management variables are endogenous or exogenous. An application of the Durbin-Hausman-Wu test suggests that 19 of our 21 land variables are, indeed, exogenous; in contrast, the Hausman test statistic indicates the land variables are collectively endogenous. Given these mixed results, we proceed with our econometric models treating the land variables as exogenous; Appendix 4.2 provides details on our instrumental variables modeling and test results.

Our statistical models differentiate counties by economic structure using the USDA Economic Research Service (ERS) County Typology codes. The codes are based on the percentage of county output generated by specific economic sectors. The ERS reports six mutually exclusive codes for county economic dependency for the following sectors: (1) farming, (2) mining, (3) manufacturing, (4) service, (5) government, and (6) non-specific. Farming and mining are the county types most likely to be affected by public land ownership and management (e.g., grazing and permitting of mineral, oil, and gas claims on public land). In addition, ERS identifies counties with economies that rely upon industries associated with recreation such as hotels, restaurants, and recreation rental housing. We include three dummy variables to indicate whether the county's economy is dependent on FARMING or MINING, and to indicate if a nonmetro county is RECREATION-based.[129] Table 4.9 provides information about land classes in FARMING, MINING, and RECREATION in all counties and in Utah counties. The largest land classes, regardless of county typology, are FEDGEN and PRIVATE. On average, STATEGEN comprises less than 10 percent of a county's acreage for all county types.

Table 4.9
Land Ownership and Management, by County Type[a]

Full Sample	Federal General Use	State General Use	National Park Service	Protected	Other	Private
All counties (n=276)	32.3%	6.4%	1.2%	7.5%	8.8%	43.8%
Farm counties (n=66)	24.4%	7.1%	0.2%	3.2%	3.9%	61.2%
Mining counties (n=32)	46.9%	6.3%	0.4%	7.7%	8.0%	30.7%
Recreation counties (n=87)	41.7%	4.9%	2.8%	11.8%	7.9%	30.9%
Utah Only						
All counties (n=29)	43.7%	6.2%	2.7%	10.5%	8.7%	28.3%
Farm counties (n=4)[b]	61.5%	9.8%	0.0%	3.6%	2.5%	22.5%
Mining counties (n=4)[c]	45.2%	8.5%	0.5%	14.2%	9.3%	22.2%
Recreation counties (n=13)[d]	47.9%	6.7%	5.8%	13.8%	5.6%	20.3%

[a] Rows may not total to 100.0% due to rounding.
[b] Beaver, Millard, Piute, Rich
[c] Carbon, Duchesne, Emery, Uintah
[d] Beaver, Daggett, Duchesne, Garfield, Grand, Iron, Kane, Rich, San Juan, Summit, Wasatch, Washington, Wayne

[129] The six economic dependence typologies are mutually exclusive. RECREATION can apply to counties with any economic dependence. For example, Duchesne county is both a MINING county and a RECREATION county.

Our model specifications are rooted in the findings of prior studies and the public land variables we wish to add to the analysis. Key factors include AIRPORT (distance in minutes to the nearest primary airport), HWYDEN (interstate highway miles in a county divided by land area), and COLLEGE (percent of college graduates in a county).[130] The amenities offered by a region are largely captured in our land measures (park service land, protected land, and open-space provided by general multiple-use land), so we are left to measure climatological effects. [131] Heating and cooling degree days (CDD) are highly negatively correlated; we report models using CDD. These variables are described explicitly in Table 4.6.

Our spatial econometric model requires us to identify a spatial weights matrix to link counties to one another. The most common approach used to construct a spatial weight matrix is to link counties sharing a common border. This approach would, for example, connect Davis County to both Salt Lake and Weber counties, but Weber and Salt Lake would not be connected because they do not share a border. Another version is to use the inverse of the distance between county centroids or the major city in each county.[132] A drawback of both approaches is that neither has anything to do with the local economic structure. Just because Weber and Salt Lake counties do not share a physical border does not mean that economic activity in Weber County is independent of that in Salt Lake County, or vice versa.

An alternative to using a contiguity-based weight matrix is rooted in a theoretical structure that is, at its core, a labor market. Thus, we use commuting zones to model the mobile factors of production assumed by regional adjustment models. According to the USDA Economic Research Service, "A local economy and its labor market are bounded not by the nearest county line, but by interrelationships between buyers and sellers of labor" (2014).[133] Our row-standardized spatial weights matrix is constructed using USDA commuting zones for the year 2000, as developed from the "journey-to-work" data compiled by the U.S. Census Bureau (USDA, 2012). Table 4.10 shows the commuting zones for Utah counties (including out-of-state counties that may be grouped with a Utah county in the same commuting zone.)

Table 4.10
USDA Defined Commuting Zones, 2000[a]

Zone Number	Counties
139	Davis, Morgan, Salt Lake, Summit, Tooele, Wasatch, Weber
227	Box Elder, Cache, Franklin (ID), Oneida (ID)
262	Juab, Millard, Sanpete, Utah
274	Carbon, Emery
377	Duchesne, Uintah
394	Daggett, Rich, Sweetwater (WY), Uinta (WY)
438	Kane, Coconino (AZ), Yavapai (AZ)
530	Garfield, Piute, Sevier, Wayne
581	Beaver, Iron, Washington
617	Grand, San Juan

[a] Based on Bureau of Census "journey-to-work" files

130 For example, Rasker et al. (2009) demonstrate the importance of airports in rural development.
131 We also explored the role of natural resource amenities on migration and income growth by using the USDA ERS Natural Resource Amenities scale. The scale is based on county characteristics: warm winter, winter sun, temperate summer, low summer humidity, topographic variation, and water area. We do not use the amenity index in our model because it is highly correlated with RECREATION. We opt to use the dummy variable controlling for economic structure.
132 An inverse distance implies that the economic effects of "connected" counties decrease with distance.
133 As an example of the effects of commuting zones, Renkow (2003) found that 70 to 80 percent of the change in employment growth during the 1980s could be explained by changes in commuting flows.

4.4 RESULTS

We estimate regional adjustment models that vary by time period and the way in which spatial effects are measured. Our two different time periods measure growth between 2000 and 2007, and growth between 2000 and 2010. Using two time frames for the analysis allows us to isolate any effects associated with the Great Recession that began December 2007. As noted in Section IV (Econometric Modeling), we use two econometric approaches. The well-known simultaneous equations 3SLS method applies the economic structure of the regional adjustment model and captures spatial fixed effects using dummy variables. The Generalized Spatial 3SLS approach also imposes the economic structure of the regional adjustment model, but controls for spatial dependence by an additional parameter to measure the effects of spatial spillovers. All models were estimated using the statistical software package, Stata.

Our initial exploration of the relationship between economic growth and measures of public land ownership and management used ordinary least squares (OLS) regression. That is, we simply regressed population growth due to migration, employment growth, and income growth in counties against the percentages of federal multiple-use land ownership and state multiple-use land ownership. Graphs of these simple regressions appear in Figures 4.2, 4.3, and 4.4 for migration, employment growth, and income growth, respectively, for the 2000–2007 period (see figures at the end of this section). [134] In all cases the model providing the best fit was quadratic in the percentage of land ownership, with both quadratic parameters estimated for all models statistically significant for 2000–2007 and for all but the employment model for 2000–2010. Regardless of the economic measure under investigation, an inverted-U shaped was found for the percentage of federal land ownership managed for multiple-use (the upper graph in each figure). The implication of the initial finding is that relatively modest amounts of federal land managed for general use fosters county-level economic growth, but that beyond some amount, federal land managed for general use is associated with a drag on growth. The opposite effect is found for state-owned land managed for general use, with a U-shape relationship (the bottom graph in each figure). Here, the implication is that relatively small amounts of state land managed for general use initially drag on growth but once a critical mass of land is achieved, state management is associated with faster economic growth. These quadratic relationships form the core of our specification of the regional growth model. After presenting the results of those models, we will return to an in depth discussion of the quadratic relationships for federal and state multiple-use land.

4.4.1 Baseline Specifications, 2000–2007 and 2000–2010

We choose our two time periods to control for effects of the "Great Recession" which officially began in December 2007 and ended in June 2009, after which the nation's economy began a sluggish recovery. While the rapid economic growth of the early portion of the decades was strong enough to provide net positive growth for the full 2000–2010 period, the end-of-decade economic turbulence may affect our model parameters.[135] Thus, we estimate separate models for the two time frames.

[134] Coefficients and p-values for these specifications appear in Tables 4.25 (2000–2007) and 4.26 (2000–2010) in Appendix 3 at the end of this chapter.

[135] To recall the effects of the Great Recession on Utah, the state unemployment rate shot up from 2.7% in 2007 to 8.0% in 2010 (2012 Economic Report to the Governor). Construction of residential housing units fell by over 50%, from over 20,000 units in 2007 to fewer than 10,000 units in 2010. Housing prices fell by over 25% over a four year

Our first set of regional adjustment models is estimated using 3SLS appears in Table 4.11. In this and all similar tables the variable names appear in Column 1, the 2000–2007 model parameters appear in Columns 2 through 4 and the 2000–2010 parameters appear in columns 5 through 7. The migration, employment, and income growth equations are labeled MIG, EMP, and INC. All model tables are structured to group "like variables" for ease of discussion. After the constant, the first six variables are the endogenous and lagged exogenous measures of economic growth. The next three variables measure county-level economic structure through the use of the USDA county typology codes. The eight variables following the typology codes represent exogenous effects believed to influence one or more of the three-equations; these variables were selected from a review of the literature with special emphasis on regional adjustment models that had been estimated in the western U.S. Finally, the public land ownership and management measures appear as the last set of seven variables. Discussion will focus mainly—but not exclusively—on relationships that are statistically significant at conventional levels for hypothesis testing (p≤0.10) for both time periods of analysis.

Table 4.11
Baseline Specification, No Spatial Weighting
(p-values)

	Model 1A, 2000–2007 Structural 3SLS			**Model 1B, 2000–2010 Structural 3SLS**		
	MIG	**EMP**	**INC**	**MIG**	**EMP**	**INC**
CONSTANT	–0.293229 (0.50)	0.358887 (0.58)	2.045279 (0.01)	1.358498 (0.05)	0.505458 (0.53)	2.883374 (0.01)
MIG07 (MIG10)		0.188847 (0.01)	0.234015 (0.01)		0.121082 (0.05)	0.212949 (0.01)
EMP07 (EMP10)	–0.056419 (0.04)		–0.032473 (0.31)	–0.033752 (0.41)		0.007705 (0.82)
INC07 (INC10)	0.028492 (0.48)	–0.047590 (0.43)		–0.135441 (0.03)	–0.023423 (0.75)	
MIG00	0.018752 (0.59)			0.165468 (0.01)		
EMP00		–0.145468 (0.01)			–0.156818 (0.01)	
INC00			–0.189812 (0.01)			–0.242889 (0.01)
FARMING	–0.028516 (0.05)	–0.012178 (0.57)	–0.012261 (0.53)	–0.023230 (0.24)	0.024284 (0.33)	–0.039857 (0.05)
MINING	–0.027061 (0.11)	0.008420 (0.74)	0.056369 (0.01)	–0.008503 (0.72)	0.015974 (0.59)	0.060235 (0.01)
RECREATION	0.049538 (0.01)	0.099422 (0.01)	0.045117 (0.01)	0.044812 (0.01)	0.096842 (0.01)	0.024838 (0.11)
DISTAIRPORT	–0.000235 (0.04)	–0.000055 (0.70)		–0.000444 (0.01)	–0.000179 (0.35)	
CDD	0.001272 (0.12)		0.000464 (0.64)	0.129644 (0.26)		–0.167021 (0.14)
HOMEOWN	0.000959 (0.10)			0.001262 (0.12)		
WAGEINDEX	0.000000 (0.99)	0.002477 (0.01)		0.000809 (0.16)	0.001491 (0.03)	
HOUSVAL	0.000037 (0.39)	–0.000206 (0.10)		0.000379 (0.01)	–0.000264 (0.11)	

(continued)

period. The Great Recession had the effect of freezing people in houses that were difficult to sell, even if homeowners had employment opportunities elsewhere. In addition to migration and employment effects, the decline in the stock market and low interest rates caused a decline in non-wage income. This, combined with the effect of rising unemployment, caused per capita total personal income in Utah to fall between 2007 and 2010.

Table 4.11
Baseline Specification, No Spatial Weighting
(p-values)

STINCTAX	–0.010361	–0.007020	–0.026869	–0.009288	–0.010444	–0.023749
	(0.06)	(0.38)	(0.01)	(0.22)	(0.26)	(0.01)
HWYDEN		–0.104034			–0.090508	
		(0.49)			(0.66)	
COLLEGE		0.003139	0.003174		0.004442	0.001847
		(0.01)	(0.01)		(0.01)	(0.08)
NPS	–0.000982	–0.000117	0.002931	0.000773	–0.001008	0.001077
	(0.39)	(0.95)	(0.06)	(0.63)	(0.61)	(0.50)
PROTECTED	–0.000495	–0.000893	–0.001541	–0.001384	–0.000271	–0.001479
	(0.47)	(0.34)	(0.06)	(0.13)	(0.80)	(0.08)
OTHER	–0.000568	–0.000567	–0.000500	–0.000391	–0.000617	0.000431
	(0.10)	(0.25)	(0.25)	(0.40)	(0.28)	(0.35)
FEDGEN	0.001767	0.002487	0.003844	0.002641	0.000355	0.002452
	(0.03)	(0.03)	(0.01)	(0.01)	(0.79)	(0.03)
FEDGEN^2	–0.000019	–0.000029	–0.000051	–0.000030	–0.000003	–0.000040
	(0.09)	(0.07)	(0.01)	(0.04)	(0.89)	(0.01)
STGEN	–0.006427	–0.010406	–0.007869	–0.009977	–0.009009	–0.004674
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.10)
STGEN^2	0.000232	0.000308	0.000243	0.000363	0.000301	0.000211
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.04)
χ2 (β=0)	93.49	151.72	158.21	105.96	100.15	108.30
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)

Though we are most interested in the land ownership and management variables, our discussion begins with our endogenous and exogenous variables (i.e., a discussion of the results of H1, H2, and H3). The parameters for these 17 variables remain quite stable across model specifications; overall results are discussed here so that we may focus more intently on the land parameters in subsequent specifications. Hypothesis H1 tests whether the three measures of economic growth are interrelated. Economic theory suggests the six endogenous variables should be related to one another; our results are mixed. Three of the six variables are statistically significant at conventional levels, two of which are positive. Employment and income growth are positively related to contemporaneous population density (MIG07 and MIG10). Population growth associated with migrants increases growth in employment and income. In contrast, the MIG equation suggests population growth due to migration is negatively related to contemporaneous employment density (EMP07) in the 2000–2007 period. This is likely the result of spatial spillovers. For example, Salt Lake and Utah counties have negative net migration growth yet have very high employment densities. In contrast, "bedroom" counties such as Juab and Tooele counties have relatively high migration rates while also having relatively low employment densities. All else equal, the model is capturing the fact that less populous counties adjacent to densely urban counties are enjoying faster population growth due to migration.[136] It would appear that the Great Recession may have disrupted the migration-employment relationship, where EMP10 is statistically insignificant in the 2000–2010 model. The negative and significant parameter on INC10 in the income MIG equation for the 2000–2010 period is unexpected.

Hypothesis H2 tests whether each measure of economic growth adjusts to equilibrium levels with substantial lags. Essentially, economic growth over a specified time period is conditioned on its initial level. The theoretical model suggests that counties that are already "dense" with jobs

[136] This relationship holds for many other counties located adjacent to counties with large, central cities (e.g., Pinal county is adjacent to Phoenix; Nye county is adjacent to Las Vegas; Elbert county is adjacent to both Colorado Springs and the Denver metropolitan area).

and income should grow more slowly than regions that are less dense; this holds true for both time periods (EMP00 in the EMP equation and INC00 in the INC equation). The positive sign on beginning of period population density (MIG00) suggests that dense urban areas attract more migrants than less dense regions (significant in the model for 2000–2010), all else equal. Again, the sign is unexpected. We will return to hypothesis H2 shortly.

Hypothesis H3 tests the relationship between economic growth and measures of natural resource economic dependency, FARMING, MINING, and RECREATION.[137] The county typology measures perform as expected. Counties with large FARMING sectors attract migrants at a rate that is slower than other types of counties (2000–2007) and have slower income growth (2000–2010). For both time periods MINING counties have income growth that exceeds other county types, all else equal. Finally, counties with relatively large RECREATION sectors attract migrants, enjoy faster job growth, and have faster income growth than other county types, all else equal, in both time periods.

The literature has suggested a number of additional exogenous variables that affect economic growth. The further a county is from an AIRPORT the more slowly it attracts migrants. Home ownership rates (HOMEOWN) and climate (CDD) do not appear to affect migration or income growth (HOMEOWN is marginally significant in Table 4.11, but not in many subsequent specifications). Our measures of beginning of period wages (WAGEINDX) and housing values (HOUSVAL) are not statistically significant in the migration equation. WAGEINDX, in particular, reinforces the idea that migration is not tightly related to local, in-county job markets. The positive sign on WAGEINDX in the employment growth equation suggests that faster growth occurred in regions with higher wages (i.e., cities). The median value of owner-occupied housing (HOUSVAL) is marginally significant in the 2000–2007 period and just misses significance during the 2000–2010 period. The negative coefficient suggests that higher housing values leads to slower employment growth. The higher the state tax on personal income (STINCTAX) the more slowly a county will enjoy income growth relative to counties located in states with lower income tax rates. The density of interstate highways (HWYDEN) appears to have little effect on employment growth. The positive coefficient on COLLEGE indicates that counties with larger proportions of their populations holding a four-year degree have faster employment and income growth than counties with smaller proportions of four year degree residents. By and large, the sign and statistical significance of these endogenous and exogenous variables are stable across subsequent specifications of the model and conform to theoretical expectations.

Our central hypothesis, H4, is tested by examining the relationship between economic growth and public land ownership and management. Turning to the land ownership and management variables, the percentage of land managed by the National Park Service appears to positively affect income growth in a county (2000–2007), but not migration or employment growth. As the amount of land considered PROTECTED increases, income growth falls. OTHER land has a negative effect on migration (2000–2007), as might be expected for land used as bombing ranges by the Department of Defense, test sites by the Defense of Energy, or reservations administered by tribal authorities. Table 4.11 also shows that after incorporating endogeneity in the economic measures and accounting for additional explanatory variables, the model continues to exhibit the

[137] Discussion of FARMING and MINING effects are relative to the omitted typology categories, namely, counties with economies that are more dependent on manufacturing, services, government, and "non-specific". See Table 6 for a definition of the county types and USDA (2014) for the methodology used to define county economic dependence.

inverted U-shape quadratic in federal land classified as multiple-use (FEDGEN and FEDGEN^2) in the migration, employment, and income equations for 2000–2007 and in migration and income equations for the 2000–2010 period. Similarly, all equations exhibit the highly significant U-shape quadratic in state-owned land classified as multiple-use (STGEN and STGEN^2). We estimated models restricting the 21 land ownership and management parameters to be equal to zero and calculated the resulting likelihood ratio test statistic.[138] The test statistics were 50.22 and 50.58, respectively, for 2000–2007 and 2000–2010. We reject the hypothesis that the 21 parameters are jointly equal to zero ($p \leq 0.01$). Adding the public land variables to the analysis helps explain variation in economic growth across our 276 counties. We also estimated models that are linear in all land terms, i.e., we drop FEDGEN^2 and STGEN^2.[139] The likelihood ratio test statistics were 26.14 and 23.83 for 2000–2007 and 2000–2010, respectively. With two restrictions, we reject the hypothesis that these parameters are equal to zero and that the quadratic specification is preferred to the linear.

In summary, the models in Table 4.11 appear to perform reasonably well. Of the 57 parameters estimated in each model, 34 are statistically significant for the 2000–2007 period and 30 are statistically significant for the 2000–2010 period. All 12 parameters for the general use land categories are significant for the 2000–2007 time period, as are 10 of the 12 parameters for the 2000–2010 period. All equations are highly significant, as indicated by the chi-square test statistic for each equation. The likelihood ratio tests that compare the models in Table 4.11 with the restricted versions appearing in Appendix 3 of this chapter suggest the land variables are important in explaining economic growth in the mountain west.

Table 4.12 presents the reduced form parameters for both models; that is, the simultaneous nature of the model is removed and growth rates are expressed solely in terms of exogenous measures.

Table 4.12
Baseline Specification, Reduced Form
(p-values)

	Reduced Form, 2000–2007 3SLS			Reduced Form, 2000–2010 3SLS		
	MIG	EMP	INC	MIG	EMP	INC
CONSTANT	–0.082313 (0.81)	0.848948 (0.09)	2.706187 (0.01)	1.061852 (0.02)	0.836903 (0.19)	3.546679 (0.01)
MIG00	0.020550 (0.48)	0.184054 (0.01)	0.228152 (0.01)	0.136755 (0.01)	0.139044 (0.02)	0.225324 (0.01)
EMP00	–0.034852 (0.15)	–0.093581 (0.01)	0.022669 (0.50)	–0.023426 (0.46)	–0.140319 (0.01)	0.046084 (0.21)
INC00	0.007046 (0.83)	–0.100140 (0.04)	–0.245722 (0.01)	–0.113797 (0.01)	–0.059678 (0.34)	–0.301908 (0.01)
FARMING	–0.026029 (0.06)	–0.009582 (0.65)	–0.013204 (0.49)	–0.015806 (0.39)	0.027884 (0.27)	–0.039866 (0.06)
MINING	–0.018797 (0.23)	0.020122 (0.40)	0.075760 (0.01)	–0.009444 (0.65)	0.018207 (0.53)	0.079754 (0.01)
RECREATION	0.050098 (0.01)	0.126528 (0.01)	0.059714 (0.01)	0.041287 (0.02)	0.110819 (0.01)	0.044512 (0.02)
DISTAIRPORT	–0.000358 (0.01)	–0.000317 (0.06)	–0.000486 (0.01)	–0.000526 (0.01)	–0.000340 (0.09)	–0.000507 (0.01)
CDD	0.001805 (0.04)	0.000797 (0.55)	0.001691 (0.16)	0.168909 (0.12)	–0.079952 (0.60)	–0.081640 (0.52)

(continued)

[138] These models appear in Table A3.2 in Appendix 3
[139] See Table A3.3 in Appendix 3.

Table 4.12
Baseline Specification, Reduced Form
(p-values)

HOMEOWN	0.001672 (0.01)	0.002991 (0.01)	0.002025 (0.02)	0.001876 (0.03)	0.001461 (0.21)	0.002049 (0.04)
WAGEINDEX	–0.000379 (0.36)	0.001364 (0.03)	–0.001727 (0.01)	0.000472 (0.40)	0.001157 (0.13)	–0.001373 (0.03)
HOUSVAL	0.000088 (0.35)	0.000022 (0.88)	0.000399 (0.01)	0.000358 (0.01)	–0.000171 (0.32)	0.000239 (0.10)
STINCTAX	–0.010592 (0.03)	–0.013271 (0.08)	–0.034287 (0.01)	–0.006913 (0.29)	–0.014970 (0.09)	–0.030811 (0.01)
HWYDEN	–0.312822 (0.01)	–0.265807 (0.15)	–0.094225 (0.58)	–0.076671 (0.63)	–0.042583 (0.85)	0.217545 (0.24)
COLLEGE	0.000413 (0.65)	0.003191 (0.02)	0.001918 (0.13)	0.000643 (0.59)	0.004699 (0.01)	0.001692 (0.23)
NPS	–0.001451 (0.19)	–0.001404 (0.40)	0.001838 (0.23)	0.000320 (0.83)	–0.001245 (0.53)	0.000532 (0.75)
PROTECTED	–0.000424 (0.52)	–0.000196 (0.84)	–0.001372 (0.13)	–0.000870 (0.31)	0.000195 (0.87)	–0.000863 (0.38)
OTHER	–0.000554 (0.09)	–0.000389 (0.43)	–0.000281 (0.54)	–0.000331 (0.44)	–0.000472 (0.42)	0.000773 (0.12)
FEDGEN	0.000946 (0.23)	0.001182 (0.32)	0.002779 (0.01)	0.001739 (0.09)	–0.000067 (0.96)	0.001972 (0.10)
FEDGEN^2	–0.000008 (0.44)	–0.000010 (0.56)	–0.000035 (0.02)	–0.000016 (0.25)	0.000005 (0.79)	–0.000029 (0.07)
STGEN	–0.006000 (0.01)	–0.009541 (0.01)	–0.007191 (0.01)	–0.008301 (0.01)	–0.008982 (0.01)	–0.004457 (0.15)
STGEN^2	0.000222 (0.01)	0.000318 (0.01)	0.000261 (0.01)	0.000311 (0.01)	0.000333 (0.01)	0.000256 (0.02)
$\chi 2$ (β=0)	117.82 (0.01)	148.97 (0.01)	182.48 (0.01)	135.49 (0.01)	100.12 (0.01)	116.45 (0.00)

(p-values in parentheses)

Although each equation is nominally independent of the others in this formulation, we continue to use 3SLS to adjust for cross-equation correlation. The reduced form allows us to examine the stability conditions—and formally test hypothesis H2—of the three equation system following the procedures outline by Carlino and Mills (1987) and Carruthers and Mulligan (2007). If the eigenvalues of a matrix constructed from the coefficients of the lagged dependent variables are all positive and less than one, then the model is consistent with a three-equation system converging toward a stable equilibrium, a fundamental test of the partial adjustment model.

The parameters of the 2000–2007 model yield eigenvalues that are all positive and less than one, indicating that the model is consistent with an economy working its way toward an (unknown) equilibrium. This is not true of the 2000–2010 model where one of the eigenvalues is greater than one. This instability is rooted in the unexpected signs of the 2000–2010 model, in particular, the estimated value for the lagged population density. In fact, none of the 2000–2010 models reported in this study are consistent with an economy moving toward a stable equilibrium. The effect of the Great Recession is reflected in our model parameters: we reject H2 for 2000–2010.

Spatial Diagnostics

Our next step is to examine the data for spatial spillovers in the dependent variables (spatial lags) and in the errors (spatial error correlation). Tests were conducted for each equation and time period using the same specifications shown in Table 4.11. Table 4.13 reports p-values for the robust LaGrange multiplier tests; tests were calculated using the SPATDIAG command written for Stata and interpreted following the decision rules outlined by Anselin (2005, pp. 198-200).[140]

Table 4.13
P-values for Spatial Correlation Tests
(H_0 = No spatial correlation)

2000–2007	**MIG**	**EMP**	**INC**
Spatial Lag	0.008	0.001	0.027
Spatial Error	0.114	0.012	0.954
2000–2010	**MIG**	**EMP**	**INC**
Spatial Lag	0.184	0.487	0.469
Spatial Error	0.596	0.320	0.872

For 2000–2007 the p-values reported in Table 4.13 indicate that a spatial lag is present in all three equations whereas only one of the equations (EMP) has the potential of spatially lagged errors. Anselin notes that if one of the spatial lag and spatial error tests is "…orders of magnitude more significant than the other…" then one should proceed to model the relationship with the most significant test. Following Anselin's decision rules, we estimate spatial lag regional adjustment model for the 2000–2007 period. The p-values for the robust LaGrange multiplier tests as applied to the 2000–2010 time period indicate no spatial correlation in dependent variables or errors for any equation. This suggests that spatial modeling is unnecessary for this time period.

Spatial Models

Using the same specification as that used in Table 4.11, Table 4.14 reports a generalized spatial 3SLS model (Model 2) that accounts for cross equation correlation and estimates a spatial lag parameter for each of the three endogenous regressors. The qualitative results—as measured by the coefficient magnitudes and levels of statistical significance—are nearly identical across Model 2 and Model 1A. The spatial lag parameters are reported at the bottom of Table 4.13.

Table 4.14
Model 2, Generalized Spatial 3SLS, 2000–2007
(p-values)

		MODEL 2	
	MIG	**EMP**	**INC**
CONSTANT	–0.156841 (0.69)	–0.152746 (0.80)	1.496385 (0.01)
MIG07 (MIG10)		0.137322 (0.01)	0.198143 (0.01)
EMP07 (EMP10)	–0.055054 (0.03)		–0.051600 (0.10)
INC07 (INC10)	0.011939 (0.74)	0.003402 (0.95)	
MIG00	0.031835 (0.32)		
EMP00		–0.153479 (0.01)	
INC00			–0.138585 (0.01)

(continued)

[140] See also Anselin et al. 1996.

Table 4.14
Model 2, Generalized Spatial 3SLS, 2000–2007
(p-values)

FARMING	–0.018584 (0.18)	–0.012863 (0.54)	–0.016171 (0.41)
MINING	–0.020683 (0.19)	0.002902 (0.90)	0.043519 (0.04)
RECREATION	0.047894 (0.01)	0.086647 (0.01)	0.041026 (0.01)
DISTAIRPORT	–0.000016 (0.88)	–0.000012 (0.94)	
CDD	0.000340 (0.67)		–0.000109 (0.92)
HOMEOWN	0.001245 (0.02)		
WAGEINDX	0.000238 (0.55)	0.002419 (0.01)	
HOUSVAL	0.000000 (0.50)	–0.000000 (0.04)	
STINCTAX	–0.005776 (0.27)	0.001409 (0.86)	–0.021026 (0.01)
HWYDEN		–0.166665 (0.27)	
COLLEGE		0.002670 (0.02)	0.002388 (0.02)
NPS	–0.001210 (0.27)	–0.001233 (0.46)	0.002315 (0.13)
PROTECTED	–0.000698 (0.28)	–0.000684 (0.45)	–0.001345 (0.11)
OTHER	–0.000598 (0.06)	–0.000753 (0.12)	–0.000665 (0.14)
FEDGEN	0.001567 (0.04)	0.001597 (0.17)	0.003037 (0.01)
$FEDGEN^2$	–0.000022 (0.03)	–0.000025 (0.11)	–0.000044 (0.01)
STGEN	–0.006000 (0.01)	–0.009481 (0.01)	–0.008114 (0.01)
$STGEN^2$	0.000232 (0.01)	0.000279 (0.01)	0.000262 (0.01)
λ(spatial lag)	0.577998 (0.01)	0.422673 (0.01)	0.300638 (0.01)

The spatial lag is positive and statistically significant in all equations: this implies that growth in one county is positively related to growth in its neighboring counties. If the neighboring counties experience growth in migration, employment and income, then the county of interest will enjoy positive spillovers from that growth. Conversely, neighbors that grow slowly, or have negative growth, will result in slower growth in the county of interest (Table 4.14, above).

The coefficients for the endogenous and lagged dependent variables in follow the same pattern as those in Table 4.11. Some exogenous variables that were significant in the 3SLS model of Table 4.11 were not significant in the spatial model of Table 4.14: FARMING (MIG), DISTAIRPORT (MIG), and STINCTAX (MIG). Eleven of the 21 land ownership and management variables are significant in the GS3SLS model of Table 4.14—four fewer than in Table 4.11. For our key land management variables, the inverted U-shape for federal general use land (FEDGEN and $FEDGEN^2$) is observed for both migration and income growth, but not employment growth. The U-shaped for state-owned multiple-use land (STGEN and $STGEN^2$) continues to hold for migration, employment growth, and income growth.

It would appear that the parameters on the general use land variables are essentially identical across Tables 4.11 and 4.14. To evaluate statistical differences in our land parameters across the two modeling strategies, we can impose the GS3SLS parameters on the 3SLS model and calculate a likelihood ratio test statistic to test the null hypothesis that the parameters are identical. That is, for the FEDGEN and FEDGEN^2 quadratic relationship in the migration equation, we estimate a new 3SLS model that constrains the 3SLS parameters to equal the GS3SLS parameters (0.001567 and −0.000022, respectively). If we observe little difference in the value of the constrained log-likelihood value relative to the unconstrained value (Table 4.11) then we can conclude that the parameters arising from the more restrictive GS3SLS approach are not different from the 3SLS. The p-values for the test statistics appear in Table 4.15. The null hypothesis of parameter equality can be rejected in only one of the six tests, federal general use land in the migration equation. In all other cases, the GS3SLS produces parameter estimates that are statistically identical to that of the 3SLS. As noted previously, the spatial modeling approach (1) is more restrictive in that spatial effects are captured in a single spatial lag parameter; (2) limits our ability to capture spatial fixed effects using simple dummy variables and, (3) we cannot drop potentially influential observations. Given this result—plus the fact that no spatial spillovers were identified for the 2000–2010 period, we proceed with 3SLS estimation for subsequent specifications.

Table 4.15
Test of Parameter Equality, 3SLS vs. GS3SLS (2000–2007)

	MIG	EMP	INC
FEDGEN and FEDGEN^2	0.080	0.145	0.412
STGEN and STGEN^2	0.930	0.970	0.965

P-value for null hypothesis that linear and quadratic parameters for 3SLS (Table 11) are equal to the parameters estimated for GS3SLS (Table 4.14).

4.4.2 Alternative Specifications

In addition to our baseline specification, a number of alternative specifications were estimated. These alternatives tested the possibility of state-level fixed effects, as well as the potential for counties with high population, employment, and income densities to influence the effect of public land variables on economic growth. As noted in the previous section, the sign and statistical significance of the endogenous and exogenous variables were remarkably constant across specifications; thus, our discussion in this section focuses solely on the newly introduced variables and on the land variables of interest.

Our first effort is to include a variable capturing the influence of dense, urban counties and a set of variables that measure state-level spatial fixed effects. Our measure of dense counties is counties with Census-designated central cities; central city counties are roughly four times as dense in population, employment, and income than counties without central cities.[141] CENTRALCITY is a dummy variable taking the value of 1 if the county is home to a central city and 0 otherwise. Table 4.16 displays the 26 counties that have central cities. We also include a 0/1 dummy variable for seven of our 8 states. Colorado was selected as the reference state simply because it has the most counties in the dataset (59 counties); the interpretation of the state dummy variables coefficients are relative to growth rates for Colorado.

[141] Densities are reported in Table A.3.4 of Appendix 3.

Table 4.16
Census Designated Central Cities

City	County	State	City	County	State
Flagstaff	Coconino	AZ	Missoula	Missoula	MT
Phoenix	Maricopa	AZ	Billings	Yellowstone	MT
Tucson	Pima	AZ	Las Vegas	Clark	NV
Yuma	Yuma	AZ	Reno	Washoe	NV
Denver	Denver	CO	Albuquerque	Bernalillo	NM
Colorado Springs	El Paso	CO	Las Cruces	Dona Ana	NM
Ft. Collins	Larimer	CO	Santa Fe	Santa Fe	NM
Grand Junction	Mesa	CO	Farmington	Davis	UT
Pueblo	Pueblo	CO	Salt Lake City	Salt Lake	UT
Boise	Ada	ID	Provo	Utah	UT
Pocatello	Bannock	ID	Ogden	Weber	UT
Caldwell	Canyon	ID	Cheyenne	Laramie	WY
Great Falls	Cascade	MT	Casper	Natrona	WY

Table 4.17 shows models 3A and 3B, which add CENTRALCITY and the state fixed effects. CENTRALCITY is negative and significant in the income growth equation for both time periods. This indicates that income growth is slower in counties with central cities—where income density is already very high—than other counties. Relative to Colorado, every state except New Mexico enjoyed faster income growth. In addition, the states of Idaho, Utah and Wyoming had faster migration growth relative to Colorado, while Utah and Wyoming experienced faster employment growth. The magnitude of the public land variable coefficients stays the same across with the addition of state fixed effects, though the significance of FEDGEN and FEDGEN^2 is weakened for the migration and employment equations in 2000–2007, and the income equation in 2000–2010. The U-shape for STGEN and STGEN^2 remains statistically robust.

Models 4A and 4B in Table 4.18 replicate the baseline specification (Table 4.11) for the two time periods, but drops the 26 counties with Census-designated central cities from the analysis. We do so to investigate the influence of counties with relatively high migration, employment and income densities. By and large, the effect of the endogenous and exogenous variables is exactly the same as seen in Table 4.11. The pattern of signs and statistical significance for the land variables is also the same: we again observe an inverted U-shape for the FEDGEN and FEDGEN^2 for all equations in 2000–2007 and in migration and income for 2000–2010. We observe a U-shape for STGEN and STGEN^2 in all equations for both time periods. Similarly, Models 5A and 5B in Table 4.19 replicate the spatial fixed effects models reported in Table 4.17, again dropping counties with central cities.

Table 4.17
Add Central-City Designation and State-level Fixed Effects, No Spatial Weighting (p-values)

	MODEL 3A, 2000–2007 Structural 3SLS			MODEL 3B, 2000–2010 Structural 3SLS		
	MIG	EMP	INC	MIG	EMP	INC
CONSTANT	–0.454432 (0.27)	–0.155189 (0.80)	1.531280 (0.01)	0.939153 (0.13)	0.069994 (0.93)	2.093390 (0.01)
MIG07 (MIG10)		0.131556 (0.01)	0.215857 (0.01)		0.085533 (0.16)	0.159560 (0.01)
EMP07 (EMP10)	–0.057192 (0.04)		–0.045931 (0.13)	–0.066056 (0.10)		–0.000065 (0.99)
INC07 (INC10)	0.035690 (0.38)	0.004351 (0.94)		–0.097461 (0.10)	0.016579 (0.81)	
MIG00	0.019889 (0.59)			0.160222 (0.01)		
EMP00		–0.144197 (0.01)			–0.164736 (0.01)	
INC00			–0.152613 (0.01)			–0.174668 (0.01)
FARMING	–0.028255 (0.04)	–0.013853 (0.49)	–0.011449 (0.53)	–0.019676 (0.29)	0.027297 (0.25)	–0.038837 (0.04)
MINING	–0.027680 (0.10)	–0.000412 (0.99)	0.044425 (0.03)	–0.023074 (0.30)	0.003876 (0.89)	0.036387 (0.09)
RECREATION	0.048041 (0.01)	0.096936 (0.01)	0.045640 (0.01)	0.038475 (0.03)	0.100883 (0.01)	0.021225 (0.18)
DISTAIRPORT	–0.000167 (0.14)	–0.000127 (0.38)		–0.000319 (0.03)	–0.000173 (0.39)	
CDD	0.001592 (0.12)		0.001385 (0.25)	0.118971 (0.40)		–0.139150 (0.34)
HOMEOWN	0.000908 (0.13)			0.000467 (0.56)		
WAGEINDEX	–0.000070 (0.88)	0.002183 (0.01)		0.000992 (0.09)	0.001379 (0.06)	
HOUSVAL	0.000063 (0.52)	–0.000247 (0.05)		0.000371 (0.01)	–0.000273 (0.09)	
HWYDEN		–0.144271 (0.33)			–0.192052 (0.36)	
COLLEGE		0.003189 (0.01)	0.003386 (0.01)		0.004387 (0.01)	0.000814 (0.44)
CENTRAL CITY	–0.021046 (0.27)	–0.008646 (0.27)	–0.039294 (0.10)	0.000600 (0.98)	0.020165 (0.54)	–0.044566 (0.08)
AZ	0.033505 (0.28)	0.056530 (0.14)	0.092225 (0.02)	0.042844 (0.33)	0.003738 (0.93)	0.118110 (0.01)
ID	0.024185 (0.13)	0.053632 (0.02)	0.055458 (0.01)	0.054037 (0.01)	0.032267 (0.24)	0.035933 (0.10)
MT	0.031769 (0.05)	0.010487 (0.64)	0.053009 (0.01)	0.017156 (0.42)	0.011593 (0.66)	0.058660 (0.01)
NV	0.049446 (0.05)	0.036133 (0.33)	0.051318 (0.10)	0.024484 (0.46)	0.064943 (0.14)	–0.012933 (0.70)
NM	–0.013165 (0.48)	0.036144 (0.16)	0.018742 (0.43)	–0.017441 (0.47)	0.046432 (0.13)	0.068465 (0.01)
UT	0.007308 (0.69)	0.096910 (0.01)	0.068417 (0.01)	0.101293 (0.01)	0.118089 (0.01)	0.081749 (0.01)
WY	0.051382 (0.02)	0.081555 (0.01)	0.181224 (0.01)	0.115853 (0.01)	0.087385 (0.02)	0.182491 (0.01)
NPS	–0.001173 (0.30)	–0.001761 (0.28)	0.001187 (0.42)	–0.000637 (0.67)	–0.002633 (0.17)	–0.000986 (0.52)
PROTECTED	–0.000323 (0.63)	–0.000560 (0.53)	–0.000991 (0.21)	–0.001252 (0.15)	–0.000204 (0.85)	–0.000954 (0.24)
OTHER	–0.000669 (0.06)	–0.000620 (0.21)	–0.000705 (0.11)	–0.000506 (0.28)	–0.000612 (0.30)	0.000083 (0.86)
FEDGEN	0.001169 (0.14)	0.001696 (0.13)	0.002412 (0.02)	0.001936 (0.07)	0.000154 (0.91)	0.001205 (0.26)
$FEDGEN^2$	–0.000012 (0.26)	–0.000023 (0.14)	–0.000034 (0.02)	–0.000025 (0.08)	–0.000004 (0.82)	–0.000021 (0.15)
STGEN	–0.005863 (0.01)	–0.012341 (0.01)	–0.011308 (0.01)	–0.012564 (0.01)	–0.011505 (0.01)	–0.011833 (0.01)
$STGEN^2$	0.000221 (0.01)	0.000363 (0.01)	0.000341 (0.01)	0.000456 (0.01)	0.000388 (0.01)	0.000391 (0.01)
$\chi 2$ (β=0)	114.28 (0.01)	181.20 (0.01)	221.86 (0.01)	152.21 (0.01)	131.57 (0.01)	175.56 (0.01)

Table 4.18
Baseline Specification, Drop 26 Counties with Central Cities
(p-values)

	MODEL 4A, 2000–2007 Structural 3SLS			MODEL 4B, 2000–2010 Structural 3SLS		
	MIG	EMP	INC	MIG	EMP	INC
CONSTANT	–0.328447 (0.47)	0.320011 (0.64)	1.983387 (0.01)	1.351681 (0.06)	0.530992 (0.54)	2.757250 (0.01)
MIG07 (MIG10)		0.186145 (0.01)	0.229597 (0.01)		0.123060 (0.06)	0.207573 (0.01)
EMP07 (EMP10)	–0.053613 (0.06)		–0.026219 (0.43)	–0.031311 (0.46)		0.011300 (0.76)
INC07 (INC10)	0.029957 (0.49)	–0.046417 (0.48)		–0.135210 (0.04)	–0.025000 (0.75)	
MIG00	0.017857 (0.63)			0.160343 (0.01)		
EMP00		–0.141915 (0.01)			–0.160537 (0.01)	
INC00			–0.186967 (0.01)			–0.234430 (0.01)
FARMING	–0.025923 (0.08)	–0.011850 (0.59)	–0.008652 (0.67)	–0.023428 (0.26)	0.022313 (0.39)	–0.034798 (0.10)
MINING	–0.029259 (0.09)	0.004274 (0.87)	0.055694 (0.01)	–0.006076 (0.81)	0.015661 (0.62)	0.055998 (0.02)
RECREATION	0.046436 (0.01)	0.098714 (0.01)	0.039649 (0.01)	0.046116 (0.02)	0.100140 (0.01)	0.017607 (0.29)
DISTAIRPORT	–0.000220 (0.06)	–0.000018 (0.91)		–0.000435 (0.01)	–0.000187 (0.38)	
CDD	0.001581 (0.12)		0.000925 (0.45)	0.168821 (0.21)		–0.148998 (0.26)
HOMEOWN	0.000869 (0.17)			0.001313 (0.14)		
WAGEINDEX	0.000094 (0.84)	0.002689 (0.01)		0.000818 (0.19)	0.001630 (0.03)	
HOUSVAL	0.000040 (0.70)	–0.000203 (0.13)		0.000426 (0.01)	–0.000224 (0.20)	
STINCTAX	–0.009272 (0.12)	–0.004107 (0.63)	–0.025208 (0.01)	–0.007227 (0.37)	–0.008648 (0.39)	–0.023300 (0.01)
HWYDEN		–0.063205 (0.77)			–0.237079 (0.43)	
COLLEGE		0.003230 (0.01)	0.003413 (0.01)		0.004338 (0.01)	0.001820 (0.11)
NPS	–0.001057 (0.38)	0.000137 (0.94)	0.003308 (0.04)	0.000783 (0.64)	–0.001014 (0.63)	0.001321 (0.42)
PROTECTED	–0.000611 (0.41)	–0.001303 (0.21)	–0.001678 (0.06)	–0.001860 (0.07)	–0.000776 (0.53)	–0.001328 (0.16)
OTHER	–0.000543 (0.14)	–0.000725 (0.18)	–0.000492 (0.30)	–0.000325 (0.52)	–0.000774 (0.22)	0.000541 (0.28)
FEDGEN	0.001821 (0.03)	0.002495 (0.05)	0.003885 (0.01)	0.002983 (0.01)	0.000550 (0.71)	0.002543 (0.03)
$FEDGEN^2$	–0.000020 (0.09)	–0.000029 (0.08)	–0.000051 (0.01)	–0.000034 (0.04)	–0.000005 (0.79)	–0.000041 (0.01)
STGEN	–0.007106 (0.01)	–0.011670 (0.01)	–0.008163 (0.01)	–0.010138 (0.01)	–0.009906 (0.01)	–0.004737 (0.14)
$STGEN^2$	0.000242 (0.01)	0.000344 (0.01)	0.000246 (0.02)	0.000366 (0.01)	0.000327 (0.02)	0.000210 (0.05)
$\chi 2$ (β=0)	87.63 (0.01)	141.28 (0.01)	149.20 (0.01)	101.29 (0.01)	78.24 (0.01)	83.80 (0.01)

Table 4.19
Add State Fixed Effects, Drop 26 Counties with Central Cities (p-values)

	MODEL 5A, 2000–2007 Structural 3SLS			MODEL 5B, 2000–2010 Structural 3SLS		
	NETMIG	EMP	INC	NETMIG	EMP	INC
CONSTANT	-0.560711 (0.20)	-0.227853 (0.73)	1.545564 (0.01)	0.740674 (0.24)	0.010500 (0.99)	2.073863 (0.01)
MIG07 (MIG10)		0.123971 (0.03)	0.214771 (0.01)		0.080157 (0.22)	0.157505 (0.01)
EMP07 (EMP10)	-0.059629 (0.04)		-0.041548 (0.19)	-0.069933 (0.09)		0.000577 (0.99)
INC07 (INC10)	0.045183 (0.29)	0.010364 (0.87)		-0.077729 (0.20)	0.022769 (0.76)	
MIG00	0.014710 (0.71)			0.145280 (0.01)		
EMP00		-0.140397 (0.03)			-0.164554 (0.01)	
INC00			-0.154474 (0.01)			-0.173056 (0.01)
FARMING	-0.025828 (0.07)	-0.012545 (0.55)	-0.009711 (0.61)	-0.018014 ((0.34)	0.028404 (0.12)	-0.036724 (0.35)
MINING	-0.031847 (0.07)	-0.006301 (0.80)	0.046959 (0.03)	-0.025781 (0.26)	0.000032 (0.99)	0.038180 (0.09)
RECREATION	0.045119 (0.01)	0.097416 (0.01)	0.044410 (0.01)	0.037200 (0.04)	0.101439 (0.01)	0.020768 (0.20)
DISTAIRPORT	-0.000148 (0.23)	-0.000105 (0.51)		-0.000350 (0.03)	-0.000206 (0.35)	
CDD	0.002050 (0.10)		0.001827 (0.22)	0.184014 (0.23)		-0.105620 (0.51)
HOMEOWN	0.000725 (0.25)			0.000238 (0.78)		
WAGEINDEX	0.000042 (0.93)	0.002376 (0.01)		0.001147 (0.07)	0.001455 (0.06)	
HOUSVAL	0.000055 (0.60)	-0.000263 (0.05)		0.000359 (0.01)	-0.000273 (0.11)	
HWYDEN		-0.015974 (0.94)			-0.205177 (0.48)	
COLLEGE		0.003173 (0.02)	0.003608 (0.02)		0.004321 (0.01)	0.001107 (0.33)
AZ	0.034745 (0.32)	0.043288 (0.33)	0.091179 (0.04)	0.046195 (0.34)	-0.002409 (0.96)	0.132506 (0.01)
ID	0.025082 (0.14)	0.052488 (0.03)	0.057887 (0.01)	0.054622 (0.01)	0.035970 (0.22)	0.046474 (0.04)
MT	0.036489 (0.03)	0.009922 (0.68)	0.052807 (0.01)	0.022345 (0.31)	0.013011 (0.65)	0.063245 (0.01)
NV	0.050802 (0.07)	0.028396 (0.49)	0.047575 (0.17)	0.008712 (0.81)	0.069675 (0.15)	-0.008177 (0.83)
NM	-0.013572 (0.50)	0.038660 (0.17)	0.015049 (0.57)	-0.014755 (0.56)	0.053162 (0.11)	0.076020 (0.01)
UT	0.029675 (0.15)	0.116822 (0.01)	0.081789 (0.01)	0.137209 (0.01)	0.143776 (0.01)	0.111120 (0.01)
WY	0.054858 (0.02)	0.077348 (0.02)	0.178398 (0.01)	0.117209 (0.01)	0.088120 (0.02)	0.187946 (0.01)
NPS	-0.001622 (0.18)	-0.002004 (0.25)	0.001136 (0.47)	-0.001450 (0.35)	-0.003183 (0.12)	-0.001514 (0.35)
PROTECTED	-0.000417 (0.56)	-0.000921 (0.36)	-0.001266 (0.14)	-0.001711 (0.07)	-0.000468 (0.69)	-0.001187 (0.19)
OTHER	-0.000658 (0.08)	-0.000697 (0.20)	-0.000733 (0.13)	-0.000524 (0.28)	-0.000723 (0.26)	0.000069 (0.89)
FEDGEN	0.001298 (0.13)	0.001673 (0.17)	0.002441 (0.03)	0.001928 (0.08)	0.000128 (0.93)	0.001262 (0.27)
$FEDGEN^2$	-0.000015 (0.18)	-0.000023 (0.16)	-0.000035 (0.02)	-0.000027 (0.08)	-0.000006 (0.77)	-0.000024 (0.13)
STGEN	-0.007202 (0.01)	-0.014767 (0.01)	-0.012570 (0.01)	-0.014742 (0.01)	-0.013732 (0.01)	-0.013759 (0.01)
$STGEN^2$	0.000249 (0.01)	0.000435 (0.01)	0.000372 (0.01)	0.000508 (0.01)	0.000451 (0.01)	0.000435 (0.01)
$\chi 2$ (β=0)	109.86 (0.01)	174.28 (0.01)	207.21 (0.01)	162.22 (0.01)	113.03 (0.01)	149.21 (0.01)

Once again the pattern of coefficient signs and statistical significance remains constant with and without counties with central cities. We observe a weakened relationship for FEDGEN and $FEDGEN^2$ in the migration and employment equations for the 2000–2007 period and in the income equation for 2000–2010. Again, state-owned land managed for general uses has a statistically significant U-shape in all equations for both time periods.

The specifications reported in this study were not the only models estimated; the literature provides a wealth of potential variables that have been used by others to explain migration, employment growth, and income growth. Other variables include measures of pollution, government expenditures on public goods, local tax rates, and the age structure of the population. Our measure of pollution—nonattainment status for air pollutants in the year 2000—was never statistically significant. Similarly, local government expenditures on education and/or health (both measured in 2002) were also insignificant, as was the sum of state and local tax rates (i.e., total tax rate).

Two measures of the age structure of the population (percentage under age 18 and the percentage over age 65) were insignificant regardless of whether one, the other, or both were included in the model. The USDA county typology code for retirement destination counties was often statistically significant. This variable measures whether a county has experienced large in-migration by persons aged 60 and older during the decade of 1990–2000. Its presence in the model had little effect on the statistical performance of other variables in the model (see Table 4.30 in Appendix 3 at the end of this chapter). The statistical significance of two quadratic relationships was softened (federal general use in the migration equation for 2000–2007, and state general use in the income equation for 2000–2010) but the extreme values associated with all general use land variables in all equations remained quite stable (extreme values addressed the next portion of the report).

4.4.3 The Effect of Public Land Ownership and Management on Economic Growth

We consistently find an inverted-U quadratic relationship for federal land managed for general use and a U-shape relationship for state land managed for multiple-use. Focusing on federal land, the inverted-U relationship means that relatively modest amounts of federal general use land in a county is associated with faster growth than privately held land (our baseline category), all else equal, yet growth is increasing at a diminishing rate. Beyond a certain point, such land is associated with a drag on economic growth measures, and county economic growth begins to decline. Table 4.20 shows the turning points for the quadratic relationships of Tables 4.11 and 4.18, along with its estimated 95% confidence interval.[142] (Recall, the parameters for both 2000–2007 models represent an economy on a path toward equilibrium; the parameters for both 2000–2010 models are not consistent with an equilibrium path.)

[142] Turning points were calculated by solving for the percentage of land that sets the derivative of each growth equation with respect to land percentage equal to zero. This approach does not account for endogenous nature of the three equations. Land ownership in a county is, of course, limited between 0% and 100%; confidence intervals which extend below or above these bounds reflect statistical imprecision in the parameter estimates.

Table 4.20
Extreme Values (Turning Points) for Quadratic Land Ownership Relationships

	MIG	EMP	INC
2000–2007 (Model 1A)			
FEDGEN (max)	47.2%	43.0%	37.5%
	[17.7% - 130.4%]	[19.3% - 97.8%]	[30.2% - 45.6%]
STGEN (min)	13.8%	16.9%	16.2%
	[9.1% - 19.3%]	[13.0% - 26.8%]	[10.9% - 27.2%]
2000–2007 (Model 4A)			
FEDGEN (max)	45.5%	43.0%	38.1%
	[−0.7% - 119.4%]	[18.5% - 99.7%]	[30.2% - 46.2%]
STGEN (min)	14.7%	17.0%	16.6%
	[9.9% - 21.2%]	[13.2% - 25.5%]	[11.0% - 31.5%]
2000–2010 (Model 1B)			
FEDGEN (max)	44.1%	N/A	30.6%
	[28.6% - 88.9%]		[10.1% - 39.4%]
STGEN (min)	13.7%	15.0%	11.1%
	[9.7% - 17.9%]	[8.2% - 25.2%]	[−2.5% - 18.0%]
2000–2010 (Model 4B)			
FEDGEN (max)	43.9%	N/A	31.0%
	[23.3% - 84.1%]		[8.5% - 40.1%]
STGEN (min)	13.8%	15.1%	11.3%
	[9.5% - 19.0%]	[10.0% - 24.8%]	[−4.7% - 27.1%]

95% confidence interval in brackets; based on 1000 bootstrap simulations following the method of Krinsky and Robb (1986).
N/A = both quadratic parameters statistically equal to zero

For the 2000–2007 models, the parameters predict the peak employment and income growth at 43% and 38% of a county, respectively, of land in federal general use. Although the point estimates for the migration equation suggest peak growth at about 46% of FEDGEN land, imprecision in the parameter estimates cause the 95% confidence interval to exceed the 0%/100% bounds. For state administered general use land, the turning points for migration, employment, and income are approximately 14%, 17%, and 16%, respectively. Both quadratic parameters for federal general use land were statistically insignificant in the employment equation of the 2000–2010 models so no turning point is calculated. The point estimates for FEDGEN in the migration and income equations suggest turning points at 44% for migration and 31% for income. The turning points for STGEN are 14%, 15%, and 11% for migration, employment and income, respectively. The turning points for the models appearing in Tables 4.12, 4.17, and 4.19 may be found in Table 4.31 in Appendix 3 at the end of this chapter.

The positive portion of this quadratic function for federal general use land is consistent with the argument that land managed for multiple uses—which includes flows of both market commodities and non-market value (recreation and open space)—attracts migrants and generates income. The income may be generated from employment of federal employees located in the field, or it may be from the non-wage income brought to the region by migrants. The negative portion of the curve is consistent with the idea that growth is declining at an increasing rate. This could be due to scale economies in land management (once a Field Office or Ranger District is in place, the marginal cost of managing a few thousand more acres is relatively small), or it may be due to other institutional factors.

Federal land is managed under a variety of legal requirements, but perhaps the most binding is the National Environmental Policy Act. When BLM and USFS engage in land management planning, NEPA requires an Environmental Impact Assessment (EIA) or an Environmental Impact Statement (EIS). The NEPA process is cumbersome, expensive, and time consuming: the typical EIS completed in 2012 had taken more than four years to prepare (GAO, 2014).

Even after being prepared, EISs frequently face legal challenges, further delaying the implementation of a new land management plan. The net effect is to put large tracts of federally managed land in stasis for long periods of time, unable to be managed in any new, proposed use. The more federal multiple-use land in a county the more likely a portion of the county's land may be found in management limbo—and the greater the negative effect of management stasis on economic growth.

Turning to state general use land, the parameters of all estimated models indicate that every measure of economic growth—migration, employment, and income—reaches a minimum point at about 11%-17% of state-owned multiple-use land. Across our 276 counties the average percentage of land in this category is about 6%, with a maximum of just over 30%. Further, state-owned land tend to be isolated from other state land, a fact that derives from the institutional history of public land ownership in which states received designated one-square mile sections from the federal estate. State-owned sections are often completely surrounded by federal land. Though still subject to federal laws such as the Clean Air Act, the Clean Water Act, and the Endangered Species Act, state-owned land is exempt from the NEPA process; as such, the regulatory constraints governing state-owned land are less burdensome than those governing management of federal land. However, if access to the state-owned land requires, say, improving a road located on federal land to allow heavier vehicles, then the state's management plan is subject to the NEPA process.

The U-shaped quadratic relationship for state general use land is consistent with the arguments outlined above. Relatively small amounts of state-owned land mean that such land is likely to be isolated and thus, from the state's perspective, may not be worth the trouble to manage. Relative to private land, small amounts of state-owned land are less effective in generating migration, employment, and income growth (the negatively-sloped portion of the curve). Once the state acquires a critical mass of general use land the state has land that (1) is less likely to be isolated and is more likely to be accessible, and (2) is more likely to have a commercially viable concentration of resource wealth, or a region with high recreation and tourism value.

The statistically significant U-shape relationship between state general use land and economic growth measures comes with an important caveat. The positive portion of the curve is the result of strong economic growth in a subset of the relatively few counties with large portions of state-owned land (see Figures 2, 3, and 4). The bottom of the U-shape curve occurs at 14%-16% of state-owned land managed for multiple-use, with increasing growth occurring only after that critical mass has been achieved. Of the 276 counties in the sample, only 21 counties have more than 14% of their land managed by the state for general use, most of which are located in Arizona or New Mexico.[143] Even these counties show very divergent growth rates, though: Harding and Luna counties in New Mexico have similar amounts of state multiple-use land (26.2% and 28.8%, respectively), yet income growth in Harding over the 2000–2007 period was −23.0% whereas income growth in Luna county was 31.6% over the same time period. This suggests that ownership and management—by either federal or state landlords—is highly dependent on characteristics of the land under state ownership and the extant economic conditions of the region in which a county is located.

[143] One can see very few observations on the positively sloped portion of the curves for STGEN in Figures 2, 3, and 4. The 21 counties are Cochise, Graham, Greenlee, Pinal, and Yavapai in Arizona, Pueblo and Otero in Colorado, Clearwater in Idaho, Daniels and Deerlodge in Montana, Chaves, De Baca, Eddy, Grant, Harding, Hidalgo, Lea, Luna, Torrence, and Union in New Mexico, and Grand in Utah.

4.4.4 Modeling the Effects of a Federal Land Transfer to the State of Utah

Although the state of Utah is not requesting transfer of National Parks, officially designated wilderness areas, or land administered by the Department of Defense, Utah H.B. 148 aims at transferring title to 31.2 million acres currently administered by the federal government. This accounts for about 60% of Utah's land area and would represent a massive shift in the current economic structure of the state. No one can predict how much of the current federal presence in Utah—expenditures on labor, goods and services, for example, as well as payments in lieu of taxes (PILT) and Secure Rural Schools (SRS) funds that flow directly to county coffers—would remain when the federal estate is largely diminished. Further, the state of Utah is still in the process of formulating a detailed plan to manage a vastly enlarged public land portfolio. If the state were to take over a large portion of what is currently federal land, how would it do so? Which programmatic actions—such as grazing, wild horse and burro control, invasive species management, wildfire suppression, etc.—would be managed by the state and which would remain with the federal government? Would the state use approximately the same number of employees and keep them at their current pay, or would the state be more cost-effective, employing fewer people and paying them less? Would it purchase the same mix of goods and services? If the state held title to the land, would the land retain its tax-free status? If so, would the state hold county budgets harmless and provide the same level of PILT and SRS funding currently delivered by federal authorities? Under state management, by how much would production of marketable commodities increase, thus increasing employment and income? These questions are merely the tip of the proverbial iceberg when attempting to forecast the economic effects of a land transfer from the federal government to the state of Utah and, as of this date, the answers remain unknown.

Further, the models presented in this study are rooted in the *current* economic structure. Large federal land ownership is associated with faster economic growth (up to a point) because Field Offices and Ranger Districts are spread throughout the state, and expenditures needed to support its land management activities are reflected in the estimated model. The state of Utah, by comparison, does not have as large economic impact at the county level because large expenditures are not needed to manage its current estate. That, too, is reflected in the empirical models. If we were to use our model to mimic a land transfer from federal to state authorities—moving land from the "federal general use" category to the "state general use" category—we would be removing relatively large federal land management expenditures at the county level and replacing them with relatively small state land management expenditures. The unknown structural changes that would accompany a future land transfer under H.B. 148 would annul the land management and ownership parameters estimated under the current economic structure.

4.4.5 Caveats

Our model has documented (1) the drag on economic growth associated with large federal land holdings in many counties and (2) the potential for state land ownership to accelerate growth with sufficient land holdings. We consistently observe an inverted-U for FEDGEN for income growth and a U-shape for STGEN for migration, employment growth, and income growth. This suggests potential economic gains from a different approach to public land management. However, the results of any empirical model are dependent upon the available data, as well as the theoretical structure and set of assumptions brought to the analysis.

Our model of economic growth captures the market productivity of general use land in a very crude way. The land measures do not distinguish, for example, how much of the FEDGEN and STGEN land categories in any county are comprised of energy-rich reserves, or how much of the land is best suited for agricultural or recreation uses. This suggests that a closer look at the characteristics of public land is warranted. This would seem particularly important in considering how the state would manage an enlarged land portfolio. Relatively large state land holdings are not *always* associated with improved economic performance (Figures 2, 3, and 4 at the end of this section). A model that incorporates not just the quantity of land but also its potential to generate migration, employment and income—which will differ across counties—would improve upon the models presented in this report.

The economic, demographic, and resource data requirements of our modeling approach caused us to use counties as the unit of analysis. But counties are a political unit for which data are conveniently available, they not an economic unit. Consider the motivation of our regional adjustment model: our justification appealed to the actions of individual households and firms—which are the true behavioral units of interest. Though such "microdata" are very difficult to obtain for such a large study area and over such a long time frame, a model based on microdata has the potential to provide a different perspective of the role of public land management and ownership in the economic decisions of people and firms.

A third issue concerns endogeneity of our public land variables, an issue on which we have expended significant time and energy (Appendix 2 at the end of this chapter). Again, this issue relates the initial allocation of land between private citizens, the state government, and the federal government at or around the time of statehood. In essence, the argument is that land best suited for agricultural uses or with known mineral value went to private individuals, and government entities were left to managed land that was perceived (at the time) to yield little in the way of market commodities. In short, much of the public estate is not well-suited to generate significant economic activity, and it really does not matter who manages or owns the land. This argument implies that, perhaps with the exception of energy-rich lands, state management of public land will do little to improve the economic performance of counties relative to federal management. Our efforts to model the potentially endogenous pubic land variables were inconclusive: one econometric test indicates that our variables are exogenous whereas another indicates they are not. Our models are based on the assumption that the variables are exogenous (as have many others, with the exception of Eichman et al. 2010), and that the resulting parameter estimates from the regional adjustment model are consistent.

4.5 CONCLUSIONS

The theoretical and empirical literature concerning regional economic growth as measured by migration rates, employment growth, and income growth has a long history; we add to that literature by estimating a regional adjustment model that is the first to include a more complete range of possible public land ownership and management combinations. This is important in the mountain west, where public ownership of land is extensive. Our model incorporates the natural constraints faced by counties with extensive public land within their boundaries; in particular, our key growth variables are measured as densities, where the densities reflect the developed area of a county rather than the entire county area. Our models are estimated using two estimation approaches and two different growth periods. Though the models estimated for the 2000–2010 were not consistent with economies moving toward a stable equilibrium, the models for both time periods yield broadly consistent results with regard to the economic structure of counties and differences across counties in ownership and management of public land within their boundaries.

Counties that host a relatively large mining industry enjoyed faster income growth than other counties, all else equal. Further, counties with well-developed recreation sectors enjoyed more rapid migration, employment growth, and income growth than other counties, all else equal. The exceptionally robust finding about recreation counties suggests an economic development opportunity for those counties with public land amenities wishing to diversify their economic structure.

The primary concern of this study is how federally-owned land managed for multiple uses contributes to migration, employment, and income growth relative to similar land owned by states. Regardless of estimation method and timeframe, we consistently find an inverted-U relationship between federally-owned general use land and income growth—and, to a lesser extent, migration—and a U-shaped relationship between state-owned multiple-use land and migration, employment, and income growth. For the 2000–2007 time period we find peak migration, employment, and income growth at 47%, 43%, and 37% of land in federal general use, respectively. At relatively modest levels of federal land ownership, there is a positive relationship between the percent of a county's federal general use land and measures of economic growth, yet at a diminishing rate. After reaching peak growth rates, additions to federal general use land are associated with declining economic growth. For state general use land, we find trough values for migration, employment, and income growth at 14%, 17%, and 16% of state owned land in a county, respectively. We find a positive relationship between economic growth and state general use land in counties that have reached this critical mass of state land managed for general use.

A very robust empirical finding is that federal land managed for general use is associated with a drag on income growth after reaching some critical value. This conclusion is based on its consistency across timeframes and modeling approaches, as well as the fact that we have a relatively large sample of counties that "pin" down the relationship. One hundred and two counties of our 276 counties have 40% (or more) of the county land managed by federal authorities for general use—that is, a large portion of the counties in the sample are at or beyond the turning points of our quadratic curves. These counties also reflect diversity of county typology: 16 are farm counties, 20 are mining counties, and 44 are recreation counties. The consistency with which we observe the drag on income growth—given the diversity of economic structures—is remarkable.

Our data also yielded another remarkably stable result: the U-shaped effect of state-owned multiple-use land in counties. Although the parameters that describe this relationship are statistically significant, we note that the virtuous portion of this quadratic function—the positive slope beyond the trough at about 15% of land—is based on relatively few observations. Only 21 counties—some 7.6% of the sample—have 14% or more of the county in state-owned multiple-use land. This is a relatively small sample on which to base an argument that states can manage multiple-use land more effectively than the federal government. Given the relatively few counties with this amount of state-owned general use land, an in depth analysis of land resources and management in these counties is warranted.

The regional adjustment model measures the effect of public lands ownership and management on migration, employment, and income; these effects include production of marketed goods from the land, as well as the amenities associated with public land as people and firms move in response to characteristics that vary across counties. As stated in the State of Utah Outdoor Recreation Vision report (2013, p. 42):

> By managing lands for both recreation and commodity production (e.g. mining, grazing, and logging), the best-performing communities were able to weather the economic cycles associated with extractive industries by sustaining a tourist economy and attracting new residents.

The parameters of our regional adjustment model are entirely consistent with this statement—two of our key findings are that counties with well-developed economic sectors that serve mining and recreation industries enjoy faster economic growth than counties without such sectors. In fact, our dataset includes counties that have both large recreation *and* mining sectors, so that framing economic development choices as "resource use vs. recreation" is a false dichotomy.

But public land contributes to much more than just jobs and income. As important as public land is in generating employment and income, the vast vistas offered by western landscapes and ready accessibility to public land in western communities improve the conditions under which westerners live. Put another way, public land provides as much to the soul as it does to economic growth. Recreation activities on public land have value beyond market expenditures because it contributes to an improved quality of life for Utah residents. The current Utah outdoor recreation plan notes that "…outdoor recreation provides health and social benefits for individuals and families and increases a sense of community." Further, about 50% of Utah residents said that outdoor recreation was "extremely important" to their lives (Utah State Comprehensive Outdoor Recreation Plan 2014, page ix).

Many of these benefits are not captured in traditional market-based measures such as jobs, income, and gross domestic product, yet landscape vistas and recreation have value. Over the past sixty years economists have developed a set of techniques to measure economic benefits that accrue outside of traditional market measures—that is, economists can measure the degree to which amenities offered by public land contribute to our quality of life. Changes in management of public land with the goal of increasing employment and income may affect the characteristics of, and access to, public lands in Utah, and thus affect the quality of life of Utah residents. If one is to manage public lands to maximize the well-being of Utahans, the potential gains in employment or income associated with changes in public land use can be balanced against the potential gains or losses in quality of life measures. We address this issue in Chapter 7, Section 7.1.

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Figure 4.2
General Use Land Ownership and Migration Growth

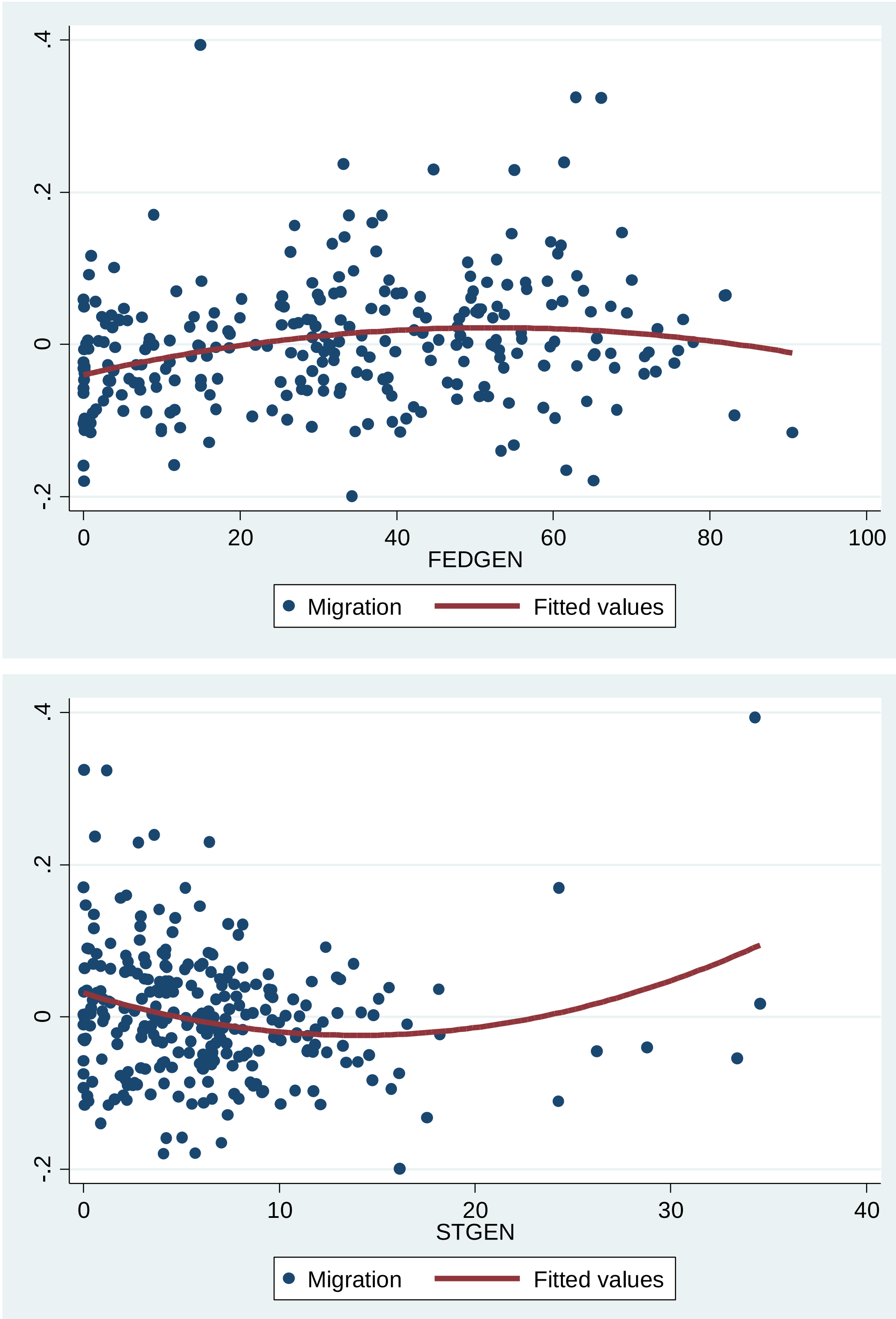
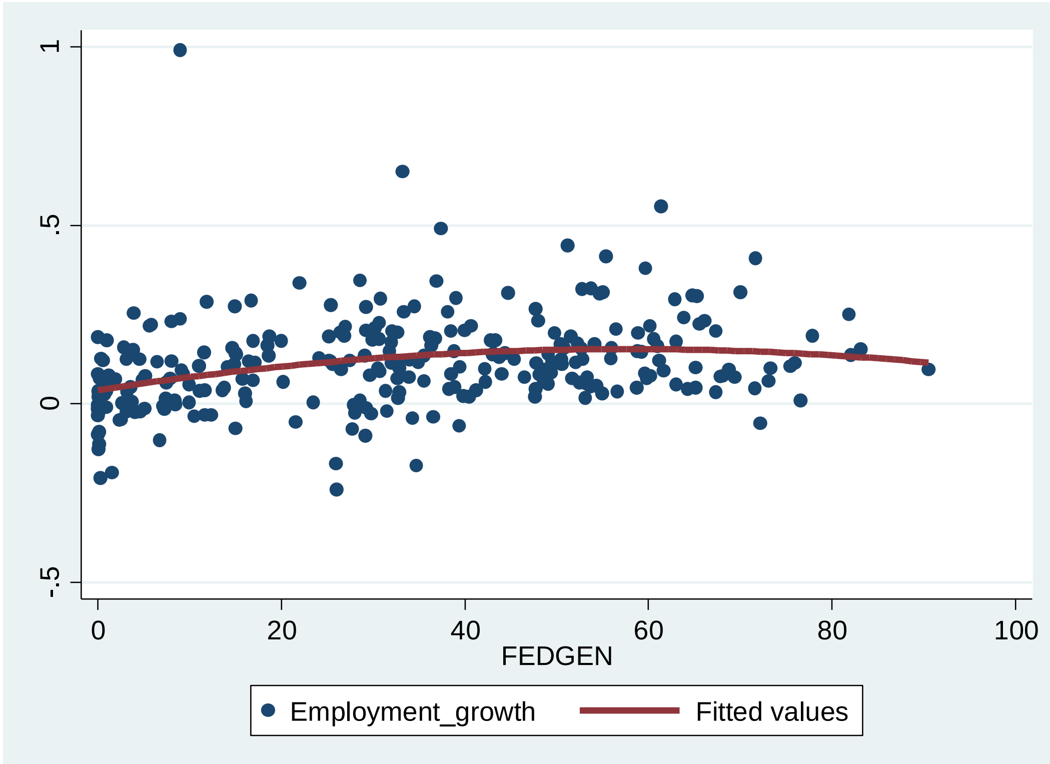


Figure 4.3
General Use Land Ownership and Employment Growth



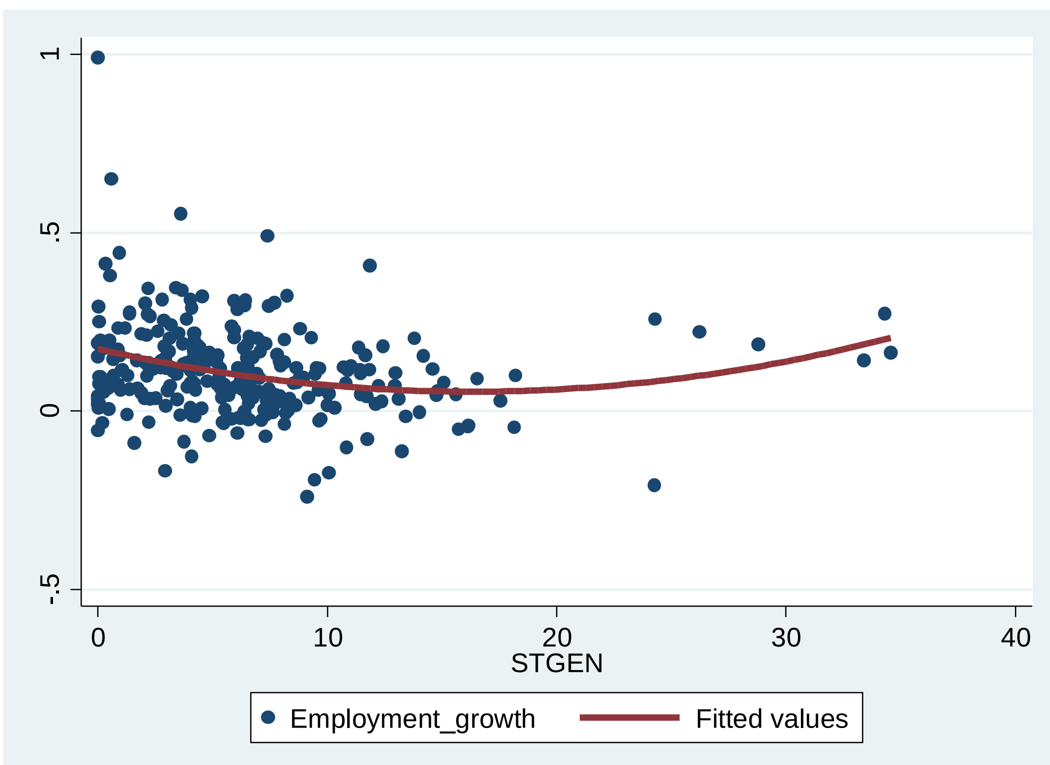
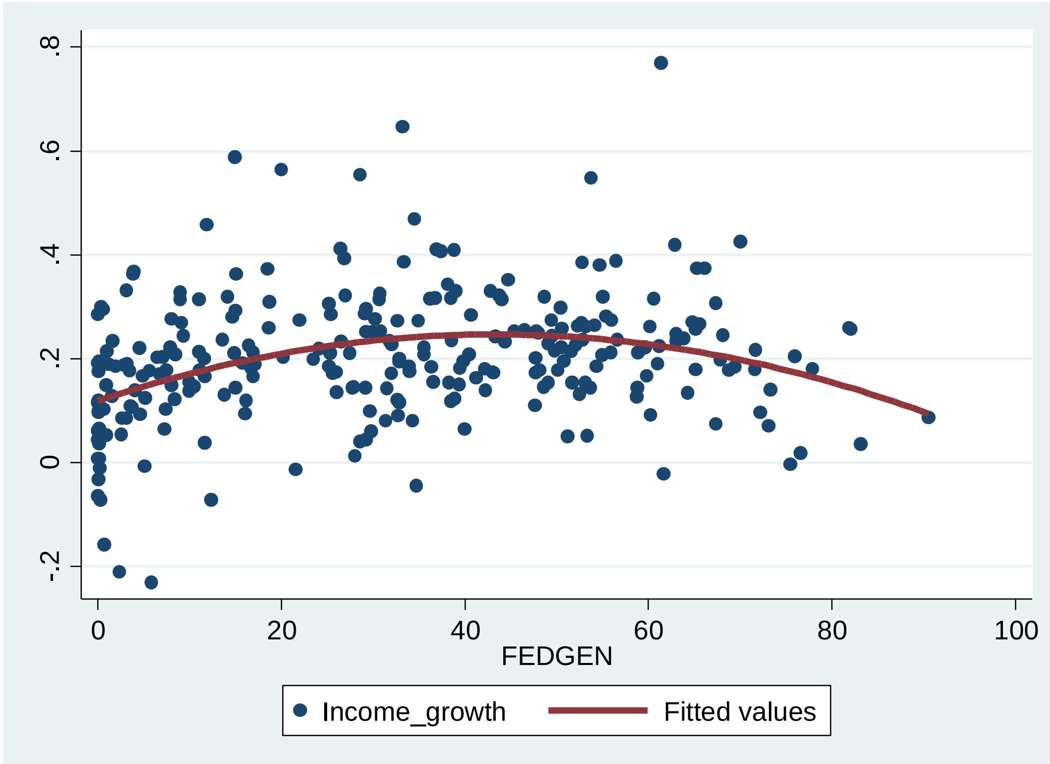
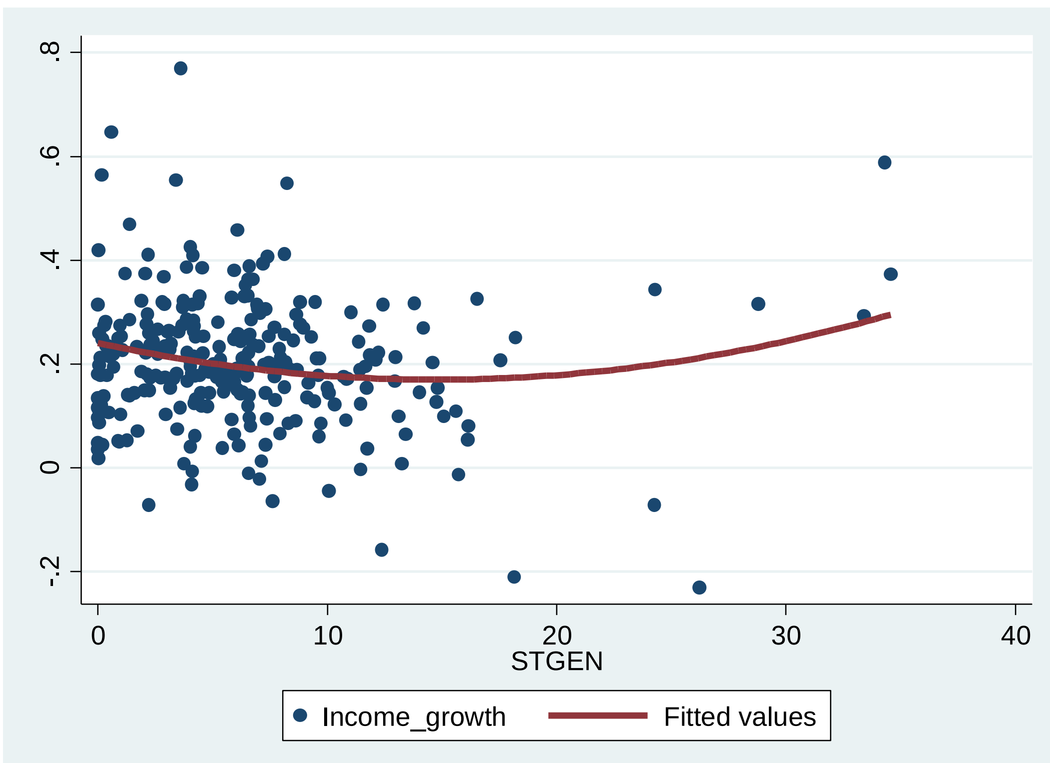


Figure 4.4
General Use Land Ownership and Income Growth





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APPENDIX 1: GAP STATUS CODE DEFINITIONS

GAP Status	Definition
1	An area having permanent protection from conversion of natural land cover and a mandated management plan in operation to maintain a natural state within which disturbance events (of natural type, frequency, intensity, and legacy) are allowed to proceed without interference or are mimicked through management.
2	An area having permanent protection from conversion of natural land cover and a mandated management plan in operation to maintain a primarily natural state, but which may receive uses or management practices that degrade the quality of existing natural communities, including suppression of natural disturbance.
3	An area having permanent protection from conversion of natural land cover for the majority of the area, but subject to extractive uses of either a broad, low-intensity type (e.g., logging, OHV recreation) or localized intense type (e.g., mining). It also confers protection to federally listed endangered and threatened species throughout the area.
4	There are no known public or private institutional mandates or legally recognized easements or deed restrictions held by the managing entity to prevent conversion of natural habitat types to anthropogenic habitat types. The area generally allows conversion to unnatural land cover throughout or management intent is unknown.

Source: USGS Gap Analysis Program, 2013.

Appendix 2: ARE THE LAND MEASURES EXOGENOUS?

A natural question arises with regard to the land measures used as explanatory variables in our model. Simply put, our pattern of land ownership was not generated by a random process: there is a reason why some land ended up in private hands and federal land ended up in federal hands. Generally speaking, land settled by private landowners in the west was well-suited for particular purposes; either the land was good for homesteading (i.e., good for crop or animal production) or the land had known mineral value. This land was claimed by early settlers before statehood and did not revert to federal ownership. Conversely, land left "unappropriated" at statehood was generally that considered uncultivable or had no known mineral value. That is, at statehood the federal government was left with ownership of land with the least potential for economic productivity. Carrying this argument to the current analysis, land ownership really doesn't matter with respect to economic growth: federal land is, and will continue to be, a poor contributor to economic growth. Simply transferring that land to a state authority will not improve economic growth regardless of the management strategy adopted by the state. Economic growth will be poor because the land is poor.

The argument is compelling and we have conducted an in-depth examination of the issue. Econometrically, the problem is that the explanatory variables—National Park Service land, Protected land, Other land, Federal general use land, and State general use land—may not be exogenous; that is, they have not been determined independent of economic growth, and the random error in our growth models is conflated with the land measures.[144] The consequence is that parameter estimates based on a model which treats the land variables as independent may be inconsistent.

The appropriate way to deal with the problem is to find a set of "instruments" (variables) that are highly correlated with the variable of concern (our land measures) but are also uncorrelated with the error term(s) in the primary model of interest. To put this concretely, we want to find a variable, or set of variables, that predict which land became, say, federal multiple-use land or a National Park. At the same time, the instruments must be uncorrelated with the error terms in the migration, employment and income models and can be excluded from the primary models.

A review of the history of western settlement at the time of statehood suggested a number of potential instruments. The settlement period examined was 1850 until 1890, the year at which the western frontier was considered "closed" (Tate, 1999). The U.S. Army established a number of permanent and semi-permanent forts in western states during this time, and the location of the forts was based on a number of criteria. While the role of the U.S. Army in protecting settlers is well-known, forts were also situated so as to protect workers building the transcontinental telegraph lines and railways, and to provide westward emigrants with supplies. Forts were also necessarily sited at locations with cultivable land and water to supply the troops. All of these factors—along with the fact that forts were rarely attacked by native populations—led many settlers to end their treks westward and settle near forts. In contrast, settlers avoided areas of conflict with Indian populations. Two of our instruments variables indicating the number of military forts established in the county as wells as the number of major Indian battles in the county during 1850-1890 period (Mincho, 2007).

Independent of proximity to a fort, settlers favored high quality soils suitable for farming. Further, given the aridity of the region, homesteads needed to be located near water sources used for irrigation. The period of settlement occurred prior to major water legislation and the development of large-scale irrigation. Irrigation "systems" prior to 1890 were very small-scale, and settler sought good soil with sufficient rainfall or located close to surface water. Our primary instrument for soil quality was generated from GIS measures of soil capacity, and captures the percentage of a county with poor quality, non-irrigable soils (USDA STATSGO2 database).

Other factors influencing the settlement of the west included land grants associated with each state's Enabling Act and the routes of transcontinental railways. Three states in our sample (Arizona, New Mexico, and Utah) received trust lands totaling four one-square mile sections per 36 square-mile township; the other five states received only two sections per township. A dummy variable took the value of one for Arizona, New Mexico, and Utah, and zero for the other states. As a means of subsidizing the construction of a railway, a railroad company could receive specified sections of federal land in a corridor adjacent to the railway and then sell those sections to private citizens. In many cases the land was of poor quality and railways could not sell the land (which then remained under federal control), whereas in other regions the railways had little trouble with sales. A dummy variable instrument was formed based on the route of the land grant transcontinental railroads: if the railroad ran through a county the variable took the value of one, and zero if not.

[144] Technically, the issue is that $\mathrm{Cov}(X,\varepsilon) \neq 0$.

Our models thus contain a number of "primary" instruments—Forts, Indian battles, poor soils, a dummy variable capturing the details of each state's Enabling Act, and a dummy variable denoting the route of a transcontinental railroad. All of these are assumed to be highly correlated with the land measures of interest, uncorrelated with the error terms of the primary model, and excludable from the primary model. Following Wooldridge (2002), we also use squared versions for Forts, Indian battles, and the percentage of poor soils in a county.

Finally we also follow Wooldridge with regard to additional instruments used for our "land squared" terms in the primary model (FEDGEN^2 and STGEN^2). Instruments for these models are the squared predicted values arising from the instrumental models used for the linear FEDGEN and STGEN terms. Further, given the large number of counties that have no NPS or PROTECTED land (189 and 25 counties, respectively), we use the predicted value calculated from a Tobit model in the OLS model for NPS and Protected land. The instruments appear in Table 4.21, with the instrumental models appearing in Tables 4.22 and 4.23. Four of the seven instrumental variable models—NPS, Protected, FEDGEN, FEDGEN^2, and STGEN^2—have F-statistics in excess of ten, the rule-of-thumb "cutoff" regarding strength of a single instrument. The models for OTHER and STGEN have F-statistics less than 10, indicating a weak instrumental relationship.

Table 4.21
Instruments

Variable	Mean	Std. Dev.	Min	Max
Forts	0.377	0.674	0	3
Battles	1.076	2.593	0	25
Enabling Act	0.279	0.449	0	1
Land Grant Railroad	0.196	0.397	0	1
Non-irrigable Soil (%)	88.177	16.955	10.136	100
Forts2	0.594	1.526	0	9
Battles2	7.859	44.021	0	625

Table 4.22
Instrumental Variable Models for NPS, PROTECTED, OTHER
(p-values)

Variable	NPS (Tobit)	NPS (OLS)	PROTECTED (Tobit)	PROTECTED (OLS)	OTHER (OLS)
Constant	21.192	–0.872	77.892	–1.431	110.664
	(0.65)	(0.01)	(0.04)	(0.11)	(0.12)
Forts	–2.445		–3.647		2.366
	(0.24)		(0.02)		(0.48)
Battles	0.698		0.076		0.257
	(0.17)		(0.90)		(0.77)
Enabling Act	4.166		–1.265		1.734
	(0.06)		(0.40)		(0.51)
Land Grant Railroad	–3.899		–0.835		3.221
	(0.03)		(0.48)		(0.22)
Non-irrigable Soil (%)	0.315		–0.035		0.292
	(0.27)		(0.74)		(0.26)
Forts^2	0.479		1.277		–1.058
	(0.56)		(0.04)		(0.45)
Battles^2	–0.038		–0.006		0.017
	(0.07)		(0.80)		(0.65)
Non-irrigable soil^2	–0.002		0.001		–0.003
	(0.34		(0.49)		(0.10)
NPS-Hat		1.327			
		(0.01			
PROTECTED-Hat				1.090	
				(0.01)	
σ	7.727		7.557		
	(0.01)		(0.01)		
R^2		0.172		0.396	0.198
F-statistic	1.59	17.03	7.59	80.34	5.55
Censored Observations	189/276		25/276		0/276

Parameters for other exogenous variables are suppressed for clarity.
NPS-Hat and Protected-Hat are predicted values from the Tobit models appearing in columns 2 and 4, respectively

Table 4.23
Instrumental Variable Models for FEDGEN, FEDGEN², STGEN, STGEN²
(p-values)

Variable	FEDGEN (OLS)	FEDGEN² (OLS)	STGEN (OLS)	STGEN² (OLS)
Constant	275.480	249.06	–59.189	–15.367
	(0.01)	(0.03)	(0.02)	(0.30)
Forts	–4.028		0.500	
	(0.35)		(0.60)	
Battles	0.182		0.879	
	(0.86)		(0.01)	
Enabling Act	–2.140		3.874	
	(0.55)		(0.01)	
Land Grant Railroad	–8.694		0.224	
	(0.01)		(0.77)	
Non-irrigable Soil (%)	–0.416		–0.112	
	(0.21)		(0.10)	
$Forts^2$	–4.028		0.121	
	(0.35)		(0.78)	
$Battles^2$	0.182		–0.043	
	(0.86)		(0.01)	
Non-irrigable $soil^2$	0.006		0.001	
	(0.02)		(0.08)	
$(FEDGEN\text{-}Hat)^2$		1.065		
		(0.01)		
$(STGEN\text{-}Hat)^2$				1.695
				(0.01)
R^2	0.372	0.334	0.344	0.306
F-statistic	11.39	100.80	4.46	126.12
Censored Observations	7/276		6/276	

Parameters for other exogenous variables are suppressed for clarity.
FEDGEN-Hat and STGEN-Hat are predicted values from the OLS instrumental variable models appearing in columns 2 and 4, respectively.

Exogeneity Tests

We first use the Durbin-Wu-Hausman test to evaluate the exogeniety of the land variables. In this case, one includes both the original variables and the instrumented variables in the same model. If the instrumented variables are statistically significant then one rejects the hypothesis that the original land variable is exogenous. Table 4.24 shows the results for the instruments added to the GS2SLS model for the 2000–2007. The findings are contradictory; only three of the 21 parameters are statistically significant ($p \leq 0.10$). None of the twelve instrumented variables for federal general use and state general use land are statistically significant, which should be interpreted as evidence that the vast majority of the land variables are exogenous. In contrast, the Hausman statistic, which is based differences in estimated parameters and variance-covariance matrices for models estimated with and without instruments, has a value of 177.17. This strongly rejects the hypothesis that the land variables are exogenous. The two tests are not in agreement, and we are left in an unsatisfying empirical situation.

Table 4.24
P-values for Instrumented Land Variables, 2000–2007 3SLS Model,
Durbin-Wu-Hausman Test

Variable	MIG	EMP	INC
NPS	0.83	0.44	0.06
PROTECTED	0.21	0.23	0.18
OTHER	0.91	0.07	0.10
FEDGEN	0.72	0.34	0.26
FEDGEN^2	0.77	0.35	0.83
STGEN	0.91	0.31	0.71
STGEN^2	0.67	0.13	0.95

APPENDIX 3: ADDITIONAL TABLES OF RESULTS

Table 4.25
Simple Linear and Quadratic Specifications, 2000–2007, No Spatial Weighting
(p-values)

	MIG	EMP	INC	MIG	EMP	INC
CONSTANT	-0.022136 (0.05)	0.080475 (0.01)	0.169718 (0.01)	-0.011283 (0.043)	0.096777 (0.01)	0.156423 (0.01)
FEDGEN	0.000777 (0.01)	0.001462 (0.01)	0.001140 (0.01)	0.002384 (0.01)	0.004053 (0.01)	0.005954 (0.01)
FEDGEN^2				-0.000025 (0.01)	-0.000040 (0.01)	-0.000071 (0.01)
STGEN	-0.000302 (0.74)	-0.002324 (0.10)	-0.000595 (0.66)	-0.007002 (0.01)	-0.012814 (0.01)	-0.008728 (0.01)
STGEN^2				0.000262 (0.01)	0.000410 (0.01)	0.000305 (0.01)
Adjusted R^2	0.04	0.08	0.04	0.10	0.14	0.14

Table 4.26
Simple Linear and Quadratic Specifications, 2000–2010, No Spatial Weighting
(p-values)

	MIG	EMP	INC	MIG	EMP	INC
CONSTANT	0.029405 (0.05)	0.082727 (0.01)	0.193146 (0.01)	0.042528 (0.02)	0.122308 (0.01)	0.191708 (0.01)
FEDGEN	0.001057 (0.01)	0.000902 (0.02)	0.000437 (0.20)	0.003959 (0.01)	-0.000783 (0.53)	0.002408 (0.03)
FEDGEN^2				-0.000044 (0.01)	0.000023 (0.18)	-0.000030 (0.05)
STGEN	-0.001506 (0.22)	-0.001017 (0.53)	0.002109 (0.14)	-0.011918 (0.01)	-0.007270 90.05)	-0.002267 (0.49)
STGEN^2				0.000406 (0.02)	0.000260 (0.01)	0.000167 (0.01)
Adjusted R^2	0.05	0.02	0.01	0.14	0.03	0.02

Table 4.27
Baseline Specification, No Land Variables and No Spatial Weighting
(p-values)

	2000–2007 Structural 3SLS			2000–2010 Structural 3SLS		
	MIG	**EMP**	**INC**	**MIG**	**EMP**	**INC**
CONSTANT	–0.192740 (0.65)	0.614491 (0.33)	2.237010 (0.01)	1.634784 (0.01)	0.544630 (0.49)	2.963799 (0.01)
MIG07 (MIG10)		0.209617 (0.01)	0.249729 (0.01)		0.123596 (0.04)	0.240123 (0.01)
EMP07 (EMP10)	–0.054398 (0.05)		–0.013129 (0.67)	–0.023094 (0.57)		0.003773 (0.91)
INC07 (INC10)	0.016371 (0.68)	–0.077147 (0.20)		–0.166807 (0.01)	–0.029894 (0.68)	
MIG00	0.030997 (0.37)			0.188818 (0.01)		
EMP00		–0.133450 (0.01)			–0.156726 (0.01)	
INC00			–0.215008 (0.01)			–0.257586 (0.01)
FARMING	–0.022881 (0.11)	–0.003725 (0.86)	–0.000538 (0.98)	–0.017120 (0.40)	0.028641 (0.24)	–0.028816 (0.15)
MINING	–0.016074 (0.34)	0.021479 (0.38)	0.059235 (0.01)	0.005536 (0.82)	0.023956 (0.41)	0.052904 (0.02)
RECREATION	0.058624 (0.01)	0.115959 (0.01)	0.060593 (0.01)	0.061811 (0.01)	0.101890 (0.01)	0.022259 (0.14)
DISTAIRPORT	–0.000255 (0.02)	–0.000101 (0.47)		–0.000526 (0.01)	–0.000208 (0.26)	
CDD	0.001164 (0.13)		0.000483 (0.59)	0.154345 (0.19)		–0.141341 (0.21)
HOMEOWN	0.000884 (0.12)			0.001626 (0.05)		
WAGEINDEX	0.000101 (0.81)	0.002611 (0.01)		0.000859 (0.13)	0.001654 (0.01)	
HOUSVAL	0.000089 (0.34)	–0.000114 (0.34)		0.000467 (0.01)	–0.000150 (0.33)	
STINCTAX	–0.012521 (0.03)	–0.011274 (0.16)	–0.029423 (0.01)	–0.013274 (0.08)	–0.013465 (0.14)	–0.023307 (0.01)
HWYDEN		–0.057956 (0.69)			–0.015644 (0.94)	
COLLEGE		0.003267 (0.01)	0.003784 (0.01)		0.004101 (0.01)	0.002183 (0.04)
$\chi 2$ (β=0)	63.47	126.04	125.05	84.44	87.07	83.61

Table 4.28
Linear Land Specification, No Spatial Weighting
(p-values)

	2000–2007 Structural 3SLS			2000–2010 Structural 3SLS		
	MIG	EMP	INC	MIG	EMP	INC
CONSTANT	–0.335038	0.356783	2.164514	1.295763	0.362715	2.956563
	(0.44)	(0.58)	(0.01)	(0.06)	(0.66)	(0.01)
MIG07 (MIG10)		0.200003	0.255265		0.118635	0.229444
		(0.01)	(0.01)		(0.05)	(0.01)
EMP07 (EMP10)	–0.054830		–0.023219	–0.027195		0.013923
	(0.05)		(0.47)	(0.51)		(0.69)
INC07 (INC10)	0.028073	–0.053761		–0.136722	–0.014454	
	(0.49)	(0.38)		(0.04)	(0.85)	
MIG00	0.021100			0.166203		
	(0.55)			(0.01)		
EMP00		–0.145018			–0.163908	
		(0.01)			(0.01)	
INC00			–0.209172			–0.256531
			(0.01)			(0.01)
FARMING	–0.023643	–0.004397	0.000175	–0.016028	0.027016	–0.030324
	(0.10)	(0.84)	(0.99)	(0.43)	(0.27)	(0.14)
MINING	–0.026260	0.009463	0.056584	–0.006352	0.015040	0.060425
	(0.12)	(0.70)	(0.01)	(0.79)	(0.61)	(0.01)
RECREATION	0.053467	0.104753	0.051829	0.051431	0.098312	0.030557
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.05)
DISTAIRPORT	–0.000253	–0.000065		–0.000472	–0.000166	
	(0.02)	(0.64)		(0.01)	(0.38)	
CDD	0.001313		0.000200	0.150167		–0.186452
	(0.11)		(0.84)	(0.20)		(0.10)
HOMEOWN	0.001038			0.001490		
	(0.07)			(0.07)		
WAGEINDEX	0.000006	0.002545		0.000752	0.001685	
	(0.99)	(0.01)		(0.19)	(0.01)	
HOUSVAL	0.000059	–0.000181		0.000413	–0.000234	
	(0.54)	(0.15)		(0.01)	(0.16)	
STINCTAX	–0.011156	–0.008229	–0.027167	–0.010431	–0.011895	–0.024112
	(0.05)	(0.30)	(0.01)	(0.17)	(0.20)	(0.01)
HWYDEN		–0.078750			–0.039785	
		(0.59)			(0.85)	
COLLEGE		0.003302	0.003620		0.004308	0.002186
		(0.01)	(0.01)			
NPS	–0.000969	0.000012	0.003177	0.000765	–0.000985	0.001248
	(0.40)	(0.99)	(0.04)	(0.64)	(0.62)	(0.43)
PROTECTED	0.000042	–0.000156	–0.000561	–0.000499	0.000144	–0.000704
	(0.95)	(0.86)	(0.48)	(0.58)	(0.89)	(0.39)
OTHER	–0.000438	–0.000403	–0.000348	–0.000177	–0.000484	0.000559
	(0.20)	(0.41)	(0.43)	(0.70)	(0.39)	(0.23)
FEDGEN	0.000512	0.000535	0.000287	0.000636	0.000264	–0.000321
	(0.03)	(0.13)	(0.37)	(0.06)	(0.54)	(0.34)
STGEN	–0.000094	–0.001941	–0.000637	–0.000050	–0.001189	0.001469
	(0.92)	(0.14)	(0.61)	(0.97)	(0.44)	(0.24)
$\chi2$ (β=0)	77.83	137.35	131.70	89.78	91.35	91.95

Table 4.29
Population, Employment, and Income Density Measures, by Central City

	Non-Central City counties (n=250)	Central city counties (n=26)	Ratio (Central ÷ Non-central)
2000			
Population	626.8	2390.3	3.81
Employment (jobs)	359.3	1524.2	4.24
Income ($ millions)	$20.6	$89.1	4.33
2007			
Population	668.6	2535.7	3.79
Employment (jobs)	410.6	1651.4	4.02
Income ($ millions)	$25.8	$105.0	4.07
2010			
Population	678.8	2574.9	3.79
Employment (jobs)	391.9	1516.7	3.87
Income ($ millions)	$25.4	$99.8	3.93

Note: All densities measured per developed square mile.

Table 4.30
Baseline Specification, Add Retirement County
(p-values)

	2000–2007 Structural 3SLS			2000–2010 Structural 3SLS		
	MIG	EMP	INC	MIG	EMP	INC
CONSTANT	–0.111995 (0.78)	0.475414 (0.47)	2.148655 (0.01)	1.427515 (0.03)	0.525469 (0.52)	2.972538 (0.01)
MIG07 (MIG10)		0.186454 (0.01)	0.227639 (0.01)		0.119716 (0.05)	0.201123 90.01)
EMP07 (EMP10)	–0.027232 (0.31)		–0.016955 (0.59)	–0.015390 (0.71)		0.028162 (0.43)
INC07 (INC10)	0.013775 (0.72)	–0.057922 (0.34)		–0.140926 (0.03)	–0.024945 (0.74)	
MIG00	0.004116 (0.90)			0.152708 (0.01)		
EMP00		–0.133165 (0.01)			–0.154208 (0.01)	
INC00			–0.199291 (0.01)			–0.251094 (0.01)
FARMING	–0.015776 (0.25)	–0.006670 (0.75)	–0.004876 (0.80)	–0.017209 (0.39)	0.025370 (0.31)	–0.032487 (0.11)
MINING	–0.010920 (0.50)	0.016608 (0.51)	0.064390 (0.01)	–0.000264 (0.99)	0.017868 (0.56)	0.068820 (0.01)
RECREATION	0.040392 (0.01)	0.097056 (0.01)	0.039992 (0.01)	0.039425 (0.03)	0.095994 (0.01)	0.018546 (0.24)
RETIREMENT	0.053487 (0.01)	0.025295 (0.14)	0.030396 (0.04)	0.031341 (0.05)	0.005319 (0.79)	0.036651 (0.02)
DISTAIRPORT	–0.000300 (0.01)	–0.000077 (0.59)		–0.000465 (0.01)	–0.000185 (0.34)	
CDD	0.000702 (0.38)		0.000212 (0.83)	0.098584 (0.39)		–0.203358 (0.07)
HOMEOWN	0.000925 (0.10)			0.001256 (0.12)		
WAGEINDEX	–0.000118 (0.77)	0.002463 (0.01)		0.000765 (0.18)	0.001465 (0.04)	
HOUSVAL	0.000024 (0.79)	–0.000205 (0.01)		0.000367 (0.01)	–0.000259 (0.12)	
STINCTAX	–0.011049 (0.03)	–0.007482 (0.35)	–0.027230 (0.01)	–0.009488 (0.20)	–0.010560 (0.26)	–0.024044 (0.01)
HWYDEN		–0.118860 (0.43)			–0.089318 (0.67)	
COLLEGE		0.003248 (0.01)	0.003228 (0.01)		0.004446 (0.01)	0.001845 (0.08)
NPS	–0.001481 (0.17)	–0.000385 (0.82)	0.002649 (0.07)	0.000432 (0.78)	–0.001067 (0.59)	0.000717 (0.65)
PROTECTED	–0.000280 (0.66)	–0.000888 (0.34)	–0.001471 (0.07)	–0.001313 (0.15)	–0.000277 (0.80)	–0.001448 (0.08)
OTHER	–0.000516 (0.11)	–0.000576 (0.24)	–0.000493 (0.25)	–0.000350 (0.44)	–0.000609 (0.28)	0.000458 (0.31)
FEDGEN	0.001152 (0.12)	0.002261 (0.05)	0.003525 (0.01)	0.002332 (0.03)	0.000309 (0.82)	0.002133 (0.05)
$FEDGEN^2$	–0.000013 (0.21)	–0.000027 (0.08)	–0.000048 (0.01)	–0.000027 (0.07)	–0.000002 (0.91)	–0.000037 (0.07)
STGEN	–0.005841 (0.01)	–0.010425 (0.01)	–0.007577 (0.01)	–0.009688 (0.01)	–0.008985 (0.01)	–0.004452 (0.12)
$STGEN^2$	0.000211 (0.01)	0.000303 (0.01)	0.000229 (0.01)	0.000350 (0.01)	0.000299 (0.02)	0.000198 (0.02)
$\chi2$ (β=0)	129.31 (0.01)	154.76 (0.01)	171.22 (0.01)	111.36 (0.01)	99.89 (0.01)	118.80 (0.01)

Table 4.31
Extreme Values (Turning Points) for Alternative Specifications

	MIG	EMP	INC
2000–2007 (Model 2)			
FEDGEN (max)	35.4% [17.8% - 55.0%]	N/A	34.3% [23.2% - 42.5%]
STGEN (min)	12.9% [8.3% - 17.2%]	17.0% [12.6% - 27.3%]	15.5% [10.2% - 25.6%]
2000–2007 (Model 3A)			
FEDGEN (max)	N/A	N/A	35.9% [22.0% - 52.6%]
STGEN (min)	13.3% [6.9% -18.8%]	17.0% [12.6% - 24.0%]	16.6% [12.8% - 22.9%]
2000–2007 (Model 5A)			
FEDGEN (max)	N/A	N/A	35.0% [19.4% - 50.1%]
STGEN (min)	14.4% [8.7% -19.8%]	17.0% [13.5% - 22.5%]	16.9% [13.2% - 23.0%]
2000–2010 (Model 3B)			
FEDGEN (max)	38.0% [4.5% - 106.7%]	N/A	N/A
STGEN (min)	13.8% [10.5% - 17.4%]	14.8% [9.5% - 21.8%]	15.1% [11.6% - 20.0%]
2000–2010 (Model 5B)			
FEDGEN (max)	36.3% [−6.5% - 76.5%]	N/A	N/A
STGEN (min)	14.5% [11.7% - 17.8%]	15.2% [10.3% - 20.8%]	15.8% [12.2% - 20.2%]

Note: 95% confidence interval in brackets; based on 1000 bootstrap simulations following the method of Krinsky and Robb (1986).
N/A = both quadratic parameters statistically equal to zero

5 FEDERAL LAND-BASED REVENUES

Utah receives funds from several federal agencies that are tied to the amount of federally owned land in the state. These land-based federal funds are due to oil, gas and mineral production on federal land (mineral lease disbursements); federal land ownership in general (Payments in Lieu of Taxes, Secure Rural Schools payments, federal highway funds matching rates); oil and gas pipeline rights-of-way rentals, grazing on federal land, and sales of land and materials (BLM payments to states); and coal production from federally owned mineral rights (coal program). In federal fiscal year 2013 funding from all of these sources totaled more than $187 million (Table 5.1).

Table 5.1
Total Land-Based Federal Funds Received in FY2013
(Current Dollars)

Source	Amount
Mineral Lease Disbursement	$138,285,907
Payments in Lieu of Taxes (PILT)	$35,391,052
Secure Rural Schools (SRS)*	$10,935,246
BLM Payments to States	$588,287
Oil & Gas Pipeline Rights-of-Way Rentals	$417,684
Taylor Grazing Act	$142,478
Sale of Land and Materials	$28,125
Coal Program	$1,940,872
Total	$187,141,364

*SRS amount comprises Title I, Title III and 25 percent payments.

Source: U.S. Department of the Interior, Office of Natural Resources Revenue; U.S. Department of the Interior; U.S. Forest Service; Bureau of Land Management; Bureau of Reclamation; Utah Department of Natural Resources, Division of Oil, Gas and Mining.

Some of these funds find their way to the state's counties. Payments in Lieu of Taxes (PILT) are paid directly to the counties and Secure Rural Schools (SRS) funds are paid to the state, which then disburses them to the counties. At least 40 percent of mineral lease revenue disbursements paid to the state are distributed to counties and special service districts by the Utah Department of Transportation. Other mineral funds are channeled to state agencies and subdivisions of the state by the Permanent Community Impact Fund. Taylor Grazing Act receipts are sent to the state's six grazing districts.

Another source of state and county revenue related to federal land ownership is taxation of mining activities on federal land. The state imposes excise taxes on various mining activities and receives sales tax revenues from taxable sales in the mining sector. The counties also tax mining sales and charge property taxes on the capitalized net revenue value of wells and mines, machinery, surface improvements and other mining infrastructure. While these revenues do not come directly from the federal government, they are tied to activity on federal lands.

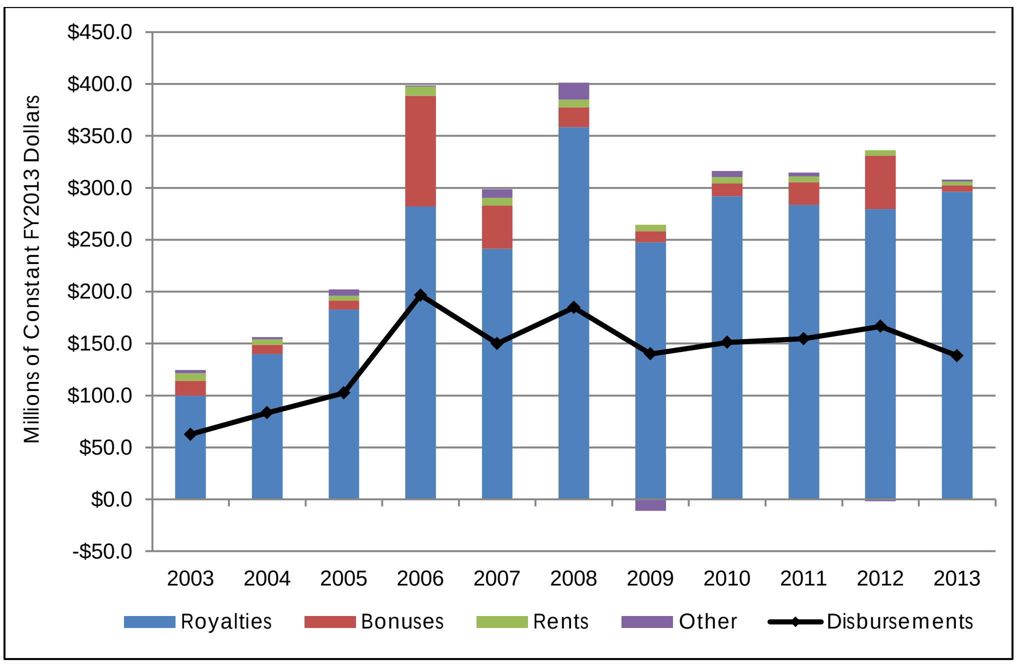
The following sections provide details on each of these sources of federal funds, their importance to county budgets, and how the payments might be affected by a transfer of federal lands to the state.

5.1 MINERAL LEASE REVENUES

Oil, gas and mineral production on federal land is subject to royalty, bonus, and rent payments under the Mineral Lands Leasing Act of 1920. Royalty rates range from 8 percent of the gross value of coal produced from underground mines to 12.5 percent for surface-mined coal and oil and natural gas. These are paid to the Office of Natural Resources Revenue, an agency within the U.S. Department of Interior. Half of these funds is returned to the state of origin, 40 percent goes to the Bureau of Reclamation's Reclamation Fund, and 10 percent goes to the U.S. Treasury. Revenues from production on Indian lands are returned to the appropriate tribe, not to the state government. The states have full discretion as to the distribution of federal mineral funds as long as priority is given to areas with economic and/or social impacts from leasing activities.

From fiscal year 2003 through FY2013, mineral lease revenues paid to the Office of Natural Resources Revenue from activity in Utah grew from $124.6 million to $308.0 million (in constant 2013 dollars), a 147 percent increase after inflation. Revenues tripled between fiscal year 2003 and 2006, then fell by one-quarter in 2007 due largely to a significant drop in bonus payments and lower royalties from natural gas. Spurred by historically high oil and gas prices in 2008, revenues jumped 34 percent to a high of $401.2 million (in FY2013 dollars). After dropping to $253.6 million in 2009, they have since remained above $300 million (Figure 5.1 and Table 5.2).

Figure 5.1
Federal Mineral Lease Revenues and Disbursements in Utah, FY2003–2013



Note: Years are federal fiscal years (October 1 through September 30).
Source: U.S. Department of the Interior, Office of Natural Resources Revenue.

Royalties accounted for 96 percent of all mineral lease revenues in FY2013, with bonus payments contributing 2 percent and rents and other revenues each contributing 1 percent.[145] Looking at commodities, oil and gas (including natural gas liquids) supplied 87 percent of 2013 revenues and coal 12 percent.

Disbursements to the state of Utah followed a similar, though less volatile, path to that of lease revenues. From FY2003 through FY2013 they increased from $62.5 million to $138.3 million (in constant FY2013 dollars), an inflation-adjusted 121 percent increase. Disbursements tripled

145 Bonus payments are associated with the awarding of federal mineral leases, rents are paid on leases until production begins, and other revenues include minimum and estimated royalty payments, settlement agreements, and interest.

Table 5.2
Federal Mineral Lease Revenues and Disbursements by Type and Commodity, FY2003–2013
(Constant FY2013 Dollars)

Type & Commodity	FY2003	FY2004	FY2005	FY2006	FY2007	FY2008	FY2009	FY2010	FY2011	FY2012	FY2013
REVENUES											
Reported Royalties	$99,866,688	$139,918,694	$182,759,399	$282,052,147	$241,352,660	$358,429,940	$247,526,458	$291,866,492	$283,445,935	$279,670,223	$296,202,054
Gas	$58,082,621	$91,881,809	$117,615,482	$188,468,988	$147,187,730	$210,489,129	$129,467,673	$139,841,572	$120,707,981	$91,285,869	$106,024,963
Oil	$13,129,611	$15,817,460	$29,972,516	$59,183,552	$63,048,578	$113,450,153	$81,189,951	$100,481,899	$110,900,267	$114,242,735	$125,073,382
Coal	$26,656,941	$30,142,179	$32,755,634	$30,917,200	$27,394,733	$24,387,446	$22,024,216	$29,955,732	$18,790,037	$36,423,767	$35,641,043
Natural Gas Liquids	$1,389,631	$1,298,455	$1,598,394	$2,653,891	$2,566,491	$8,482,002	$12,234,270	$19,491,689	$29,637,168	$33,972,707	$25,870,073
Other Products[1]	$607,884	$778,790	$817,372	$828,515	$1,155,128	$1,621,211	$2,610,348	$2,095,600	$3,410,483	$3,745,145	$3,592,593
Bonus Payments	$14,313,874	$8,850,287	$8,696,882	$106,547,419	$41,718,490	$19,051,828	$10,727,316	$12,382,941	$21,851,698	$51,353,266	$6,182,972
Oil & Gas	$5,588,288	$4,467,438	$4,246,751	$101,704,430	$39,511,959	$18,348,556	$741,559	$11,242,674	-$858,656	$50,816,479	$6,142,652
Coal	$8,725,586	$4,371,496	$4,450,131	$4,842,989	$2,206,531	$703,272	$623,524	$701,453	$1,038,893	$536,787	$40,320
Other Products[2]	$0	$11,352	$0	$0	$0	$0	$9,362,233	$438,814	$21,671,460	$0	$0
Rents	$7,192,753	$5,342,031	$4,662,330	$8,857,910	$7,147,899	$7,421,230	$6,279,405	$6,254,371	$5,795,752	$5,163,293	$3,748,601
Oil & Gas	$6,716,863	$5,077,482	$4,703,175	$8,482,335	$6,990,882	$7,088,269	$5,833,355	$5,559,780	$5,008,489	$4,426,270	$3,063,620
Coal	$406,297	$321,585	-$90,170	$313,130	$117,465	$258,677	$178,414	$244,002	$287,585	$263,567	$230,003
Geothermal	$47,365	-$101,877	$268	$26,637	$2,318	$23,047	$233,412	$416,545	$437,902	$405,275	$371,509
Other Products[3]	$22,227	$44,842	$49,056	$35,808	$37,234	$51,237	$34,225	$34,044	$61,776	$68,181	$83,469
Other Revenues[4]	$3,261,391	$2,191,952	$6,235,122	$931,372	$8,420,168	$16,294,956	-$10,967,493	$5,808,907	$3,544,342	-$1,660,146	$1,887,389
Oil & Gas	$2,942,910	$2,106,436	$3,135,742	$1,185,236	$8,627,501	$16,261,296	-$10,986,712	$5,777,816	$3,310,655	-$1,726,861	$1,695,894
Coal	$82,337	$0	$2,970,372	-$253,625	-$242,291	$0	$17,254	$0	$198,094	$43,985	$133,527
Other Products[5]	$236,145	$85,516	$129,008	-$239	$34,958	$33,659	$1,966	$31,091	$35,593	$22,730	$57,968
Total Revenues	**$124,634,707**	**$156,302,964**	**$202,353,733**	**$398,388,847**	**$298,639,217**	**$401,197,954**	**$253,565,686**	**$316,312,712**	**$314,637,727**	**$334,526,636**	**$308,021,015**
DISBURSEMENTS											
Geothermal				$72,715	$70,315	$78,729	$2,471,883	$290,531	$168,400	$195,096	$159,275
Beaver County				$71,964	$69,917	$74,504	$104,282	$112,225	$82,129	$78,161	$74,087
Iron County				$65	$63		$16,976	$20,528	$1,310	$1,283	$1,203
Juab County							$291,934	$93,017	$39,195	$75,824	$46,644
Millard County				$686	$335	$4,225	$2,058,691	$64,760	$45,766	$39,828	$37,342
State	$62,477,073	$83,284,373	$102,434,819	$196,465,221	$149,911,475	$184,603,932	$137,624,735	$150,873,042	$154,491,284	$166,415,027	$138,126,632
Total Disbursements	**$62,477,073**	**$83,284,373**	**$102,434,819**	**$196,537,936**	**$149,981,790**	**$184,682,661**	**$140,096,618**	**$151,163,573**	**$154,659,684**	**$166,610,123**	**$138,285,907**

Note: Years are federal fiscal years (October 1 through September 30). Data are accounting year data, which represent all transactions that ONRR accepted into its financial system during a given fiscal year. Excludes revenues from activities on Indian tribal lands.
1 Comprises carbon dioxide, clay, geothermal, gilsonite, magnesium chloride brine, manure salts, potash, and salt.
2 Comprises geothermal, gilsonite, and potassium.
3 Comprises clay, gilsonite, hardrock, limestone, oil shale, phosphate, potassium, and tar sands.
4 The main components of "other revenues" are minimum royalty payments, estimated royalty payments, settlement agreements, and interest.
5 Comprises clay, hardrock, geothermal, gilsonite, phosphate, and potassium.

Source: U.S. Department of the Interior, Office of Natural Resources Revenue, statistics.onrr.gov/ReportTool.aspx.

from 2003 to $196.5 million in 2008, fell by almost one-quarter in 2007, then rose again in 2008 to $184.7 million (Table 5.2). In 2006, the federal government began making disbursements directly to a few counties in Utah for geothermal projects. Initially, Beaver, Iron and Millard counties were the only recipients, with Juab receiving funds starting in 2009. These disbursements grew from $72,715 in FY2006 to $290,531 in 2010, with an unusual spike at almost $2.5 million in 2009 (in constant FY2013 dollars). Geothermal disbursements have since declined to $159,275 in 2013. Over the period of these disbursements, Beaver County has generally received the largest amount.

In Utah, federal mineral revenues are distributed to several different agencies and funds according to state law (Table 5.3). The largest recipients are the Utah Department of Transportation and the Permanent Community Impact Fund. UDOT then distributes its funds to counties and special service districts in proportion to the amount of mineral lease money generated by each county (Table 5.4). The Permanent Community Impact Fund makes loans and grants to state agencies and subdivisions of the state impacted by mineral resource development. Unlike the funds administered by UDOT, which are distributed in proportion to revenues generated in the county, monies from the Permanent Community Impact Fund are distributed by a state-appointed board in response to proposals submitted by county and municipal governments, taxing districts, and other authorities. Therefore, the distribution of money by the Permanent Community Impact Fund to the counties are not necessarily proportional to the amount of revenue generated.

Table 5.3
Distribution of Federal Mineral Revenues in Utah

Source Recipient	Share
All mineral lease money *except* categories below	
Department of Transportation	40.0%
Permanent Community Impact Fund	32.5%
Department of Workforce Services	5.0%
State Board of Education	2.25%
Utah Geological Survey	2.25%
Water Research Laboratory	2.25%
Counties w/SITLA, DPR, DWR lands	81¢ per acre*
Permanent Community Impact Fund	Remainder
Mineral Lease Bonus Payments	
Permanent Community Impact Fund	70.0%
Mineral Bonus Account	30.0%
Money received from the United States attributable to royalties from the extraction of minerals on federal land that, on September 18, 1996, was located within the boundaries of the Grand Staircase–Escalante National Monument	
Department of Transportation	40.0%
State Board of Education	40.0%
State School Fund	17.75%
Utah Geological Survey	2.25%

*As of 2013. Amount is adjusted annually by the average annual change in the CPI.

Source: Utah State Code, Title 59, Chapter 21.

The Department of Workforce Services distributes its mineral lease revenues to special service districts in counties with 125,000 people or fewer (third class or smaller), in which not more than 4.5 percent of the mineral lease money is generated, and that are significantly impacted by the transportation of hydrocarbons within the county. Half of these funds is allocated equally among the eligible counties and half is allocated based on population.

The funds received by the State Board of Education are to be used for research to improve the quality of education in Utah. Funds appropriated to the Utah Geological Survey are to be used for activities aimed at the development and exploitation of natural resources in the state. And funds allocated to the Utah State University Water Research Laboratory are for activities intended to develop and exploit water resources in the state.

The 81¢-per-acre payments to counties cited in Table 5.3 are payments in lieu of taxes made by the state government to counties for lands controlled by the School and Institutional Trust

Table 5.4
Mineral Lease Distributions from UDOT to Counties, FY2003–2013
(Constant FY2013 Dollars)

County/SSD	FY2003	FY2004	FY2005	FY2006	FY2007	FY2008	FY2009	FY2010	FY2011	FY2012	FY2013
Beaver	$65,142	$46,284	$58,615	$55,940	$57,138	$57,248	$59,993	$63,509	$58,648	$66,492	$63,048
Box Elder		$126	$123	$123					$3,371		
Carbon	$3,999,023	$6,556,664	$8,297,267	$11,566,048	$9,325,431	$8,504,383	$9,783,917	$7,899,508	$7,829,226	$7,022,290	$5,260,882
Daggett Road & Transportation				$167,291	$91,101	$36,288	$97,562	$37,240	$42,624	$45,209	$29,931
Daggett	$74,131	$110,302	$164,046	$23,291	$16,077	$6,404	$17,217	$6,572	$7,522	$7,978	$5,282
Davis	$187	$143		$121						$1,074	$1,073
Duchesne	$839,342	$1,126,476	$2,239,947	$3,135,127	$3,498,743	$5,427,863	$6,704,459	$5,832,740	$6,803,109	$8,267,330	$7,529,583
Duchesne SSD #3						$267,805	$397,870				
Emery	$2,731,027	$4,549,114	$4,804,766	$4,066,274	$2,574,495	$1,277,226	$1,065,068	$734,138	$772,371	$2,616,512	$2,445,969
Garfield	$191,535	$180,024	$275,753	$265,496	$310,057	$360,713	$375,562	$317,653	$376,830	$381,235	$289,759
Grand Co. Hospital Service Dist	$128,681	$241,149	$257,709	$297,535	$259,241	$241,951	$313,425	$157,365	$169,946	$144,514	$668,082
Grand Co. Transportation SSD							$56,736	$157,413	$169,997	$144,557	$403,242
Grand Co. Recreation SSD	$128,719	$185,414	$257,787	$297,624	$259,319	$242,024	$253,600				
Grand Co. Solid Waste Mgmt. SSD #1	$128,681	$241,149	$257,709	$297,535	$259,241	$241,951	$313,425	$157,365	$169,946	$144,514	$138,160
Iron	$615	$578	$255	$1,487	$621	$367		$2,200	$11,136	$4,247	$21,479
Juab	$1,056	$1,362	$2,817	$3,058	$1,947	$1,438	$1,243	$1,152	$11,804	$6,622	$6,405
Kane		$64							$1,860		
Millard	$276	$211		$1,141	$329			$1,158	$13,647	$4,926	$8,610
Morgan	$81	$62		$59						$78	$79
Piute	$760	$580	$578	$579	$584		$20	$1,026	$3,221	$2,042	$2,059
Rich	$270	$922	$345	$346	$349				$1,867		
Salt Lake	$561	$36		$561	$761			$318	$182	$370	$373
San Juan	$1,157,178	$1,334,054	$1,007,803	$1,608,640	$1,169,018	$1,384,915	$2,753,638	$922,148	$1,189,712	$1,362,115	$1,096,566
Sanpete	$1,638	$374	$373	$413	$417	$2,043	$22,329	$11,625	$94,118	$1,099	$1,086
Sevier	$1,996,808	$2,023,093	$2,165,135	$4,410,068	$5,730,467	$6,226,906	$6,108,403	$6,745,920	$5,444,746	$7,106,433	$7,195,291
Summit	$58,466	$56,267	$112,227	$169,440	$100,310	$172,971	$146,796	$13,197	$32,728	$22,430	$44,842
Tooele	$27,723	$29,808	$22,881	$15,841	$19,034	$33,597	$80,313	$43,273	$60,910	$65,209	$72,220
Uintah Transportation SSD					$16,595,721	$15,082,903	$22,487,854	$15,585,628	$17,009,944	$17,401,383	$14,224,906
Uintah Recreation SSD					$6,034,808	$5,484,692	$8,177,401	$5,667,501	$6,185,434	$6,075,392	$4,789,914
Uintah Fire Suppression SSD					$2,112,183	$1,919,642	$2,862,090	$1,983,625	$2,164,902	$1,906,063	$1,394,193
Uintah Economic Develop. SSD					$3,470,014	$3,153,698	$4,702,006	$3,258,813	$3,556,625	$4,151,765	$3,799,162
Uintah Healthcare SSD					$1,206,962	$1,096,938	$1,635,480	$1,133,500	$1,237,087	$1,265,555	$1,034,539
Uintah Animal Control SSD					$754,351	$685,586	$1,022,175	$708,438	$773,179	$838,720	$761,572
Uintah Total	$8,525,044	$14,231,841	$19,659,239	$31,350,795							
Utah	$1,921	$635	$353	$1,072	$491		$10	$1,064	$8,497	$38,840	$4,491
Wasatch				$5,970							
Washington	$1,895	$1,455	$398	$5,945	$1,369			$3,536	$18,378	$11,279	$12,818
Wayne						$11	$1		$2,003		
State Total	$20,060,758	$30,918,186	$39,586,124	$57,747,821	$53,850,578	$51,909,561	$69,438,594	$51,447,627	$54,225,568	$59,106,274	$51,305,617

Note: Years are state fiscal years (July 1 through June 30). Cache and Weber counties did not receive any mineral lease distributions from UDOT from FY2003 through FY2013.

Source: Utah Department of Transportation, www.udot.utah.gov/main/f?p=100:pg:0::::V,T:,135; downloaded November 11, 2013.

Lands Administration, the Division of Parks and Recreation, and the Division of Wildlife Resources. This rate is adjusted annually for inflation according to changes in the Consumer Price Index. For counties in which SITLA lands were transferred to the federal government after December 31, 1992, the payment per transferred acre is 81¢ minus the most recent federal PILT per-acre payment. For counties in which federal entitlement lands were transferred to SITLA, the payment per transferred acre is the most recent federal PILT per-acre payment minus 81¢. Finally, counties with 11,000 or fewer people (fifth and sixth class) receive $1000 per nontaxable residence owned by, or on land owned by, the Division of Parks and Recreation or the Division of Wildlife Resources. All of these payments are paid from federal mineral lease revenues.

From state fiscal year 2003 through fiscal year 2013, UDOT distributed mineral lease money to all but Cache and Weber counties. However, only 14 counties received payments in every year. In 2013, UDOT distributions ranged from just $79 for Morgan County to a total of $26,004,287 to special service districts in Uintah County (Table 5.4), half of all the funds distributed in FY2013. In fact, from 2003 through 2013 Uintah County was by far the largest recipient of mineral lease monies from UDOT, taking a total of $289.2 million (in FY2013 dollars). This represents more than half of the total cumulative distributions over the period. Since 2011, payments have been made monthly; previously, funds were allocated quarterly.

5.2 PAYMENTS IN LIEU OF TAXES

The federal government makes payments in lieu of taxes (PILT) directly to county governments to help offset foregone property tax revenues due to nontaxable federal lands within their boundaries. The payments are made annually in June for tax-exempt federal lands administered by the BLM, the National Park Service, the U.S. Forest Service, the U.S. Fish and Wildlife Service, and for federal water projects and some military installations. The formula used to compute the payments is based on the amount of federal land within an affected county; population, with less populous counties paid at a higher per-capita rate than more populous counties; prior-year payments from other federal land-payment programs, such as Secure Rural Schools, mineral lease revenues and grazing receipts; the existence of state laws directing county payments from federal land agencies to a particular purpose (pass-through requirements); and the Consumer Price Index. In the case of counties whose prior-year payments from other federal sources were more than their acreage- and population-based PILT payment would be, they receive a minimum PILT payment that amounted to 35¢ per acre for fiscal year 2013 (Corn 2014). Local governments may use their PILT payment for any governmental purpose.

All 29 counties in Utah receive PILT payments from the federal government. In 2013 these totaled $35.4 million, with individual county payments ranging from $29,911 for Morgan County to $3,193,382 for Tooele County (Table 5.5). From 2003 to 2007 annual total payments declined slightly, in real terms, from almost $23.0 million to $22.1 million (in constant 2013 dollars). In 2008 PILT funding changed from discretionary to mandatory, increasing the state's total by 55 percent to $34.2 million. This grew to $36.4 million in 2012, then dipped to $35.4 million in 2013 (Table 5.5 and Figure 5.2). The top five recipients of PILT payments, with their 2013 amounts, have been Tooele ($3,193,382), Iron ($2,991,420), Box Elder ($2,895,731), Washington ($2,717,957) and Uintah ($2,683,939) counties. The bottom five are Morgan ($29,911), Davis ($64,848), Daggett ($119,803), Weber ($127,550) and Piute ($225,071). Since the funding formula changed in 2008, payment amounts have declined in 10 counties and risen in the remaining

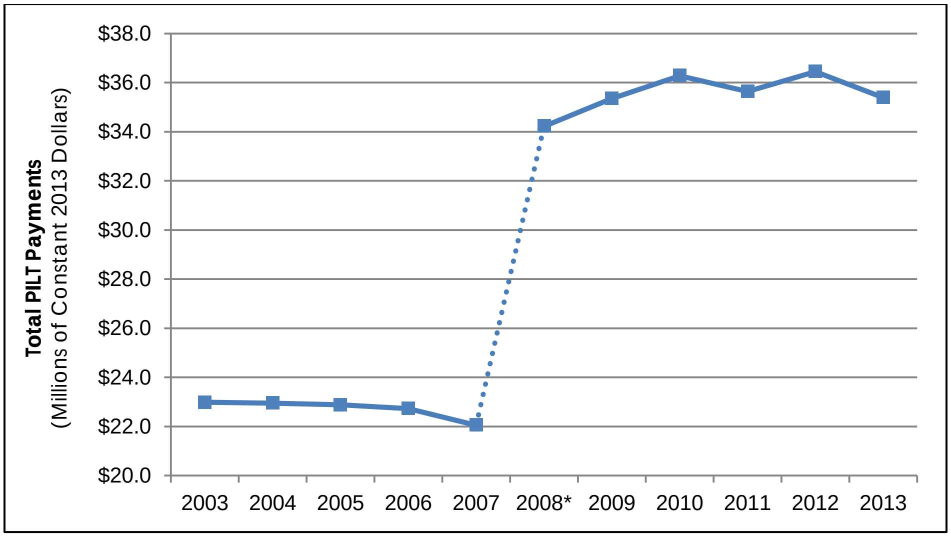
Table 5.5
Federal PILT Payments to Counties, 2003–2013
(Constant 2013 Dollars)

County	2003	2004	2005	2006	2007	2008*	2009	2010	2011	2012	2013	Change Since '08	2013 PILT per acre
Beaver	$620,827	$621,634	$616,944	$610,744	$590,098	$904,481	$934,097	$919,232	$940,693	$1,036,596	$1,001,367	10.7%	$0.78
Box Elder	$2,002,474	$1,999,790	$1,986,481	$1,966,724	$1,898,513	$2,912,234	$3,000,180	$3,021,502	$2,962,133	$3,001,270	$2,895,731	–0.6%	$2.41
Cache	$412,860	$429,291	$391,017	$388,338	$375,553	$577,315	$597,273	$630,906	$619,724	$632,186	$611,581	5.9%	$2.28
Carbon	$729,948	$729,044	$723,805	$715,500	$690,663	$1,059,391	$1,091,423	$1,106,478	$1,083,518	$1,087,742	$1,049,658	–0.9%	$2.41
Daggett	$80,859	$82,122	$83,285	$82,788	$79,614	$122,750	$126,002	$126,025	$122,393	$124,025	$119,803	–2.4%	$0.33
Davis	$51,820	$51,976	$51,943	$51,455	$50,341	$77,616	$80,302	$59,720	$62,675	$64,732	$64,848	–16.5%	$1.79
Duchesne	$925,866	$928,031	$920,984	$912,873	$882,980	$1,429,260	$1,479,764	$1,689,086	$1,726,124	$1,798,826	$1,737,658	21.6%	$1.92
Emery	$832,427	$834,023	$824,659	$816,340	$788,762	$1,208,954	$1,163,772	$1,259,758	$1,225,472	$1,240,595	$1,201,940	–0.6%	$0.53
Garfield	$513,622	$514,186	$505,588	$491,261	$475,737	$739,493	$762,481	$789,546	$784,217	$839,698	$811,164	9.7%	$0.31
Grand	$767,178	$768,051	$762,195	$754,448	$728,818	$1,116,954	$1,153,125	$1,194,712	$1,171,706	$1,154,257	$1,115,018	–0.2%	$0.65
Iron	$1,836,414	$1,829,359	$1,884,719	$1,862,491	$1,868,440	$2,953,303	$3,088,208	$3,151,930	$3,086,380	$3,099,973	$2,991,420	1.3%	$2.41
Juab	$757,429	$758,427	$752,658	$745,164	$719,977	$1,103,617	$1,161,089	$1,156,951	$1,135,396	$1,146,409	$1,110,698	0.6%	$0.73
Kane	$614,778	$615,662	$611,026	$606,935	$586,429	$989,245	$1,021,819	$1,056,405	$1,033,404	$1,036,596	$1,001,367	1.2%	$0.44
Millard	$869,442	$866,902	$871,566	$863,581	$839,265	$1,280,291	$1,320,520	$1,315,689	$1,297,545	$1,389,450	$1,342,254	4.8%	$0.40
Morgan	$23,921	$23,943	$23,786	$23,586	$22,802	$35,032	$36,218	$27,816	$27,981	$29,871	$29,911	–14.6%	$1.89
Piute	$138,025	$135,897	$144,169	$144,230	$139,953	$207,723	$212,810	$214,317	$214,533	$224,708	$225,071	8.4%	$0.63
Rich	$213,758	$217,052	$216,030	$219,466	$210,210	$320,541	$340,435	$354,427	$348,712	$386,766	$367,782	14.7%	$1.67
Salt Lake	$145,413	$145,470	$144,391	$143,141	$139,109	$216,972	$226,503	$236,812	$232,291	$234,090	$226,395	4.3%	$2.27
San Juan	$947,344	$948,559	$941,358	$932,108	$900,753	$1,380,798	$1,426,469	$1,400,902	$1,385,402	$1,406,748	$1,384,188	0.2%	$0.45
Sanpete	$869,958	$869,058	$863,408	$853,782	$824,384	$1,264,939	$1,304,144	$1,256,673	$1,238,400	$1,255,745	$1,217,685	–3.7%	$2.29
Sevier	$1,147,254	$1,140,754	$1,158,134	$1,148,137	$1,120,504	$1,766,561	$1,821,258	$1,775,375	$1,747,192	$1,830,846	$1,786,167	1.1%	$1.87
Summit	$759,813	$743,700	$760,094	$752,923	$735,090	$1,129,935	$1,174,693	$1,341,916	$1,318,075	$1,323,309	$1,279,584	13.2%	$2.41
Tooele	$2,142,154	$2,139,338	$2,159,451	$2,177,560	$2,103,882	$3,224,943	$3,330,200	$3,341,122	$3,283,786	$3,297,460	$3,193,382	–1.0%	$1.56
Uintah	$1,457,698	$1,459,707	$1,448,462	$1,490,150	$1,439,850	$2,290,109	$2,407,062	$2,681,978	$2,548,270	$2,670,140	$2,683,939	17.2%	$1.47
Utah	$1,127,675	$1,121,743	$1,082,778	$1,069,586	$1,033,772	$1,587,929	$1,639,130	$1,657,924	$1,621,413	$1,641,710	$1,589,730	0.1%	$2.31
Wasatch	$733,733	$707,942	$704,096	$696,765	$675,844	$1,038,415	$1,073,387	$1,108,843	$1,091,419	$1,101,932	$1,066,599	2.7%	$2.32
Washington	$1,868,048	$1,867,176	$1,854,866	$1,834,212	$1,771,190	$2,717,156	$2,801,752	$2,852,956	$2,792,836	$2,810,569	$2,717,957	0.0%	$2.37
Wayne	$287,624	$288,013	$273,236	$272,197	$260,816	$415,022	$424,255	$444,023	$428,106	$456,134	$440,605	6.2%	$0.33
Weber	$102,408	$116,414	$115,680	$101,260	$97,896	$150,232	$155,381	$108,994	$111,843	$127,503	$127,550	–15.1%	$1.85
State Total	$22,980,770	$22,953,265	$22,876,808	$22,727,744	$22,051,245	$34,221,212	$35,353,754	$36,282,017	$35,641,640	$36,449,887	$35,391,052	3.4%	$1.08

* In 2008, funding for PILT changed from discretionary to mandatory.

Source: U.S. Department of the Interior, www.doi.gov/pilt/county-payments.cfm, accessed 08/29/13. Values were adjusted using the CPI West for Class B/C size cities (50,000 to 1,500,000).

Figure 5.2
Federal PILT Payments to Utah, 2003–2013



Note: Years are federal fiscal years (October 1 through September 30).
* In 2008, PILT funding changed from discretionary to mandatory.
Source: U.S. Department of the Interior, www.doi.gov/pilt/county-payments.cfm.

19, after adjusting for inflation. The declines ranged from –0.2 percent in Grand to –16.5 percent in Davis. The fastest payment growth from 2008 to 2013 was in Duchesne County, with an increase of 21.6 percent.

PILT payments as a share of total county revenues (in 2012) ranged from 1 percent or less in the urban counties of Salt Lake, Davis, Utah and Weber to 10 to 12 percent in rural Box Elder, Iron, Juab, Sanpete and Sevier.

A portion of the PILT payment a county receives may be directed to one or more school districts in the county. Table 5.6 shows the amount of PILT funds that each school district received from state fiscal year 2003 through FY2013. There is a significant amount of variation in the size and frequency of these payments from year to year. Less than half (15) of the state's 41 districts received PILT funds in every year of the study period. Five received no funds at all between FY2003 and FY2013. The remaining 21 districts received PILT funds in as few as 3 to as many as 10 of the last 11 fiscal years.

There is some uncertainty about the future of PILT payments. A study by the Congressional Research Service published in February 2014 summarizes the program's current status.

> Before 2008, annual appropriations were necessary to fund PILT, but a provision in P.L. 110-343 for mandatory spending ensured that, beginning with FY2008 and continuing through the payment made in 2012, all counties would receive 100 percent of the authorized payment. P.L. 112-141 extended mandatory spending to FY2013. The Budget Control Act (P.L. 112-25) provided for a sequestration of 5.1 percent of PILT payments for FY2013.Most recently, PILT's mandatory spending expired in FY2013, but was renewed for one year in P.L. 113-79 [the 2014 farm bill].... With the enactment of P.L. 113-79, the question of funding for the program has been addressed until the next appropriations cycle. At the same time, with congressional debate over spending levels in general,

there may be proposals to modify or even eliminate PILT in later years as a means of reducing federal deficits (Corn 2014).

Table 5.6
School District Revenues from Federal PILT Payments to Counties, FY2003–FY2013
(Constant FY2013 Dollars)

School District (by County)	FY2003	FY2004	FY2005	FY2006	FY2007	FY2008	FY2009	FY2010	FY2011	FY2012	FY2013
Beaver	$13,069	$12,887	$12,750	$12,635	$12,427	$11,967	$113,455	$94,263	$111,257	$74,436	$72,097
Box Elder	$14,964	$14,809	$14,598	$14,467	$14,229	$13,701	$87,986	$79,563	$67,574	$61,616	$0
Cache	$20,134	$49,247	$48,546	$40,892	$40,218	$38,728	$221,198	$213,074	$169,661	$163,971	$0
Logan	$39,694	$0	$0	$0	$0	$0	$89,910	$86,735	$68,995	$64,975	$0
Carbon	$1,567	$2,249	$2,217	$2,197	$2,162	$2,081	$0	$0	$0	$0	$0
Daggett	$37,189	$36,805	$36,281	$35,953	$35,361	$34,051	$0	$0	$31,165	$30,351	$0
Davis	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Duchesne	$91,665	$90,738	$89,428	$88,619	$87,162	$83,930	$0	$305,924	$264,095	$295,841	$257,878
Emery	$11,124	$15,809	$15,584	$15,444	$15,189	$14,626	$177,306	$189,591	$168,064	$136,580	$93,117
Garfield	$158,160	$156,528	$154,298	$152,903	$212,921	$144,815	$904,258	$940,769	$730,211	$623,028	$688,113
Grand	$4,328	$4,261	$0	$4,104	$3,331	$3,749	$190,960	$85,627	$84,495	$34,477	$26,232
Iron	$40,421	$14,279	$18,571	$28,038	$30,258	$22,739	$52,874	$286,243	$243,841	$208,001	$0
Juab	$0	$16,598	$16,362	$0	$714	$15,615	$107,579	$0	$0	$46,629	$0
Tintic	$2,426	$2,149	$2,117	$2,118	$1,969	$1,808	$68,072	$60,949	$52,609	$46,628	$0
Kane	$22,161	$21,933	$21,620	$21,426	$21,073	$20,292	$83,086	$74,040	$64,790	$51,982	$59,797
Millard	$40,176	$22,757	$21,383	$13,478	$19,565	$20,619	$267,700	$224,557	$193,385	$195,264	$164,838
Morgan	$0	$0	$3,758	$19,214	$6,863	$10,398	$12,429	$11,699	$9,928	$8,783	$7,713
Piute	$25,521	$14,357	$13,548	$8,530	$13,268	$13,120	$182,524	$154,098	$166,645	$143,645	$147,956
Rich	$5,288	$13,248	$13,059	$12,940	$12,728	$12,256	$40,672	$40,041	$37,019	$31,032	$31,235
Canyons	$0	$0	$0	$0	$0	$0	$0	$0	$2,865	$2,772	$0
Granite	$10,449	$10,281	$0	$0	$0	$0	$0	$0	$0	$0	$14,199
Jordan	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Murray	$951	$965	$951	$926	$926	$863	$0	$590	$566	$535	$1,364
Salt Lake City	$0	$3,568	$3,455	$3,395	$3,363	$0	$2,161	$2,109	$2,011	$1,928	$4,991
San Juan	$33,780	$33,430	$0	$64,579	$32,120	$30,928	$824,425	$0	$0	$0	$0
No. Sanpete	$15,659	$430,705	$610,138	$653,403	$610,520	$336,996	$584,524	$278,336	$230,979	$176,351	$0
So. Sanpete	$15,659	$15,497	$15,276	$15,137	$14,890	$14,337	$313,317	$289,034	$251,948	$230,831	$211,081
Sevier	$92,036	$52,064	$49,345	$31,381	$45,089	$47,348	$723,286	$689,102	$580,766	$468,289	$476,958
No. Summit	$18,908	$17,925	$17,294	$17,138	$16,806	$16,231	$0	$12,308	$11,670	$11,503	$10,548
So. Summit	$24,818	$24,269	$23,059	$22,849	$22,843	$22,723	$17,898	$17,484	$16,597	$16,648	$15,541
Park City	$74,452	$75,082	$74,940	$74,262	$72,722	$69,251	$56,937	$55,620	$52,775	$50,046	$46,704
Tooele	$28,100	$86,502	$40,285	$39,920	$39,265	$37,808	$147,543	$133,741	$126,739	$110,036	$98,534
Uintah	$38,389	$37,992	$37,451	$37,112	$36,503	$35,149	$179,918	$158,391	$127,903	$150,344	$130,926
Alpine	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Nebo	$9,775	$17,235	$16,051	$16,026	$15,382	$15,013	$141,436	$146,041	$122,697	$113,155	$93,292
Provo	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Wasatch	$62,362	$61,719	$60,847	$60,290	$59,299	$57,357	$0	$0	$0	$0	$278,207
Washington	$56,220	$55,639	$54,846	$54,351	$53,457	$51,475	$356,869	$358,430	$316,137	$277,344	$259,716
Wayne	$21,783	$21,558	$21,251	$21,059	$20,713	$19,945	$176,595	$147,251	$128,571	$133,222	$0
Weber	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Ogden	$0	$0	$0	$39,493	$0	$10,058	$0	$12,917	$13,251	$8,431	$11,242
Total	**$1,031,229**	**$1,433,087**	**$1,509,312**	**$1,624,279**	**$1,573,335**	**$1,229,980**	**$6,124,918**	**$5,148,527**	**$4,449,210**	**$3,968,672**	**$3,202,279**

Note: Years are state fiscal years (July 1 through June 30).

Source: Utah State Office of Education, Annual Financial Reports (Revenues); available from www.schools.utah.gov/finance/Financial-Reporting/Annual-Financial-Report-(AFR).aspx.

With the transfer of a large amount of the federal lands in Utah to state ownership, PILT payments would decrease substantially for most counties. If all of the land described in HB148 (*Utah Code Ann.* 63L-6-102) were transferred to state ownership, counties would see losses of federal acres ranging from 53 percent (Tooele) to 100 percent (Beaver, Carbon, Daggett, Millard, Morgan, Piute, Rich and Wasatch). Two-thirds of the counties would see a reduction in federally owned lands of 90 percent or more. This would be accompanied by analogous reductions in PILT payments, particularly in those counties that no longer had any federally owned land (Table 5.7).

Table 5.7
Change in Federal Acres by County per H.B. 148

County	Federal Acres Current	Federal Acres HB148	Change Acres	Change Percent	Estimated PILT Payment*
Beaver	1,276,194	0	–1,276,194	–100%	$0
Box Elder	1,480,052	217,889	–1,262,163	–85%	$524,676
Cache	286,406	54,950	–231,456	–81%	$125,103
Carbon	451,107	0	–451,107	–100%	$0
Daggett	370,378	0	–370,378	–100%	$0
Davis	45,052	5,821	–39,231	–87%	$10,430
Duchesne	930,834	290,646	–640,188	–69%	$559,209
Emery	2,277,083	2,093	–2,274,990	–100%	$1,116
Garfield	2,999,057	166,136	–2,832,921	–94%	$51,644
Grand	1,686,173	84,106	–1,602,067	–95%	$54,404
Iron	1,217,593	15,915	–1,201,678	–99%	$38,307
Juab	1,574,176	19,731	–1,554,445	–99%	$14,390
Kane	2,245,428	39,703	–2,205,725	–98%	$17,278
Millard	3,380,670	0	–3,380,670	–100%	$0
Morgan	17,700	0	–17,700	–100%	$0
Piute	362,462	0	–362,462	–100%	$0
Rich	223,691	0	–223,691	–100%	$0
Salt Lake	106,736	43,611	–63,124	–59%	$98,942
San Juan	3,116,515	311,722	–2,804,792	–90%	$141,048
Sanpete	527,217	756	–526,461	–100%	$1,732
Sevier	942,086	4,472	–937,614	–100%	$8,349
Summit	529,586	161,887	–367,699	–69%	$389,860
Tooele	3,642,744	1,700,877	–1,941,867	–53%	$2,649,292
Uintah	1,702,982	52,921	–1,650,061	–97%	$77,635
Utah	605,920	54,495	–551,425	–91%	$126,051
Wasatch	435,517	0	–435,517	–100%	$0
Washington	1,162,302	317,554	–844,749	–73%	$752,882
Wayne	1,349,874	199,557	–1,150,317	–85%	$66,222
Weber	74,064	412	–73,652	–99%	$763
State	35,019,834	3,745,254.0	–31,274,580	–89%	$4,034,734

* Based on 2013 PILT payment per acre.

Source: BEBR analysis of land ownership data from State of Utah, SGID and Utah Code Ann. 63L-6-102.

5.3 SECURE RURAL SCHOOLS PAYMENTS

Since 1908 states with national forests would receive the most recent seven-year average of 25 percent of the receipts from the forests within their borders. The states could spend this on public schools and roads in the counties in which the national forests were located. With the decline in timber harvest revenue in the 1990s, the Secure Rural Schools and Community Self-Determination Act of 2000 (SRS) was passed "to stabilize and transition payments to counties to provide funding for schools and roads that supplements other available funds; to make additional investments in, and create additional employment opportunities through, projects that improve the maintenance of existing infrastructure, implement stewardship objectives that enhance forest ecosystems, and restore and improve land health and water quality; and to improve cooperative relationships among the people that use and the agencies that manage the national forests."[146] These three categories of expenditure are referred to as Title I, Title II and Title III payments, respectively. The size of these payments is based on several factors, including acres of "proclaimed national forest" within an eligible county, the average three highest 25-percent payments, and the per capita personal income for each county.[147]

A county must opt to receive *either* a share of the state's 25 percent rolling average payment (the original funding mechanism) *or* a share of the state SRS payment. In Utah, only Summit County opted to receive the 25 percent payment in FY2013, although half a dozen other counties have opted for the payments in previous years (Table 5.8).

The annual SRS payment from the US Forest Service comes to the state first, usually in the January following the federal fiscal year in which it was authorized. It is then distributed as follows: One-half of each county's Title I portion of the funds is distributed to school districts within the county. The other half of the Title I portion is distributed either to the county or to a special district within the county. The Title III portion of the funds is distributed either to the county or to a special district within the county. The Title II portion is kept by the US Forest Service and spent on projects on federal land within the county as recommended by a Resource Advisory Committee (Beckstead 2014).

In federal fiscal year 2013 Utah received $10.9 million in SRS payments (including Title II and 25 percent funds) from the Forest Service. Between FY2003 and FY2007 total SRS and 25 percent payments to Utah were steady at about $2.3 million (in constant FY2013 dollars). In 2008 SRS was reauthorized with several changes, including "full funding" that then declined over four years. As a result, total payments to Utah jumped almost eightfold in 2008 to $17.5 million (in constant FY2013 dollars) but have since declined (Table 5.8 and Figure 5.3). Only Carbon and Salt Lake counties saw an increase in their payments between 2008 and 2013; they were also two of only three counties (Summit being the third) that switched from SRS payments in 2007 to 25 percent payments in 2008, which reduced the amount they received. Carbon and Salt Lake switched back to Title I SRS payments in FY2012 while Summit continues to opt for 25 percent payments.

SRS was originally intended to last only six years, expiring at the end of FY2006. It was extended for one year in 2007, then for four more years in 2008. On October 2, 2013 Congress passed a one-year reauthorization as part of HR 527, the Helium Stewardship Act. This extended SRS payments for FY2013. The Restoring Healthy Forests for Healthy Communities Act (HR 1526) was passed by the House of Representatives on September 20, 2013 and sent to the Senate. As of this writing, it has been referred to the Senate Committee on Energy and Natural Resources. If passed and signed into law it would direct the Forest Service to distribute a payment to eligible counties in February 2015, essentially an FY2014 SRS payment. After that, county payments would return to a revenue-sharing system equal to 25 percent of current-year gross receipts. The bill would establish Forest Resource Revenue Areas within at least half of the National Forest System and create a fiduciary responsibility to generate revenue from forest products for the beneficiary counties (Hoover 2013).

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[146] 16 USC 7101.

[147] "Secure Rural Schools Program, 2008–2011," available from fsplaces.fs.fed.us/fsfiles/unit/wo/secure_rural_schools.nsf.

Table 5.8
Secure Rural Schools Payments to Counties by the U.S. Forest Service, FY2003–FY2013
(Constant FY2013 Dollars)

County	FY2003	FY2004	FY2005	FY2006	FY2007	FY2008	FY2009	FY2010	FY2011	FY2012	FY2013*	Change Since '08	2013 SRS per acre
Beaver	$26,348	$25,990	$25,844	$25,371	$24,564	$267,341	$224,820	$266,827	$178,025	$171,575	$179,685	–32.8%	$1.28
Title I	$26,348	$25,990	$25,844	$25,371	$24,564	$227,240	$191,097	$226,803	$151,321	$145,839	$152,732		
Title II							$33,723	$40,024	$26,704	$10,295	$10,781		
Title III						$40,101				$15,442	$16,172		
Box Elder	$30,166	$29,756	$29,589	$29,048	$28,124	$207,328	$189,758	$162,061	$147,364	$129,535	$125,150	–39.6%	$1.21
Title I	$30,166	$29,756	$29,589	$29,048	$28,124	$176,229	$161,294	$137,752	$125,260	$110,105	$106,377		
Title III						$31,099	$28,464	$24,309	$22,105	$19,430	$18,772		
Cache	$147,523	$145,518	$144,699	$142,054	$137,533	$733,089	$715,042	$572,370	$547,551	$453,100	$425,021	–42.0%	$1.49
Title I	$125,394	$123,690	$122,994	$120,746	$116,903	$623,126	$607,785	$486,515	$465,418	$385,135	$361,267		
Title II						$58,647	$57,203	$45,790	$43,804	$36,248	$34,002		
Title III	$22,128	$21,828	$21,705	$21,308	$20,630	$51,316	$50,053	$40,066	$38,329	$31,717	$29,751		
Carbon	$4,582	$4,520	$4,495	$4,412	$4,272	$2,086	$1,964	$1,998	$1,901	$30,494	$31,330	1401.8%	$1.03
Title I	$4,582	$4,520	$4,495	$4,412	$4,272					$30,494	$31,330		
25% Payments						$2,086	$1,964	$1,998	$1,901				
Daggett	$74,971	$73,952	$73,536	$72,191	$69,894	$835,092	$796,205	$574,821	$458,211	$354,436	$246,598	–70.5%	$0.95
Title I	$74,971	$73,952	$73,536	$72,191	$69,894	$709,828	$676,774	$488,598	$389,480	$301,271	$209,608		
Title II						$66,807	$63,696	$45,986	$36,657	$28,355	$19,728		
Title III						$58,456	$55,734	$40,237	$32,075	$24,811	$17,262		
Davis	$20,747	$20,465	$20,350	$19,978	$19,342	$54,216	$50,472	$46,648	$42,088	$38,378	$35,683	–34.2%	$0.93
Title I	$20,747	$20,465	$20,350	$19,978	$19,342	$46,084	$42,901	$39,651	$35,775	$38,378	$35,683		
Title III						$8,132	$7,571	$6,997	$6,313				
Duchesne	$217,402	$214,448	$213,241	$209,343	$202,680	$1,016,899	$821,842	$633,381	$707,541	$613,696	$495,715	–51.3%	$0.69
Title I	$184,792	$182,281	$181,255	$177,941	$172,278	$864,364	$698,566	$538,374	$601,410	$521,641	$421,357		
Title II						$81,352	$123,276	$95,007	$56,603	$49,096	$39,657		
Title III	$32,610	$32,167	$31,986	$31,401	$30,402	$71,183			$49,528	$42,959	$34,700		
Emery	$32,203	$31,765	$31,587	$31,009	$30,022	$417,799	$452,176	$403,069	$326,648	$221,600	$334,122	–20.0%	$1.57
Title I	$32,203	$31,765	$31,587	$31,009	$30,022	$355,129	$384,350	$342,609	$277,651	$188,360	$284,004		
Title II						$41,780	$36,174	$40,307	$32,665	$17,728	$26,730		
Title III						$20,890	$31,652	$20,153	$16,332	$15,512	$23,389		
Garfield	$375,108	$370,010	$367,928	$361,202	$349,707	$2,130,775	$2,243,737	$1,751,269	$1,490,053	$1,637,566	$1,454,826	–31.7%	$1.39
Title I	$318,842	$314,509	$312,739	$307,022	$297,251	$1,811,158	$1,907,177	$1,488,579	$1,266,545	$1,391,931	$1,236,602		
Title II						$170,462	$179,499	$140,102	$119,204	$131,005	$116,386		
Title III	$56,266	$55,502	$55,189	$54,180	$52,456	$149,154	$157,062	$122,589	$104,304	$114,630	$101,838		
Grand	$8,655	$8,538	$8,490	$8,335	$8,069	$93,488	$101,545	$83,051	$70,088	$53,063	$46,405	–50.4%	$0.81
Title I	$8,655	$8,538	$8,490	$8,335	$8,069	$93,488	$101,545	$83,051	$70,088	$53,063	$46,405		

(continued)

Table 5.8 (cont'd.)
Secure Rural Schools Payments to Counties by the U.S. Forest Service, FY2003–FY2013
(Constant FY2013 Dollars)

County	FY2003	FY2004	FY2005	FY2006	FY2007	FY2008	FY2009	FY2010	FY2011	FY2012	FY2013*	Change Since '08	2013 SRS per acre
Iron	$29,088	$37,854	$22,254	$54,622	$46,675	$665,715	$682,693	$584,805	$497,461	$508,683	$466,191	–30.0%	$1.91
Title I						$565,858	$580,289	$497,085	$422,842	$432,380	$396,263		
Title II						$99,857	$102,404	$87,721	$74,619	$76,302	$69,929		
25% Payments	$29,088	$37,854	$22,254	$54,622	$46,675								
Juab	$38,185	$37,666	$37,454	$36,770	$35,600	$291,667	$290,728	$252,342	$223,035	$227,029	$213,121	–26.9%	$1.83
Title I	$38,185	$37,666	$37,454	$36,770	$35,600	$247,917	$247,118	$214,491	$189,580	$192,975	$181,153		
Title II						$5,833	$5,815	$7,570	$6,691	$6,811	$6,394		
Title III						$37,917	$37,795	$30,281	$26,764	$27,243	$25,575		
Kane	$44,677	$44,070	$43,822	$43,021	$41,652	$195,781	$176,586	$155,385	$124,321	$142,303	$125,622	–35.8%	$1.02
Title I	$44,677	$44,070	$43,822	$43,021	$41,652	$166,414	$150,098	$132,078	$105,673	$120,958	$106,778		
Title II						$29,367	$26,488	$23,308	$18,648	$21,346	$18,843		
Millard	$46,357	$43,585	$27,567	$39,941	$42,322	$630,802	$535,569	$463,797	$466,999	$392,280	$444,243	–29.6%	$1.21
Title I						$536,182	$455,234	$394,227	$396,949	$333,438	$377,606		
Title II						$50,464	$42,846	$37,104	$37,360	$31,382	$35,539		
Title III						$44,156	$37,490	$32,466	$32,690	$27,460	$31,097		
25% Payments	$46,357	$43,585	$27,567	$39,941	$42,322								
Morgan	$7,764	$7,659	$7,616	$7,477	$7,239	$24,896	$23,716	$20,240	$17,853	$15,602	$13,113	–47.3%	$0.91
Title I	$7,764	$7,659	$7,616	$7,477	$7,239	$24,896	$23,716	$20,240	$17,853	$15,602	$13,113		
Piute	$29,244	$27,617	$17,448	$25,539	$26,932	$430,096	$367,525	$399,667	$343,548	$352,106	$332,244	–22.8%	$1.68
Title I						$365,581	$312,396	$339,717	$292,015	$299,290	$282,408		
Title II						$34,408	$29,402	$31,973	$27,484	$28,169	$26,580		
Title III						$30,107	$25,727	$27,977	$24,048	$24,647	$23,257		
25% Payments	$29,244	$27,617	$17,448	$25,539	$26,932								
Rich	$26,984	$26,618	$26,468	$25,984	$25,157	$95,839	$95,499	$75,465	$63,085	$63,183	$54,731	–42.9%	$1.05
Title I	$26,984	$26,618	$26,468	$25,984	$25,157	$81,463	$81,174	$75,465	$63,085	$63,183	$54,731		
Title III						$14,376	$14,325						
Salt Lake	$52,696	$51,980	$51,687	$50,742	$49,127	$33,215	$32,863	$31,346	$30,201	$77,967	$74,649	124.7%	$0.76
Title I	$52,696	$51,980	$51,687	$50,742	$49,127					$77,967	$74,649		
25% Payments						$33,215	$32,863	$31,346	$30,201				
San Juan	$68,097	$67,172	$66,794	$65,573	$63,486	$1,942,658	$1,803,683	$1,566,205	$1,174,844	$987,260	$996,234	–48.7%	$2.21
Title I	$68,097	$67,172	$66,794	$65,573	$63,486	$1,651,259	$1,533,131	$1,331,274	$998,617	$839,171	$846,799		
Title II						$155,413	$144,295	$125,296	$93,988	$78,981	$79,699		
Title III						$135,986	$126,258	$109,634	$82,239	$69,108	$69,736		
Sanpete	$63,133	$62,275	$61,925	$60,793	$58,858	$1,332,901	$1,244,534	$1,070,605	$973,829	$892,871	$832,407	–37.5%	$2.12
Title I	$63,133	$62,275	$61,925	$60,793	$58,858	$1,132,966	$1,057,854	$910,015	$827,755	$758,940	$707,546		
Title II						$106,632	$99,563	$85,648	$77,906	$71,430	$66,593		
Title III						$93,303	$87,117	$74,942	$68,168	$62,501	$58,269		

(continued)

Table 5.8 (cont'd.)
Secure Rural Schools Payments to Counties by the U.S. Forest Service, FY2003–FY2013
(Constant FY2013 Dollars)

County	FY2003	FY2004	FY2005	FY2006	FY2007	FY2008	FY2009	FY2010	FY2011	FY2012	FY2013*	Change Since '08	2013 SRS per acre
Sevier	$106,052	$100,583	$64,186	$92,048	$97,188	$1,704,338	$1,643,511	$1,392,853	$1,119,974	$1,135,058	$1,080,575	–36.6%	$1.48
Title I						$1,448,687	$1,396,984	$1,183,925	$951,978	$964,799	$918,489		
Title II						$136,347	$131,481	$111,428	$89,598	$90,805	$86,446		
Title III						$119,304	$115,046	$97,500	$78,398	$79,454	$75,640		
25% Payments	$106,052	$100,583	$64,186	$92,048	$97,188								
Summit	$280,281	$276,472	$274,916	$269,891	$261,301	$175,122	$173,151	$165,210	$158,964	$147,248	$144,198	–17.7%	$0.27
Title I	$238,239	$235,001	$233,679	$229,407	$222,106								
Title III	$42,042	$41,471	$41,237	$40,484	$39,195								
25% Payments						$175,122	$173,151	$165,210	$158,964	$147,248	$144,198		
Tooele	$83,244	$82,113	$81,651	$80,158	$77,607	$369,395	$338,909	$322,957	$279,615	$249,145	$232,350	–37.1%	$1.46
Title I	$83,244	$82,113	$81,651	$80,158	$77,607	$295,516	$271,127	$258,365	$223,692	$199,316	$185,880		
Title II										$49,829	$46,470		
Title III						$73,879	$67,782	$64,591	$55,923				
Uintah	$77,389	$76,337	$75,908	$74,520	$72,149	$423,955	$377,764	$306,752	$359,566	$311,576	$292,334	–31.0%	$1.09
Title I	$77,389	$76,337	$75,908	$74,520	$72,149	$360,361	$321,100	$260,739	$305,631	$264,840	$248,484		
Title II						$33,916	$30,221	$24,540	$28,765	$24,926	$23,387		
Title III						$29,677	$26,443	$21,473	$25,170	$21,810	$20,463		
Utah	$152,869	$150,791	$149,943	$147,202	$142,517	$1,232,075	$1,287,641	$1,099,641	$1,013,192	$835,590	$768,901	–37.6%	$1.58
Title I	$129,939	$120,633	$119,954	$117,762	$114,014	$1,047,263	$1,094,495	$934,695	$861,213	$710,251	$653,566		
Title II						$98,566	$103,011	$87,971	$81,055	$66,847	$61,512		
Title III	$22,930	$30,158	$29,989	$29,440	$28,503	$86,245	$90,135	$76,975	$70,923	$58,491	$53,823		
Wasatch	$147,905	$145,895	$145,074	$142,422	$137,889	$820,052	$748,363	$657,819	$605,984	$662,074	$587,215	–28.4%	$1.35
Title I	$125,719	$124,010	$123,313	$121,059	$117,206	$697,044	$636,108	$559,146	$515,087	$562,763	$499,133		
Title II						$65,604	$59,869	$52,626	$48,479	$52,966	$46,977		
Title III	$22,186	$21,884	$21,761	$21,363	$20,683	$57,404	$52,385	$46,047	$42,419	$46,345	$41,105		
Washington	$141,668	$139,743	$138,956	$136,416	$132,075	$840,920	$854,854	$758,191	$663,304	$618,069	$588,768	–30.0%	$1.49
Title I	$113,334	$111,794	$111,165	$109,133	$105,660	$714,782	$726,626	$644,462	$563,808	$525,359	$500,453		
Title II						$67,274	$68,388	$60,655	$53,064	$49,446	$58,877		
Title III	$28,334	$27,949	$27,791	$27,283	$26,415	$58,864	$59,840	$53,073	$46,431	$43,265	$29,438		
Wayne	$43,913	$43,316	$43,073	$42,285	$40,940	$416,125	$351,193	$308,353	$263,422	$242,394	$241,104	–42.1%	$1.50
Title I	$43,913	$43,316	$43,073	$42,285	$40,940	$353,706	$298,514	$262,100	$223,909	$206,035	$204,938		
Title II						$33,290	$28,095	$24,668	$21,074	$19,392	$16,877		
Title III						$29,129	$24,584	$21,585	$18,440	$16,968	$19,288		
Weber	$37,167	$36,662	$36,456	$35,789	$34,650	$114,007	$106,345	$92,796	$82,879	$78,038	$72,712	–36.2%	$1.02
Title I	$37,167	$36,662	$36,456	$35,789	$34,650	$96,906	$90,394	$92,796	$82,879	$78,038	$72,712		
Title III						$17,101	$15,952						

(continued)

Table 5.8 (cont'd.)
Secure Rural Schools Payments to Counties by the U.S. Forest Service, FY2003–FY2013
(Constant FY2013 Dollars)

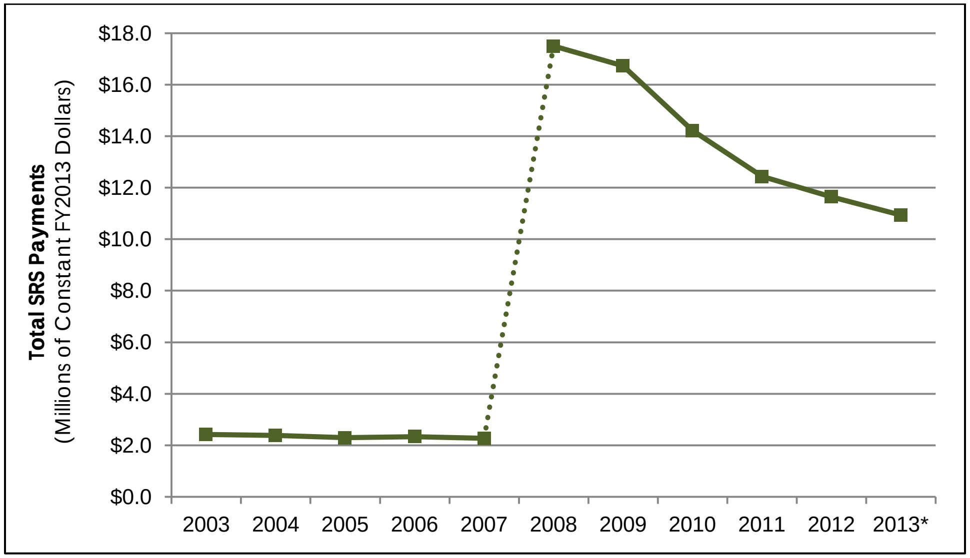
County	FY2003	FY2004	FY2005	FY2006	FY2007	FY2008	FY2009	FY2010	FY2011	FY2012	FY2013*	Change Since '08	2013 SRS per acre
State Total	$2,414,420	$2,383,368	$2,292,955	$2,334,137	$2,267,571	$17,497,670	$16,732,688	$14,219,925	$12,431,546	$11,641,919	$10,935,246	–37.5%	$1.34
Title I	$1,977,182	$1,942,772	$1,931,841	$1,896,527	$1,836,169	$14,693,448	$14,047,847	$11,942,750	$10,425,513	$9,811,522	$9,210,067		
Title II						$1,336,020	$1,365,449	$1,167,725	$974,368	$941,356	$891,406		
Title III	$226,497	$230,958	$229,659	$225,460	$218,285	$1,257,779	$1,111,413	$910,896	$840,599	$741,793	$689,576		
25% Payments	$210,741	$209,638	$131,455	$212,149	$213,117	$210,423	$207,978	$198,554	$191,066	$147,248	$144,198		

* Data for 2013 are draft amounts.

Note: A county must opt to receive *either* a share of the state's 25 percent rolling average payment *or* a share of the state payment. Title I payments are to be used for schools and roads, Title II are for special projects on national forests, and Title III county funds are to be used for Firewise Communities activities.

Source: U.S. Forest Service, http://www.fs.usda.gov/main/pts/securepayments/projectedpayments, accessed 4/11/14.

Figure 5.3
Total Secure Rural Schools Payments to Utah, FY2003–FY2013



* Data for 2013 are draft amounts. Note: Years are federal fiscal years. In 2008, SRS was reauthorized with full funding.

Source: U.S. Forest Service, payment reports ASR 10-3 and ASR 18-1.

If all of the land described in HB148 (*Utah Code Ann.* 63L-6-102) were transferred to state ownership, 90 percent of US Forest Service land in Utah would become state land (Table 5.9). Counties would see losses of national forest acres of at least 60 percent. In more than half of the counties all of the Forest Service land would become state land. The national forest land that remained would be designated wilderness, which does not permit timber harvesting, grazing, mining or other revenue-generating activities. Thus, all counties and school districts would likely see a drastic reduction in SRS payments under a complete realization of the land transfer called for in HB148. The estimated payments shown in Table 5.9 are based on 2013 payments per acre. Since SRS payments are partially based on national forest revenues, any actual payments would likely be less.

Table 5.9
Change in US Forest Service Acres by County per H.B. 148

County	USFS Acres Current	USFS Acres HB148	Change Acres	Change Percent	Estimated SRS Payment*
Beaver	138,967	0	–138,967	–100%	$0
Box Elder	103,938	11,876	–92,062	–89%	$14,352
Cache	285,921	54,950	–230,971	–81%	$81,619
Carbon	30,270	0	–30,270	–100%	$0
Daggett	257,323	0	–257,323	–100%	$0
Davis	38,951	0	–38,951	–100%	$0
Duchesne	722,748	290,646	–432,102	–60%	$199,444
Emery	211,965	0	–211,965	–100%	$0
Garfield	1,046,311	25,248	–1,021,063	–98%	$35,088
Grand	56,695	0	–56,695	–100%	$0
Iron	243,783	7,069	–236,714	–97%	$13,488
Juab	116,853	19,731	–97,122	–83%	$36,036
Kane	123,403	0	–123,403	–100%	$0
Millard	368,371	0	–368,371	–100%	$0
Morgan	16,534	0	–16,534	–100%	$0
Piute	196,543	0	–196,543	–100%	$0
Rich	52,219	0	–52,219	–100%	$0
Salt Lake	97,556	36,403	–61,153	–63%	$27,592
San Juan	449,924	46,166	–403,758	–90%	$102,184
Sanpete	391,422	0	–391,422	–100%	$0
Sevier	732,423	0	–732,423	–100%	$0
Summit	528,858	161,863	–366,995	–69%	$44,024
Tooele	160,819	25,156	–135,663	–84%	$36,782
Uintah	269,081	0	–269,081	–100%	$0
Utah	485,761	38,599	–447,162	–92%	$60,954
Wasatch	432,060	0	–432,060	–100%	$0
Washington	395,395	52,855	–342,539	–87%	$78,819
Wayne	160,140	0	–160,140	–100%	$0
Weber	60,993	0	–60,993	–100%	$0
State	8,175,226	770,563	–7,404,663	–91%	$1,029,220

* Based on 2013 SRS payment per acre.

Source: BEBR analysis of land ownership data from State of Utah, SGID and Utah Code Ann. *63L-6-102.*

Table 5.10 shows PILT and SRS payments versus county property tax revenues and as a share of total county revenues in 2012. Since the Forest Service retains Title II SRS funds, only Title I and Title III or 25 percent payments were included in the SRS amounts.

PILT payments averaged 5.6 percent of total county revenues in 2012. For individual counties, PILT ranged from less than 1 percent of total county revenues in Davis, Morgan, Salt Lake and Weber to more than 10 percent in Box Elder, Iron, Juab and Sevier. The ratio of PILT payment to property tax revenues varied from 0.01 or less in Davis, Morgan, Salt Lake and Weber counties to 0.70 or more in Tooele and Wayne.

SRS Title I and III or 25 percent payments averaged 2.5 percent of 2012 total county revenues. Individual county payments ranged from less than one-tenth of one percent of revenues in Carbon, Davis, Salt Lake and Weber counties to about 12.5 percent in Garfield and Piute. The ratio of SRS payment to property tax revenues varied from 0.01 or less in Box Elder, Carbon, Davis, Morgan, Salt Lake, Summit and Weber to 1.10 in Garfield, where SRS payments exceed what the county receives in property taxes.

In many rural counties PILT and SRS are not insignificant sources of revenue. In nine counties PILT and SRS payments combined accounted for more than 10 percent of total county revenues, more than 20 percent in Garfield and Piute. Replacing these revenues would require sizable new economic activity, higher local tax rates and/or state assistance.

Table 5.10
Payments of Federal Funds to Utah Counties, 2012

	County Revenues		PILT			SRS Title I & III and 25%			PILT + SRS	
County	Property Taxes	Total Revenues	Amount	vs. Prop Tax	Share of Total Revenues	Amount	vs. Prop Tax	Share of Total Revenues	vs. Prop Tax	Share of Total Revenues
Beaver	$2,058,943	$14,441,646	$1,024,900	0.50	7.1%	$147,150	0.07	1.0%	0.57	8.1%
Box Elder	$15,361,773	$29,190,946	$2,967,407	0.19	10.2%	$143,303	0.01	0.5%	0.20	10.7%
Cache	$13,062,508	$51,096,307	$625,053	0.05	1.2%	$489,862	0.04	1.0%	0.09	2.2%
Carbon	$6,766,295	$31,953,166	$1,075,469	0.16	3.4%	$1,849	0.00	0.0%	0.16	3.4%
Daggett	$1,117,242	$7,195,414	$122,626	0.11	1.7%	$409,935	0.37	5.7%	0.48	7.4%
Davis	$45,942,586	$105,883,669	$64,002	0.001	0.1%	$40,928	0.00	0.0%	0.00	0.1%
Duchesne	$8,104,507	$25,572,624	$1,778,530	0.22	7.0%	$632,996	0.08	2.5%	0.30	9.4%
Emery	$8,028,824	$23,011,651	$1,226,597	0.15	5.3%	$285,880	0.04	1.2%	0.19	6.6%
Garfield	$1,209,297	$10,494,887	$830,224	0.69	7.9%	$1,333,065	1.10	12.7%	1.79	20.6%
Grand	$4,287,311	$17,831,559	$1,141,234	0.27	6.4%	$68,156	0.02	0.4%	0.28	6.8%
Iron	$9,978,513	$28,351,220	$3,064,996	0.31	10.8%	$411,188	0.04	1.5%	0.35	12.3%
Juab	$2,398,745	$9,553,566	$1,133,474	0.47	11.9%	$210,381	0.09	2.2%	0.56	14.1%
Kane	$6,476,026	$15,973,740	$1,024,900	0.16	6.4%	$102,760	0.02	0.6%	0.17	7.1%
Millard	$8,001,976	$19,334,395	$1,373,773	0.17	7.1%	$417,797	0.05	2.2%	0.22	9.3%
Morgan	$2,880,668	$6,950,969	$29,534	0.01	0.4%	$17,361	0.01	0.2%	0.02	0.7%
Piute	$463,148	$2,452,923	$222,173	0.48	9.1%	$307,352	0.66	12.5%	1.14	21.6%
Rich	$1,173,793	$5,213,744	$382,402	0.33	7.3%	$61,346	0.05	1.2%	0.38	8.5%
Salt Lake	$246,213,533	$637,585,454	$231,449	0.001	0.0%	$29,368	0.00	0.0%	0.00	0.0%
San Juan	$4,086,620	$19,716,731	$1,390,876	0.34	7.1%	$1,051,066	0.26	5.3%	0.60	12.4%
Sanpete	$2,683,986	$12,637,148	$1,241,577	0.46	9.8%	$871,229	0.32	6.9%	0.79	16.7%
Sevier	$4,379,588	$16,218,200	$1,810,189	0.41	11.2%	$1,001,977	0.23	6.2%	0.64	17.3%
Summit	$21,672,410	$59,178,856	$1,308,378	0.06	2.2%	$154,583	0.01	0.3%	0.07	2.5%
Tooele	$4,580,816	$51,133,748	$3,260,255	0.71	6.4%	$271,908	0.06	0.5%	0.77	6.9%
Uintah	$16,226,718	$57,718,053	$2,640,013	0.16	4.6%	$321,683	0.02	0.6%	0.18	5.1%
Utah	$39,380,547	$151,715,431	$1,623,187	0.04	1.1%	$906,445	0.02	0.6%	0.06	1.7%
Wasatch	$11,515,726	$32,930,271	$1,089,499	0.09	3.3%	$542,140	0.05	1.6%	0.14	5.0%
Washington	$21,732,065	$56,574,162	$2,778,858	0.13	4.9%	$593,420	0.03	1.0%	0.16	6.0%
Wayne	$642,696	$4,674,480	$450,987	0.70	9.6%	$235,669	0.37	5.0%	1.07	14.7%
Weber	$42,498,320	$116,080,029	$126,064	0.003	0.1%	$80,595	0.00	0.1%	0.00	0.2%
Total	$552,925,180	$1,620,664,989	$36,038,626	0.07	6.5%	$11,141,393	0.02	2.0%	0.09	8.5%

Note: PILT payments are made in June of the federal fiscal year, which coincides with the counties' calendar year. SRS payments are from federal fiscal year 2011, which were paid in early 2012.

Source: Utah State Auditor, Survey of Local Government Finances and BEBR calculations on data from U.S. Department of the Interior and U.S. Forest Service.

5.4 OTHER BLM PAYMENTS TO UTAH

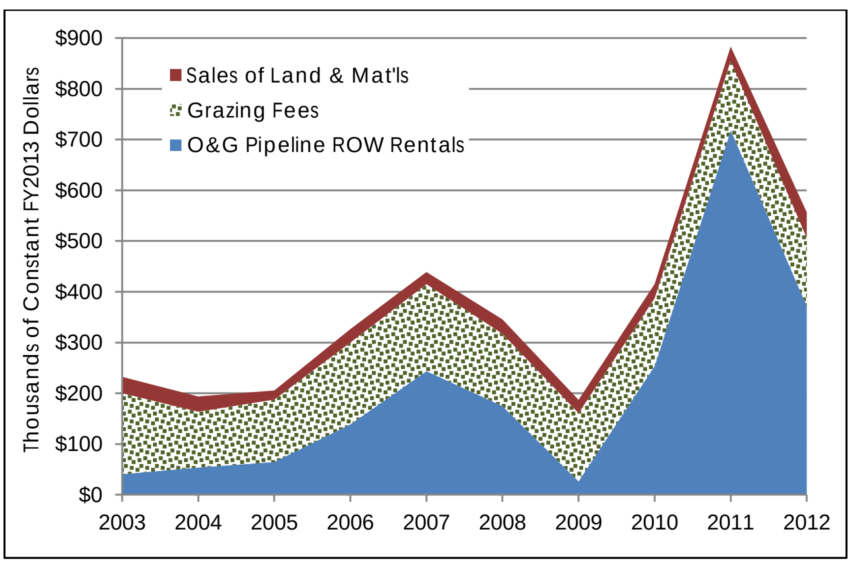
The BLM makes other payments to the states that are based on a share of the revenues generated on its lands in those states. In Utah these are composed of revenues from oil and gas pipeline rights-of-way rentals,[148] grazing district fees per the Taylor Grazing Act, and sales of public lands and materials (e.g., timber and other forest products). The state receives 50 percent of proceeds from oil and gas pipeline rights-of-way rentals, 12.5 percent from grazing, and 4 percent of proceeds from sales of land and materials. The funds from oil and gas pipeline rights-of-way rentals are processed by the Department of Workforce Services and distributed in the same manner as mineral lease royalties (see Table 5.3). Receipts from the Taylor Grazing Act go to the state Department of Agriculture and Food. DAF then pays $21,000 to the Utah Cattlemen's Association for the grazing regions' Public Lands Council dues, and distributes the remainder to the six regions to be used for range improvements.[149] Proceeds from land and material sales are deposited into the School Permanent Fund by SITLA.

Table 5.11
BLM Payments to Utah
(Constant FY2013 Dollars)

Fiscal Year	Oil & Gas Pipeline Rights-of-Way Rentals	Grazing District Fees	Sales of Public Lands & Materials	Total
2003	$40,749	$159,524	$32,221	$232,494
2004	$53,674	$110,018	$30,147	$193,838
2005	$64,802	$122,845	$17,966	$205,613
2006	$138,706	$161,264	$26,625	$326,595
2007	$243,799	$171,233	$23,953	$438,985
2008	$174,656	$142,672	$28,327	$345,655
2009	$26,498	$134,449	$26,143	$187,090
2010	$253,765	$133,234	$28,449	$415,448
2011	$718,274	$136,912	$28,120	$883,306
2012	$371,904	$134,136	$50,600	$556,640
2013	$417,684	$142,478	$28,125	$588,287

Source: BLM Public Land Statistics, Table 3-30; www.blm.gov/public_land_statistics/.

Figure 5.4
BLM Payments to Utah, FY2003–FY2012



Note: Years are federal fiscal years (October 1 through September 30).
Source: BLM Public Land Statistics, *Table 3-30.*

[148] All other mineral and oil and gas receipts are collected by the Office of Natural Resources Revenue. See BLM's *Public Land Statistics*, Tables 3-26 and 3-27.
[149] Sue Mounteer, Utah Department of Agriculture and Food, personal communication April 16, 2014.

These payments, particularly oil and gas pipeline rights-of-way rentals, have been fairly volatile and, relative to other federal land-based funding sources, rather small. Total payments ranged from about $200,000 (in constant FY2013 dollars[150]) in 2003–2005 to almost $440,000 in 2007, back to about $187,000 in 2009, up to $883,000 in 2011, and then about $557,000 in FY2012 (Table 5.11 and Figure 5.4).

Table 5.12 details the disbursement of BLM grazing fees to the grazing improvement regions (Figure 5.5) by UDAF. Disbursements to the regions[151] are based on where the fees were generated. The Central Region generally receives the largest disbursement because that's where the most grazing on BLM land is taking place. The Southwest Region usually receives the second largest payment and the Southeast Region the third. A thorough comparison is hindered by the fact that not all of the funds were disbursed in some years and/or funds from previous years were disbursed in other years.

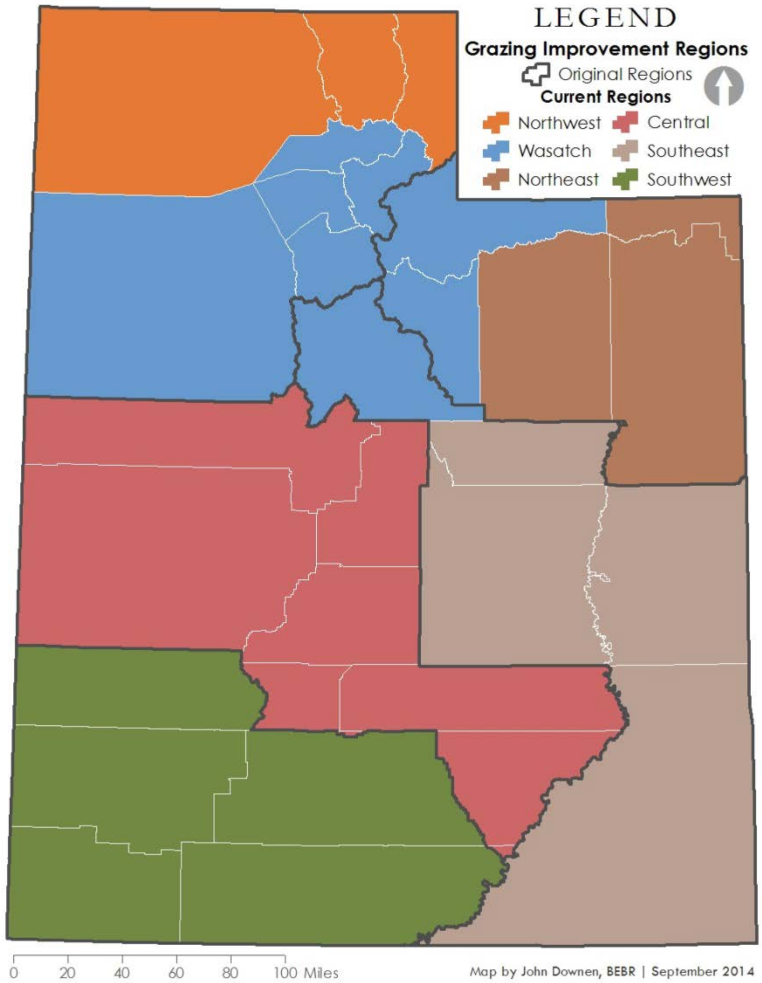
Table 5.12
Disbursement of BLM Grazing Fees by Utah Department of Agriculture and Food, FY2003–FY2013
(Constant 2013 Dollars)

Fiscal Year	Southeast Region/ Moab	Central Region/ Richfield	Southwest Region/ Cedar City	Northeast Region/ Vernal	Northwest Region/ Salt Lake	Wasatch Region	Other	Public Lands Council Dues	Total
2003	$32,702	$50,410	$33,979	$15,793	$26,640			$0	$159,524
2004	$15,623	$36,086	$17,163	$12,982	$28,165			$0	$110,018
2005	$22,849	$41,645	$20,392	$11,916	$26,043			$0	$122,846
2006	$30,317	$0	$31,769	$0	$0			$0	$62,086
2007[1]	$28,922	$47,409	$30,562	$12,076	$30,115		$8,162	$22,149	$179,395
2008[2]	$22,949	$54,589	$19,572	$0	$0			$21,248	$118,358
2009[3]	$24,193	$91,710	$0	$0	$0			$21,398	$137,301
2010[4]	$23,763	$70,496	$22,530	$42,270	$98,238			$21,146	$278,442
2011	$24,758	$30,570	$25,804	$11,275	$23,828			$20,676	$136,912
2012	$24,721	$31,832	$23,818	$10,724	$21,786			$21,256	$134,136
2013	$25,930	$32,985	$28,481	$11,366	$11,719	$10,997		$21,000	$142,478

Note: Years are federal fiscal years (October 1 through September 30).
1 UDAF received $41,111 from the Cedar City/Southwest Region and paid out $8,162 to BLM and other parties; $32,949 was paid to the Southwest Region for a previous year.
2 Not all of the funds were disbursed this year. They were being set up as grazing boards.
3 Funds were disbursed from other years and some were not disbursed.
4 Funds were disbursed from other years.
Source: Utah Department of Agriculture and Food, personal communication.

150 FY2013 dollars are used for comparability with the other data in this section.
151 The grazing improvement regions are composed of the following counties:
Southeast: Carbon, Emery, Grand and San Juan
Central: Juab, Millard, Piute, Sanpete, Sevier, Wayne and eastern Garfield
Southwest: Beaver, Iron, Kane, Washington and western Garfield
Northeast: Daggett, Duchesne and Uintah
Northwest: Box Elder, Cache and Rich
Wasatch: Davis, Morgan, Salt Lake, Summit, Tooele, Utah, Wasatch and Weber

Figure 5.5
Grazing Improvement Regions



Source: State of Utah, SGID.

5.5 FISH AND WILDLIFE SERVICE REFUGE REVENUE SHARING

The U.S. Fish and Wildlife Service has seven locations and almost 110,000 acres in Utah, including three national wildlife refuges and two national fisheries. Under the Refuge Revenue Sharing Act, FWS pays 0.75 percent of the market value of the property it owns to Utah counties. The amount is not a lot, between about $30,000 and $40,000 a year, but it did decline by almost 30 percent in real terms from federal fiscal year 2007 to FY2012 (the most recent year for which we received data). In FY2007 selected counties received $43,023 (in constant 2013 dollars); by FY2012 this had fallen to $30,578 (Table 5.13).

Table 5.13
US Fish and Wildlife Service Payments to Counties, FY2007–FY2012
(Constant 2013 Dollars)

	FY2007	FY2008	FY2009	FY2010	FY2011	FY2012
Refuge Revenue Sharing Act	$43,023	$43,081	$43,013	$32,450	$35,934	$30,578

Note: Years are federal fiscal years (October 1 through September 30).
Source: US Fish and Wildlife Service, July 18, 2014 FOIA request.

5.6 Coal Program

The Division of Oil, Gas and Mining receives federal funding based on the share of coal mining in the state that takes place on federal lands. This grant provides approximately 88 percent of the funding for DOGM's Coal Program, which inspects and permits coal mines in Utah. The remainder of funding comes from the state General Fund. Between fiscal years 2003 and 2013, the grant averaged $1.9 million annually (Table 5.14). With the transfer of federal lands to the state as called for in HB148, this funding would likely go away.

Table 5.14
Division of Oil, Gas & Mining Coal Program
(Constant FY2013 dollars)

	FY2003	FY2004	FY2005	FY2006	FY2007	FY2008	FY2009	FY2010	FY2011	FY2012	FY2013
Fed DNR DOGM Regulatory Grant	$2,180,662	$2,066,999	$2,036,497	$1,987,857	$1,885,325	$1,785,246	$1,896,837	$2,003,996	$1,905,405	$1,712,368	$1,940,872

Note: Years are state fiscal years (July 1 through June 30).
Source: Utah Department of Natural Resources, Division of Oil, Gas and Mining.

5.7 Federal Highway Funds

The Utah Department of Transportation (UDOT) constructs and maintains Utah's highways with emphasis on efficiency and safety. If the current state allocation scheme for federal transportation dollars persists, the transfer of federal lands to the state of Utah as proposed in Utah H.B. 148 from 2012 would reduce UDOT's federal funding and increase its state match requirements.

First, UDOT would lose a portion of its funding each year through the Federal Lands Access Program (FLAP), which amounted to $10.8 million in FY2013. Second, UDOT would be required to pay higher state match percentages for all projects that tap into federal funds from FLAP or the Federal-Aid Highway Program (FAHP). The latter provided $286.1 million for Utah in FY2013. The amount of FAHP funding Utah receives does not depend on federal land ownership. With planning adjustments, UDOT can be expected to continue to qualify for the full amount of FAHP funds it is offered, even with higher state match requirements.

Further research involving input from UDOT, the Federal Highway Administration (FHWA) and the Department of the Interior (DOI) would be necessary to estimate Utah's FLAP funding post-transfer or to consider how UDOT's accounting and operations would be affected by post-transfer increases in state match outlays for FAHP and FLAP funding to the state.

The Utah Transit Authority (UTA) operates an extensive public transportation system in the Wasatch Front region. UTA does not anticipate that a change in federal land ownership in Utah would have any impact on its substantial federal funding receipts (Meyer 2014).

5.7.1 Federal Funding for Road Projects in FY2013

About one-fifth of Utah Department of Transportation (UDOT) construction is funded by federal sources (Hull 2014). In FY2013, Utah was authorized to spend $296.8 million in federal funds for transportation routes in the state (Federal Highway Administration 2013a, Federal Highway Administration 2013c).[152] State matches were required for projects that received a portion of that funding (Hull 2014). Solely because a large percentage of Utah is federal land of various types, its state match requirement is lower than that of most other states.

Federal funds flow from the Federal Highway Administration (FHWA) to UDOT via two main programs: the Federal-Aid Highway Program (FAHP) and the Federal Lands Access Program (FLAP) (Hull 2014).[153] In FY2013 Utah was allocated $286.1 million under FAHP, plus $10.8 million through FLAP (Federal Highway Administration 2013c). These levels of funding are typical for Utah (Hull 2014).[154]

FLAP provides funding to states for improvements to "transportation facilities that provide access to, are adjacent to, or are located within federal lands" (Federal Highway Administration 2013b). A state match is required for FLAP-funded projects, generally ranging from 5 percent to 20 percent, depending on the share of federal lands in the state (Table 5.15). For example, Utah qualifies for a 6.8 percent match for most FLAP-funded projects, a match requirement estimated to rise to 18.8 percent post-transfer (Federal Highway Administration 1992).

FHWA distributed at least $34.8 billion to the states under FAHP in FY2013 (Federal Highway Administration 2013c). For FAHP allocations to the states, silos of money correspond to a variety of programs, such as the National Highway Performance Program and the Highway Safety Improvement Program. Having either the third- or fourth-highest share of federal land under the three definitions of federal lands used by FHWA, Utah currently enjoys lower state match requirements and higher federal match percentages compared with other states.

As shown in Table 15, Utah's FAHP match requirements range from 5.8 percent to 13.1 percent, while other states pay 5 percent to 25 percent to access federal FAHP funds (Federal Highway Administration 1992).[155] The most common match requirements for Utah are 5.8 percent for interstate projects and 6.8 percent for non-interstate projects, while for other states matches reach as high as 10 percent and 20 percent, respectively, for such projects (Lawrence 2014). Additional research involving UDOT would be required to determine the proportions of Utah FAHP dollars corresponding to the various state match rates in recent years.

152 Utah's "obligation limitation" under FAHP was $296.8 million in FY2013. Federal outlays to Utah that year were $286.1 million because cash flows associated with federal reimbursements happen after the completion of projects authorized in FY2013. Similarly, reimbursements from projects authorized in previous years arrived in FY2013, accounting for some of the $286.1 million.

153 An outstanding question is whether federal funding for public transit and other non-road transportation projects in Utah would be affected by a change in federal land ownership in the state. It appears that the FAHP and FLAP amounts discussed in this document are for uses like road construction, resurfacing, signs and lighting. Federal funding to the Utah Transit Authority (UTA) or state agencies for buses, light rail and commuter trains may come through other channels, sources that may or may not be affected by federal land ownership in the state. Further inquiry is needed to construct a more complete picture of Utah transportation funding under H.B. 148 implementation.

154 Utah's apportionment each year by formula for FAHP projects on federal-aid roads is about $307 million, of which UDOT passes on approximately $61 million to local Metropolitan Planning Organizations. The obligation limitation amount that can actually be spent in Utah is 7 percent less than $307 million, which is $285.5 million.

155 The 1992 FHWA tables for sliding scale rates that determine state match percentages for federally funded projects are the rates that have applied to Utah from their release through June 2014 (Lawrence 2014). Presumably FHWA rates would be updated if there were a major change in land ownership in Utah.

5.7.2 Effects of Land Transfer on Federal Road Funding

Land transfer can be expected to reduce federal funding Utah receives via FLAP. Land transfer would also result in higher state match requirements both for the reduced level of FLAP funding and for what is expected to be a steady level of federal funding from the FAHP. UDOT expects to be able to qualify for all FAHP funds offered, even at higher state match rates.

Table 5.15
Federal Land Share and State Matching Rates for Federal Highway Funds

	State Match Requirement			Federal Land Share		
Type of Federal-Aid Project	**Other states currently**	**Utah currently**	**Utah estimate post-transfer[1]**	**Other states currently**	**Utah currently**	**Utah estimate post-transfer[2]**
Interstate 90/10 23 U.S.C. 120(a)	5% to 10%[3]	5.82%	10.00%	0% to 69.23%[4]	41.83%	4.50%
Non-Interstate 80/20 23 U.S.C. 120(b)(2)	5% to 20%[5]	6.77%	18.75%	0% to 83.66%[6]	66.13%	6.11%
Non-Interstate 75/25 23 U.S.C. 120(b)(2)	5% to 25%[5]	8.47%	23.44%	0% to 83.66%[6]	66.13%	6.11%
Non-interstate 85/15 23 U.S.C. 120(b)(1)	5% to 15%[7]	7.86%	13.19%	0% to 74.44%[8]	47.61%	11.40%
Non-interstate 80/20 23 U.S.C. 120(b)(1)	5% to 20%[7]	10.48%	17.58%	0% to 74.44%[8]	47.61%	11.40%
Non-interstate 75/25 23 U.S.C. 120(b)(1)	5% to 25%[7]	13.10%	21.97%	0% to 74.44%[8]	47.61%	11.40%

Note: The two shaded rows represent the most common state match requirements for Utah road projects with federal funding: interstate 90/10 with Utah currently matching 5.82 percent and the first non-interstate 80/20 with Utah currently at 6.77 percent. While any of the project types in this table may apply to FAHP funding, only the first non-interstate 80/20 rates apply to FLAP-funded projects.

1. Utah's state match requirements given H.B. 148 (2012) land transfer correspond to estimates of Utah's post-transfer federal land shares found in the right-most column of this table. We assume the FHWA sliding scale method in force since 1992 will not change, and that the new amount of federal land in Utah can be computed from that scale.
2. Estimates of Utah's federal land share given land transfer under H.B. 148 are based on GIS analysis of data from the Utah State Geographic Information Database following federal lands definitions in notes 4, 6 and 8 here. Results for status quo federal land shares are within 3 percent of the unexplained and perhaps dated shares given by the Department of the Interior (DOI). Estimates of post-transfer federal land shares are likewise expected to be close to the DOI values FHWA would use for its decisions.
3. The 37 states with 5 percent or less in certain federal lands (see note 4) must provide a 10 percent state match for interstate projects receiving FAHP funds. The state match requirement is determined on a sliding scale from 5 percent to 10 percent for the remaining states with more than 5 percent in these federal lands.
4. A fairly narrow definition of the federal government's share of a state's total area applies to projects of this type: "unappropriated and unreserved public lands and non-taxable Indian Lands" per Department of the Interior (DOI) data.
5. The state match requirement is determined on a sliding scale from 5 percent to 20 or 25 percent for non-interstate projects governed by 23 U.S.C. 120(b)(2), based on the federal land share (see note 6).
6. The following definition of the federal government's share of a state's land applies to projects of this type: "non-taxable Indian lands and reserved and unreserved public domain lands exclusive of national forests and national parks and monuments" per DOI data.
7. The 36 states with 5 percent or less in certain federal lands (see note 8) must provide the full 15, 20 or 25 percent state match for non-interstate projects governed by 23 U.S.C. 120(b)(1). The state match requirement is determined on a sliding scale from 5 percent to 15, 20 or 25 percent for states with more than 5 percent federal lands. The only criteria for the sliding scale is federal land share as defined in note 8.
8. A fairly broad definition of the federal government's share of a state's land applies to projects of this type: "non-taxable Indian Lands and reserved and unreserved public domain lands inclusive of national forests and national parks and monuments" per DOI data.

Source: Federal Highway Administration, Notice and Tables 1-3, www.fhwa.dot.gov/legsregs/directives/notices/n4540-12.htm

The H.B. 148 land transfer would substantially reduce Utah's $10.8 million in funding from FLAP (Hull 2014). Twelve states with high federal acreage received 80 percent of FLAP funding in FY2013 (Federal Highway Administration 2013a). Post-transfer, Utah would still have five national parks and other federal lands, such as national monuments and designated wilderness areas, all of which would attract FLAP funding for roads within and near them. However, some national forest, national monument, BLM and other lands would become Utah public lands. The loss in federal funds for Utah road projects caused by the H.B. 148 land transfer would likely be less than $10.8 million, all from reduced FLAP funding.[156]

A federal-to-state land transfer is not likely to affect the amount of federal FAHP funding Utah receives (Hull 2014). FAHP is set to expire September 30, 2014.[157] If Congress renews it with the same formula for apportionment to the states, Utah could expect to continue to receive around $286.1 million each year from FAHP, regardless of the percentage of federal lands in the state (Hull 2014). However, state match requirements to access federal funding from both FAHP and FLAP would increase significantly given land transfer (Hull 2014). Again, UDOT could still spend all funds it is offered via FAHP at the existing level of funding and from FLAP at the reduced level of funding, even with higher match requirements.

The state match requirements that applied to Utah's $296.8 million in FY2013 federal FAHP and FLAP funding were 5.8 percent for interstate projects and from 6.8 percent to 13.1 percent for non-interstate projects (Federal Highway Administration 1992). States with low shares of federal lands paid up to 10 percent matches for interstate projects and up to 25 percent for non-interstate projects (see Table 5.15). Utah's favorable state match rates are attributable to its high share of federal lands.

FHWA uses three definitions of federal land shares to allocate FAHP money on a sliding scale. H.B. 148 identifies 31.3 million federal acres for transfer to Utah. Federal land share estimates given in Table 5.15 are the key inputs to determine what Utah's new state match requirements may become after H.B. 148 land transfer. Under the narrowest of FHWA's definitions, used for interstate funding, Utah's federal land share is 41.8 percent. Post-transfer, it would be an estimated 4.5 percent. For many non-interstate projects, FHWA's broadest definition of federal lands applies. Utah's federal land share by this standard is currently 66.1 percent, likely to fall to 6.1 percent under a land transfer. Finally, for certain non-interstate projects, the relevant federal land share is 47.6 percent for Utah, expected to become about 11.4 percent post-transfer.

With the scope of land transfer envisioned in H.B. 148, Utah's percentage match for transportation projects with federal funding would rise by an estimated 4.2 percentage points for FAHP interstate projects (from 5.8 percent to 10 percent). For FAHP non-interstate and any FLAP projects, Utah' match requirement would rise from a range of 6.8 to 13.1 percent to an estimated range of 13.2 to 23.4 percent, an increase for any given non-interstate project component of 5.3 to 15.0 percentage points. The most common match requirement for federal funding on non-interstate projects is estimated to rise from 6.8 percent to 18.8 percent post-transfer.

A precise estimate of additional Utah spending needed to match federal transportation dollars it receives post-transfer is not possible given available information. An outcome between $12.5 million and $71.5 million can be expected, assuming current levels of FAHP and FLAP funding continue and that UDOT's outlays to meet federal match requirements increase from their current levels to the higher amounts paid by other states under the six match arrangements identified in Table 5.15. A more accurate change estimate would be possible if the share of UDOT's federal funding received under each state match requirement were known.

156 Further research is needed to determine how much a decrease in federal land area in Utah would affect the allocation of FLAP funds among states. Allocation is not based simply on the percentage of federal lands. Allocation may not be formulaic.

157 In particular, the existing FAHP funding scheme defined by the 2012 law, Moving Ahead for Progress in the 21st Century (MAP-21), expires at the end of FY2014 (see www.fhwa.dot.gov/map21/).

The least disruptive outcome would occur for interstate project funding, which requires the lowest state match. If all $286.1 million in FAHP funds were accepted by Utah under the interstate 90/10 arrangement, and if Utah were required to produce a full 10 percent match post-transfer, the state outlay would be $31.8 million, rather than the $17.7 million that would be expected under the more favorable 5.8 percent match requirement that now applies. The increase would be $14.1 million. Additional conservative assumptions would adjust this estimate to as low as $12.5 million.[158] This lower-bound scenario represents the smallest foreseeable change in the state match requirement. Realistically, this estimate is too low due to the presence of non-interstate road projects with higher estimated increases in their state match requirements. A similar approach with different assumptions resulted in an upper bound estimate of $71.5 million.[159]

A more moderate and likely outcome can be illustrated by running the numbers for the common 80/20 federal/state funding arrangement that applies to non-interstate projects under 23 U.S.C. 120(b)(2). Full realization of H.B. 148 would raise Utah's state match requirement for that category from 6.8 percent to an estimated 18.7 percent. The increase, applied to the same FY2013 $296.8 million in FAHP and FLAP funding, would mean Utah's portion would rise from $21.6 million to $68.5 million. UDOT would need to apply $46.9 million more than it currently does to road projects receiving federal funding.

A change in Utah's state match requirements may be fairly inconsequential in its economic impact, although it would precipitate budgetary and planning adjustments. As long as the same, limited amount of total federal funding can be fully utilized for road improvements in the state, it may simply be a matter of spreading the federal amount among a greater number of projects, shifting funds without committing more state dollars to road projects.

Unfortunately, a precise estimate for additional state outlays to meet federal match requirements for road projects post-transfer cannot be produced without further research to determine three pieces of information. First, the exact federal land shares for Utah post-transfer under the three

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158 To make this a true lower-bound scenario, we will also assume that all FLAP funding goes away with land transfer, reducing state match expenditures by up to $1.6 million, assuming the highest rate possible, 13.10 percent, for the 75/25 federal/state non-interstate arrangement under 23 U.S.C. 120(b)(1). The bottom line is a net increase of $12.5 million in state match spending to access Utah's FAHP and FLAP allocations. The $12.5 million estimate equals $14.1 million in additional state dollars to match FAHP funding *minus* $1.6 million in state match requirement savings from lost FLAP funding. This $1.6 million adjustment requires a departure from a pure interstate 90/10 funding scenario for FLAP funding. Also, all FLAP funding is not likely to be lost because of H.B. 148 transfers. For these reasons the reduction in state match spending by UDOT related to FLAP is likely to be less than $1.6 million, and the net increase in UDOT's state match spending related to FAHP and FLAP together is likely to be higher than $12.5 million, as expected of a lower-bound estimate.

159 An outcome as high as the upper bound of $71.5 million is not likely. However, if all FAHP and FLAP funding were under the 75/25 non-interstate 23 U.S.C. 120(b)(2) federal/state match, and if Utah's share increased from the current 8.47 percent all the way to 25 percent, a difference of 16.53 percent, UDOT would experience the greatest foreseeable increase in state match costs associated with H.B. 148 land transfer. To access $296.8 million in federal funds, Utah's FY2013 amount, UDOT would need to provide $98.9 million, rather than the $27.5 million UDOT would pay under the status quo 8.47 percent, a $71.5 million increase. Given land transfer, it is anticipated that the new state match requirement would fall short of the maximum: 23.44 percent rather than the full 25 percent. Also, most FAHP and FLAP funding would likely be granted with match parameters more favorable than the 75/25 parameters evaluated above, for example under the more common 90/10 and 80/20 arrangements. Finally, an expected decrease in federal FLAP funding from $10.8 million would reduce total federal funds for which Utah would need to supply a state match. For these three reasons, the increase in Utah's match requirement should be considerably less than 16.53 percent, and UDOT spending to receive its full federal allotment of $296.8 million should be correspondingly lower than $71.5 million.

definitions would be needed with input from the Department of the Interior (DOI). Second, we would need from FHWA or DOI a sense of whether or how the existing sliding scale would change in order to be sure of our estimates of new state match requirements associated with new federal land shares. Finally, the amount of federal dollars UDOT receives subject to each of the three match percentage requirements would be needed.

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6 Mining-Related Tax Revenues

In addition to mineral lease royalties, rents and bonus payments, there are several other sources of state and county revenue from oil and gas and mineral production. The state assesses severance taxes on metalliferous minerals and on oil and gas production. There is also an oil and gas conservation fee and mineral production tax withholding. The state also collects sales tax on transactions in the mining sector. In addition, counties assess property taxes on "natural resources" infrastructure as well as sales taxes on the mining sector.

6.1 State Excise Taxes

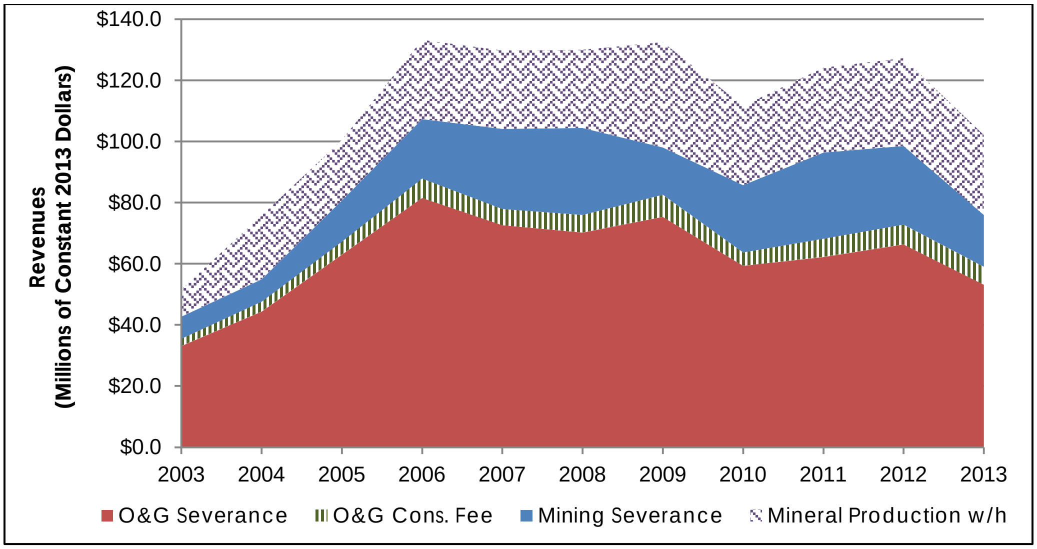
An oil and gas severance tax is paid by private owners of "an interest in oil or gas produced from a well in the state, including a working interest, royalty interest, payment out of production, or any other interest, or in the proceeds of the production of oil or gas." Federal, Indian, state and state political subdivisions are not taxed on their interests or proceeds. So, for example, for production from a federal lease with a 12.5 percent royalty, only 87.5 percent of the value is taxed. The severance tax is based on the value at the well of oil and gas produced and saved, sold or transported from the field where it is produced. Oil is assessed at 3 percent of the value of the oil up to and including the first $13 per barrel and 5 percent of the value above that. Natural gas is assessed at 3 percent of the value of the gas up to and including the first $1.50 per thousand cubic feet and 5 percent of the value above that. In addition, the severance tax rate for natural gas liquids is 4 percent of the value.[160]

The oil and gas severance tax is the largest source of mining excise tax revenue for the state (Figure 6.1 and Table 6.1). Payments grew from $33.1 million in state fiscal year 2003 (in constant 2013 dollars) to a high of $81.5 million in 2006. They have since declined to less than $53.2 million in 2013.

An oil and gas conservation fee of 0.2 percent is assessed on the value of production and the proceeds are deposited in the Oil and Gas Conservation Account. Like the severance tax, it does not apply to federal interests, Indian or tribal interests, state and state political subdivisions interests, and oil or gas used in producing or drilling operations or for repressuring or recycling purposes. The proceeds help fund the Division of Oil, Gas and Mining. Revenues were $2.4 million in fiscal year 2003 (in constant 2013 dollars), reached a high of almost $7.3 million in 2009, and were $5.9 million in 2013.

[160] Utah Code Ann. 59-5-102.

Figure 6.1
Mining-Related State Tax Revenues, 2003–2013



Source: Utah State Tax Commission annual reports.

Table 6.1
Mining-Related State Tax Revenues, FY2003–FY2013
(Constant 2013 Dollars)

Fiscal Year	Oil & Gas Severance Tax	Oil & Gas Conservation Fee	Metalliferous Ores Severance Tax	Mineral Production Tax Withholding	Total
2003	$33,075,380	$2,403,805	$7,214,718	$8,885,207	$51,579,111
2004	$44,336,659	$3,260,866	$7,288,477	$20,882,131	$75,768,133
2005	$62,944,657	$4,274,387	$13,472,257	$19,697,169	$100,388,470
2006	$81,527,500	$6,339,043	$19,429,192	$25,918,084	$133,213,819
2007	$72,638,796	$5,270,995	$26,205,192	$25,596,428	$129,711,411
2008	$70,176,254	$5,794,166	$28,438,003	$25,528,908	$129,937,331
2009	$75,325,635	$7,252,051	$15,462,508	$34,460,824	$132,501,019
2010	$59,286,905	$4,421,164	$22,011,080	$25,904,812	$111,623,962
2011	$62,179,633	$6,009,175	$28,171,375	$27,728,031	$124,088,215
2012	$66,308,341	$6,508,271	$25,698,614	$28,673,961	$127,189,186
2013	$53,164,253	$5,870,532	$16,940,927	$26,075,556	$102,051,268

Note: Years are state fiscal years (July 1 through June 30).
Source: Utah State Tax Commission annual reports.

Based on the federal share of oil and gas production in state fiscal years 2003 through 2013, we calculated the amounts of the oil and gas severance tax and conservation fee that are attributable to production on federal lands (Table 6.2). This assumes a nontaxable 12.5 percent federal royalty on oil and gas production, so that only 87.5 percent of the production value from federal lands is taxable. In 2003, 31.5 percent of the value of oil and gas produced in Utah came from federal lands, thus $10.3 million of severance taxes and about $750,000 of conservation fees were due to oil and gas produced on federal lands. The federal share climbed to 48.3 percent in 2009, yielding almost $36.0 million in severance taxes and $3.5 million in conservation fees. By 2013 the federal share of oil and gas production had shrunk to 34.8 percent, yielding $18.3 million in severance taxes and $2.0 million in conservation fees.

Under a transfer of federal lands to the state of Utah, the full value of production on what had previously been federal lands would be subject to the severance tax and the conservation fee.

A mining severance tax is imposed on the products of metalliferous mines and metalliferous claims, including gold, silver, copper, lead, iron, zinc, tungsten, uranium, vanadium and other metalliferous minerals.[161] The rate is 2.6 percent of the taxable value, which differs according to how the mineral was disposed of (i.e., sold, shipped out of state, "sold" between affiliated companies, or otherwise disposed of) and the type of mineral (yellowcake uranium, beryllium or all other metalliferous minerals).[162] Revenues from this tax grew from $7.2 million in FY2003 (in constant 2013 dollars) to $28.4 million in 2008, dipped to $15.5 million in 2009 but rose again to almost $28.2 million in 2011, then declined to $16.9 million in 2013.

Table 6.2
Oil and Gas State Tax Revenues Attributable to Production on Federal Land, 2003–2013
(Constant FY2013 Dollars)

Fiscal Year	Federal O&G Production Taxable Share	Oil & Gas Severance Tax	Oil & Gas Conservation Fee
2003	27.6%	$9,123,492	$663,064
2004	30.6%	$13,564,652	$997,651
2005	33.1%	$20,843,496	$1,415,421
2006	35.6%	$29,053,221	$2,258,988
2007	37.4%	$27,190,217	$1,973,043
2008	40.6%	$28,476,506	$2,351,188
2009	42.3%	$31,857,004	$3,067,065
2010	39.4%	$23,365,545	$1,742,424
2011	33.6%	$20,914,572	$2,021,230
2012	31.1%	$20,651,886	$2,027,016
2013	30.5%	$16,210,641	$1,790,020

Note: Years are state fiscal years (July 1 through June 30). Federal taxable share excludes 12.5 percent federal royalty on value of production.
Source: BEBR analysis of Utah State Tax Commission annual reports and Division of Oil, Gas and Mining production data.

Revenues from both the oil and gas severance tax and the mining severance tax are deposited into the General Fund, with some exceptions. Beginning in fiscal year 2009, oil and gas severance taxes in excess of $71,000,000 ($77,000,000 as of fiscal year 2012) and mining severance taxes in excess of $27,600,000 in any given fiscal year are credited to the permanent state trust fund, if authorized by law. Annual interest and dividends from these funds are deposited in the General Fund and credited to the Infrastructure and Economic Diversification Investment Account. As of fiscal year 2013, severance tax collections have not exceeded these thresholds. Severance taxes collected from production on Indian tribal lands are disposed of differently depending on whether they were from Ute or Navajo land.[163]

Similar to payroll withholding, a 5 percent mineral production tax is withheld from mineral royalty payments (including those from metalliferous and nonmetalliferous minerals, and oil and gas) by producers and paid to the State Tax Commission. This excludes payments to the federal government, the state government or any political subdivision of it, tax-exempt organizations, Indian tribes or exempt businesses, as well as payments to which the producer is entitled. Royalty recipients may claim a refundable tax credit on their tax return for the amount withheld.[164] Receipts from mineral production tax withholding are deposited into the Education Fund.

[161] See Utah Code Ann. 59-5-201 for complete list.
[162] See Utah Code Ann. 59-5-203.
[163] Utah Code Ann. 51-9-305.
[164] Utah Code Ann. 59-6-102.

6.2 STATE TAXABLE MINING SALES

The state sales and use tax rate is currently 4.7 percent of the value of taxable sales. These taxable sales are not confined to those at retail establishments, but include sales in the mining sector, among others. Mining sector sales are generally purchases and leases of machinery, equipment and parts.[165] In 2003 there were almost $174.0 million (in constant 2013 dollars) of total taxable mining sales in the state. These reached an unusual peak of $916.6 million in 2008,[166] then fell to $579.0 million in 2009 with the onset of the recession. Mining sales then grew steadily to more than $972.5 million in 2012 but declined in 2013 to $850.3 million (Table 6.3 and Figure 6.2).

Table 6.3
Statewide Taxable Mining Sales, 2003–2013
(Constant 2013 Dollars)

SIC Sector	2003	2004	2005	2006	2007
Metal Mining (1011–1099)	$40,469,654	$49,931,421	$94,624,247	$105,645,633	$150,330,079
Coal Mining (1221–1241)	$30,091,382	$33,045,151	$33,198,762	$32,402,044	$23,162,153
Oil & Gas Extraction (1311–1389)	$74,823,095	$122,434,382	$173,399,779	$287,008,600	$303,647,832
Nonmetallic Minerals (Except Fuels) (1411–1499)	$28,597,012	$29,013,268	$30,619,951	$36,492,532	$47,651,763
Nondisclosable or SIC not coded	$0	$1,616	$1,839	$2,481	$2,661
Total	$173,981,143	$234,425,838	$331,844,578	$461,551,290	$524,794,487

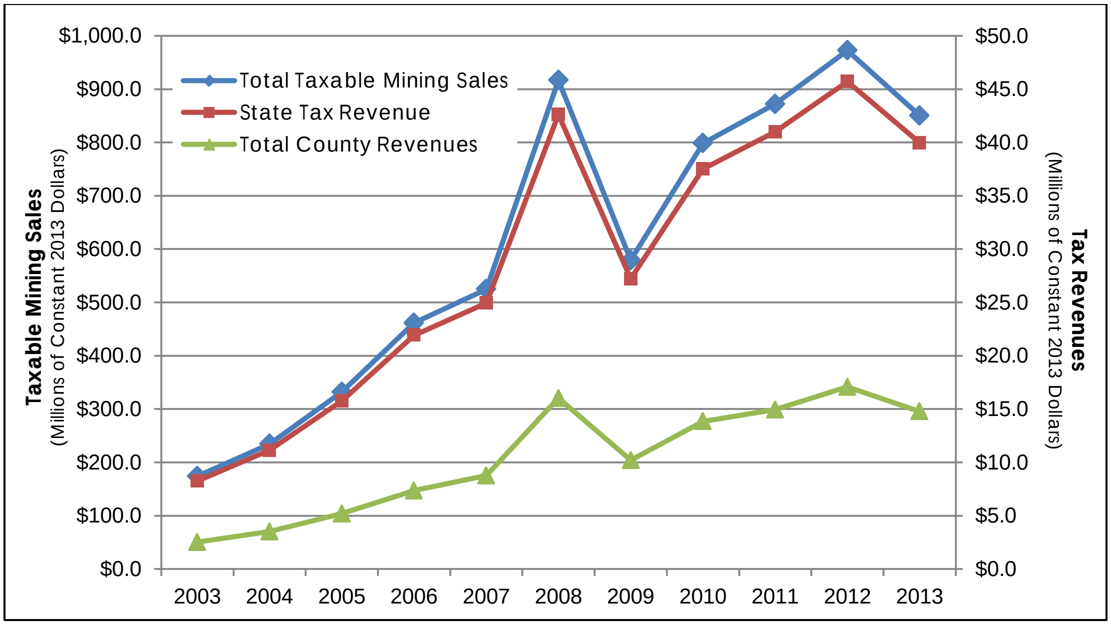
NAICS Sector	2008	2009	2010	2011	2012	2013
Oil & Gas Extraction (211000–211999)	$205,874,235	$129,156,173	$159,841,268	$180,042,957	$162,000,342	$151,851,701
Mining (Except Oil & Gas) (212000–212999)	$358,243,085	$285,362,609	$426,792,191	$467,887,415	$539,196,253	$451,176,103
Support Activities for Mining (213000–213999)	$352,530,728	$164,476,205	$211,826,425	$224,160,757	$271,346,411	$247,247,593
Total	$916,648,047	$578,994,987	$798,459,884	$872,091,130	$972,543,006	$850,275,397

Note: Years are calendar years.
Source: Utah State Tax Commission, Economic & Statistical Unit, tax.utah.gov/econstats/sales/; adjusted using the CPI West for city size Class B/C.

Of the detailed mining subsectors by which the State Tax Commission reports taxable sales for the state, the highest sales have been in mining (except oil and gas). In 2013, more than half of the taxable mining sales were in this subsector, with $451.2 million of $850.3 million total. Support activities for mining has been the second-largest category, and oil and gas extraction the smallest. Interestingly, prior to 2008, when the Tax Commission was classifying sales according to the SIC system, the most sales were in the oil and gas extraction subsector, followed by metal mining, nonmetallic minerals (except fuels), and coal mining. However, the NAICS mining (except oil and gas) sector includes metal mining, coal mining and nonmetallic mineral mining.

165 Certain purchases and leases made after January 1, 2008 are exempt from sales tax. This includes machinery and equipment used in the production process or in research and development, which have an economic life of three or more years. This applies only to the non–oil-and-gas-related mining sectors. See Utah Code Ann. 59-12-104 (14)(c).
166 Note that some of the change from 2007 to 2008 is due to the switch from SIC industry classifications to NAICS classifications. The SIC mining sectors included some industries that became part of the construction or professional, scientific and technical services sectors under the NAICS classification system. Similarly, the NAICS mining sectors added some industries that had previously been classified as manufacturing under the SIC system.

Figure 6.2
Total Taxable Mining Sales and Estimated Tax Revenues, 2003–2013



Note: In 2008, industry classification changed from the SIC system to the NAICS system, which may account for some of the unusual increase.
Source: BEBR analysis of data from the Utah State Tax Commission, Economic & Statistical Unit.

Over the study period, the state sales tax rate varied from 4.75 percent between 2003 and 2007, to 4.65 percent in 2008, to 4.70 percent in 2009, where it has remained since. Applying the prevailing tax rate to the value of taxable sales provides an estimate of state revenues from taxable sales in the mining sector. Estimated state sales tax revenues from mining sales rose from almost $8.3 million in 2003 (in constant 2013 dollars) to a peak of $42.6 million in 2008.[167] Revenues fell to $27.2 million in 2009, then climbed to $45.7 million by 2012. In 2013, estimated state revenues from taxable mining sales were almost $40.0 million (Table 6.4 and Figure 6.2).

Table 6.4
Estimated State Revenue from Taxable Mining Sales, 2003–2013
(Constant 2013 Dollars)

SIC Sector	2003	2004	2005	2006	2007
Metal Mining (1011–1099)	$1,922,309	$2,371,743	$4,494,652	$5,018,168	$7,140,679
Coal Mining (1221–1241)	$1,429,341	$1,569,645	$1,576,941	$1,539,097	$1,100,202
Oil & Gas Extraction (1311–1389)	$3,554,097	$5,815,633	$8,236,490	$13,632,908	$14,423,272
Nonmetallic Minerals (Except Fuels) (1411–1499)	$1,358,358	$1,378,130	$1,454,448	$1,733,395	$2,263,459
Nondisclosable or SIC not coded	$0	$77	$87	$118	$126
Total	$8,264,104	$11,135,227	$15,762,617	$21,923,686	$24,927,738

NAICS Sector	2008	2009	2010	2011	2012	2013
Oil & Gas Extraction (211000–211999)	$9,573,152	$6,070,340	$7,512,540	$8,462,019	$7,614,016	$7,137,030
Mining (Except Oil & Gas) (212000–212999)	$16,658,303	$13,412,043	$20,059,233	$21,990,709	$25,342,224	$21,205,277
Support Activities for Mining (213000–213999)	$16,392,679	$7,730,382	$9,955,842	$10,535,556	$12,753,281	$11,620,637
Total	$42,624,134	$27,212,764	$37,527,615	$40,988,283	$45,709,521	$39,962,944

Note: Years are calendar years. Revenues include Tax Commission's administrative fee.
Source: BEBR analysis of data from Utah State Tax Commission, Economic & Statistical Unit. Calculated by multiplying taxable sales by the state sales tax rate each year and subtracting the Tax Commission's fee.

167 See previous note.

Using data on the value of production in the various mining sectors, and the share of production on federal land,[168] we estimated the amount of taxable mining sales in 2012 attributable to activity on federal land. Oil and gas production on federal land accounted for 43.8 percent of the total value of oil and gas production in 2012. This gives an estimated $3.3 million of state tax revenue from sales in the oil and gas extraction sector that could be attributed to oil and gas activity on federal land. In the non–oil and gas mining sectors, an estimated 15.6 percent of the combined value of coal, copper, gold and other metals and minerals mined in the state was due to production on federal land. This yields an estimated $3.9 million of revenue from taxable sales in the mining (except oil and gas) sector that could be attributed to activity on federal land. Due to insufficient data, we were unable to assign support activities for mining to federal, state, private or tribal land and so cannot apportion taxable sales in this sector by land ownership. Table 6.5 provides historical data on mining sales tax revenues attributable to production on federal land for oil and gas production and coal mining.

Table 6.5
State Revenue from Taxable Mining Sales Attributable to Activity on Federal Land, 2003–2012
(Constant 2013 Dollars)

Year	Oil & Gas Extraction	Coal Mining
2003	$1,431,811	$1,165,765
2004	$2,492,866	$1,458,134
2005	$3,849,074	$1,258,804
2006	$6,878,273	$1,029,442
2007	$7,136,375	$576,601
2008	$5,219,838	$590,948
2009	$3,410,429	$750,643
2010	$3,718,369	$806,053
2011	$3,677,526	$586,312*
2012	$3,336,255	$977,395
2013	$3,078,125	$857,964*

* Actual amount was less than amount shown.

Source: BEBR analysis of data from Utah State Tax Commission, Economic & Statistical Unit, Division of Oil Gas and Mining, and Utah Geological Survey.

6.3 COUNTY TAXABLE MINING SALES

The State Tax Commission also publishes taxable sales by major industry for the counties. Table 6.6 reports taxable mining sales by county from 2003 through 2013 (in constant 2013 dollars). Note that as of 2008, the Tax Commission began reporting sales amounts in some cases as "less than" the given amount. This was done to protect the confidentiality of firms in counties where there were only a few in a particular industry sector. These amounts are indicated in blue in the tables that follow.

In 2013, the counties with the largest taxable mining sales were Salt Lake and Uintah by far, with $412.8 million and $210.6 million (in 2012 dollars), respectively (Table 6.6). The next highest sales were in Duchesne ($73.8 million) and San Juan ($44.2 million). Davis County had over $28 million in mining sales in 2013, due to the sand, gravel and stone suppliers and several oil and gas support firms in the county.

We estimated the revenues counties receive from taxable mining sales based on sales tax rates. Counties may impose a local option (1.0 percent) and a county option (0.25 percent) sales tax, and since 2008 all counties have assessed both. There are also several other sales and use taxes that counties and municipalities may opt to use. As of 2013, only about one-third of the counties assessed some of these, ranging from an additional 0.1 percent in Summit and Uintah counties to an additional 1.0 percent in Daggett, Garfield and Kane. Counties receive all of the revenue from these additional sales taxes, but only half of the revenue from the local and county option taxes is distributed based on point of sale while the other half is distributed among all counties based on each county's share of the state population. Furthermore, counties receive the revenue

[168] See Chapter 7, Section 7.5.

Table 6.6
Taxable Mining Sales by County, 2003–2013
(Constant 2013 Dollars)

County	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Beaver	$4,212,867	$2,594,742	$5,343,238	$3,038,496	$5,986,055	$5,639,454	$2,318,365	$264,715	$30,850	$1,181,871	$192,930
Box Elder	$1,107,228	$905,997		$207,286	$461,600	$4,515,786	$1,336,604	$1,486,676	$2,862,572	$4,639,824	$3,937,512
Cache		$1,005,894	$2,732,607	$2,438,979	$178,176	$1,477,527	$160,393	$476,487	$30,850	$252,853	$600,000
Carbon	$19,279,511	$23,926,642	$22,079,392	$24,753,351	$16,899,545	$39,943,323	$30,278,804	$26,120,000	$24,244,733	$18,204,004	$16,182,019
Daggett			$625,278	$156,587		$85,003	$37,425	$370,601	$205,669	$707,988	$383,163
Davis	$2,440,630	$3,514,025	$3,607,906	$4,953,750	$3,893,343	$28,551,810	$12,075,640	$13,741,878	$6,045,566	$15,759,118	$28,511,837
Duchesne	$10,038,321	$12,012,727	$22,806,667	$29,574,738	$32,621,425	$60,173,949	$47,227,836	$82,647,107	$90,524,910	$64,484,388	$74,810,630
Emery	$8,379,361	$7,410,810	$7,742,078	$9,802,996	$6,946,130	$21,781,189	$16,339,389	$17,860,964	$8,840,954	$4,289,829	$3,171,671
Garfield				$44,934		$1,588,625	$1,336,604	$1,588,291	$2,056,687	$2,075,894	$1,750,000
Grand	$135,628	$3,427,242	$2,029,479	$1,845,596	$4,035,968	$10,250,313	$2,643,041	$1,936,505	$1,772,455	$5,005,656	$5,166,680
Iron			$38,563	$86,104	$344,224	$1,435,833	$998,839	$970,540	$1,313,428	$1,260,823	$1,000,000
Juab			$440,343	$56,969	$21,744	$318,761	$374,249	$582,697	$1,628,480	$252,853	$800,000
Kane				$1,732		$2,161,420	$1,603,925	$1,853,006	$1,799,601	$1,773,830	$1,000,000
Millard	$9,127,883	$4,585,860		$207,897	$763,426	$2,363,991	$1,871,246	$878,734	$2,715,001	$4,492,939	$3,000,000
Morgan				$1,411		$371,888	$267,321	$47,649	$154,252	$20,228	$2,000
Piute									$719,840	$1,011	$70,000
Rich				$927		$2,921,979	$213,857	$264,715	$92,551	$30,342	$150,000
Salt Lake	$43,626,288	$52,875,472	$102,635,172	$116,232,208	$161,210,886	$287,529,312	$223,189,561	$374,870,438	$421,004,952	$508,650,208	$417,488,188
San Juan	$3,814,982	$5,948,532	$4,951,462	$8,664,202	$25,005,814	$24,325,081	$21,224,928	$36,166,751	$39,742,040	$35,161,241	$44,755,097
Sanpete				$790,593	$909,073	$806,918	$824,923	$1,199,299	$205,669	$606,847	$200,000
Sevier	$3,307,287	$3,471,227	$7,417,512	$6,635,694	$11,330,556	$8,129,245	$12,774,188	$13,097,196	$12,796,287	$13,682,463	$11,923,088
Summit	$1,739,649	$2,466,551	$5,899,286	$9,633,975	$12,031,283	$12,340,575	$4,141,308	$3,506,221	$3,159,798	$3,493,654	$4,516,521
Tooele	$997,982	$1,757,801	$1,009,845	$1,672,563	$2,765,598	$10,091,460	$12,857,226	$8,284,522	$7,555,598	$3,237,552	$2,753,323
Uintah	$53,933,125	$94,010,989	$126,363,305	$216,705,920	$218,322,144	$359,604,964	$177,944,337	$197,264,447	$226,407,613	$272,305,024	$213,060,850
Utah	$1,172,771	$1,577,737	$1,939,443	$3,301,122	$3,793,193	$14,126,454	$3,412,287	$3,627,509	$4,496,940	$4,719,472	$9,216,626
Wasatch				$1,715,370		$2,167,636	$962,355	$635,316	$4,627,545	$606,847	$300,000
Washington	$67,888	$54,880	$2,251,611	$1,715,652	$5,462,123	$6,826,005	$826,805	$2,020,995	$2,431,953	$2,615,059	$2,833,321
Wayne				$32,358		$21,251			$257,086	$2,023	$25,000
Weber	$118,195	$189,284	$227,984	$3,739,938	$1,779,117	$7,364,153	$2,405,888	$7,193,773	$4,749,612	$3,203,603	$3,034,101
Total	$163,499,594	$221,736,415	$320,141,172	$448,011,347	$514,761,424	$916,913,908	$579,647,344	$798,957,032	$872,473,490	$972,717,445	$850,834,557

Note: Red text indicates the actual amount was less than the amount shown and was not disclosed to protect confidentiality.

Source: Utah State Tax Commission, Economic & Statistical Unit, tax.utah.gov/econstats/sales/yearly; adjusted using the CPI West for city size Class B/C.

Table 6.7
Estimated County Revenues from Taxable Mining Sales, 2003–2013
(Constant 2013 Dollars)

County	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Beaver	$28,628	$19,531	$37,962	$25,720	$44,894	$48,696	$22,991	$13,522	$12,908	$21,258	$12,942
Box Elder	$25,189	$30,516	$35,629	$50,747	$60,323	$131,176	$73,504	$98,678	$114,761	$135,966	$116,780
Cache	$40,330	$62,613	$98,827	$128,617	$129,475	$242,998	$147,333	$206,830	$220,832	$247,374	$218,400
Carbon	$127,533	$159,390	$152,435	$175,936	$130,313	$292,511	$215,654	$200,261	$191,619	$158,174	$138,495
Daggett	$378	$522	$4,631	$2,041	$1,191	$3,440	$1,923	$7,899	$5,459	$13,753	$8,226
Davis	$134,560	$186,885	$256,294	$360,069	$396,229	$954,892	$539,750	$709,237	$671,398	$854,403	$918,055
Duchesne	$68,222	$82,666	$153,298	$200,808	$222,964	$410,678	$317,066	$545,734	$597,992	$441,182	$500,756
Emery	$45,758	$42,458	$46,484	$59,829	$47,083	$157,463	$115,580	$130,408	$75,954	$49,527	$39,211
Garfield	$1,886	$2,575	$3,687	$5,838	$5,869	$36,238	$28,303	$34,858	$43,052	$44,299	$37,453
Grand	$4,325	$25,895	$19,342	$20,930	$35,777	$82,722	$28,500	$28,486	$28,909	$50,951	$49,054
Iron	$15,301	$21,243	$32,068	$46,305	$55,002	$104,655	$66,498	$88,626	$98,046	$106,936	$91,268
Juab	$3,633	$4,927	$9,778	$10,375	$11,819	$23,249	$15,774	$21,917	$29,941	$23,610	$23,778
Kane	$2,579	$3,528	$5,109	$7,252	$8,337	$49,712	$35,182	$42,612	$42,866	$43,989	$29,322
Millard	$50,201	$29,438	$9,669	$14,233	$18,657	$40,817	$28,000	$27,793	$41,037	$54,548	$41,626
Morgan	$3,249	$4,494	$6,501	$9,235	$10,759	$21,802	$14,114	$17,200	$19,542	$21,083	$18,512
Piute	$576	$780	$1,105	$1,525	$1,741	$3,200	$2,048	$2,778	$7,431	$3,256	$3,180
Rich	$855	$1,134	$1,586	$2,228	$2,537	$22,776	$4,282	$5,694	$4,949	$4,956	$5,091
Salt Lake	$914,688	$1,165,640	$2,001,388	$2,470,115	$3,460,717	$6,477,416	$4,716,727	$7,515,762	$8,379,409	$9,933,999	$8,279,211
San Juan	$29,368	$44,520	$41,643	$68,833	$172,111	$181,311	$151,011	$250,552	$275,147	$250,203	$304,710
Sanpete	$10,309	$13,934	$19,942	$32,525	$37,489	$61,769	$41,354	$57,270	$55,433	$63,101	$52,588
Sevier	$28,456	$32,235	$61,194	$62,534	$94,847	$93,802	$106,421	$118,406	$119,520	$129,047	$111,842
Summit	$25,809	$35,974	$68,636	$105,837	$128,613	$163,830	$76,888	$90,372	$94,252	$104,839	$102,469
Tooele	$25,889	$37,863	$46,217	$67,387	$83,634	$182,390	$155,505	$155,663	$160,519	$146,889	$127,565
Uintah	$610,447	$1,059,803	$1,426,091	$2,448,991	$2,472,290	$4,079,710	$2,028,611	$1,672,646	$1,692,367	$2,031,219	$1,596,990
Utah	$177,549	$246,536	$358,766	$516,401	$610,838	$1,180,859	$708,596	$969,374	$1,075,565	$1,211,278	$1,133,888
Wasatch	$7,669	$10,612	$15,565	$33,000	$26,180	$61,043	$36,322	$46,218	$75,704	$57,365	$49,935
Washington	$43,578	$61,777	$107,537	$147,071	$192,932	$328,191	$184,297	$260,257	$286,550	$319,283	$286,338
Wayne	$1,062	$1,435	$2,030	$3,005	$3,292	$5,831	$3,615	$4,977	$6,865	$5,774	$5,150
Weber	$87,360	$119,472	$171,510	$279,067	$289,333	$581,850	$337,204	$523,193	$520,222	$546,386	$479,642
Total	$2,515,383	$3,508,398	$5,194,923	$7,356,455	$8,755,247	$16,025,027	$10,203,056	$13,847,223	$14,948,249	$17,074,645	$14,782,476

Note: This includes some local option tax revenues that are paid to the municipalities in which the transactions take place, but does not include municipal revenue from other sales taxes. Red text indicates the underlying sales amount was given as "less than" the reported amount in order to maintain confidentiality.
Source: BEBR calculations based on data from the Utah State Tax Commission, Economic & Statistical Unit.

from the local option tax only if the sale took place in an unincorporated area, otherwise the revenue goes to the municipality. We subtracted an administrative fee charged by the Tax Commission from all sales tax revenues. The fee was 1.2 percent from 2002 through 2005, then 0.8 percent from 2006 through 2013, but the amount is flexible depending on costs and other economic factors. Our analysis assumes the same rate was applied to all counties. We include revenues from the local option tax for all taxable mining sales, regardless of whether they took place in a municipality or an unincorporated area; thus some of the revenue reported in Table 6.7 would be distributed to cities and towns within each county.[169] We ignore any vendor discounts or sales tax refunds. Note also that since 2008, taxable sales in several counties were reported as "less than" the amount shown.

Between 2003 and 2013 Salt Lake, Uintah, Utah and Davis counties were consistently the top four largest recipients of tax revenue from mining sales (Table 6.7). In 2013, Salt Lake County received an estimated $8.2 million, Uintah received $1.6 million, Utah received $1.1 million and Davis received an estimated $908,000 in sales tax revenues (all amounts are in 2012 dollars).

[169] We do not include revenues from other sales taxes imposed by municipalities, e.g., a mass-transit tax, highways tax or the municipal botanical, cultural and zoo tax.

Aside from the anomalous spike in 2008, all counties except Beaver saw revenues rise steadily (adjusting for inflation) from 2003 through 2012. Growth rates ranged from a 25 percent decline in Beaver County to less than 10 percent increases in Emery and Millard to tenfold to thirty-sixfold increases in Salt Lake, Grand, Kane, Garfield and Daggett counties. Most counties then saw revenues decline from 2012 to 2013. Revenues grew in only Davis, Duchesne, Juab, Rich and San Juan counties by rates of less than 1 percent (Juab) to more than 20 percent (San Juan).

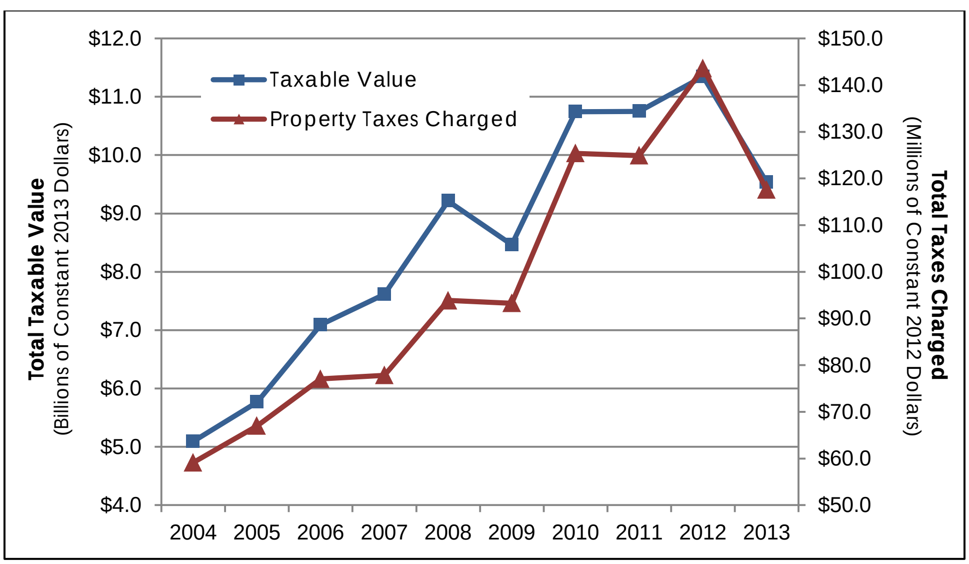
Since we don't have county-level mining sales data by detailed subsector, e.g. oil and gas extraction, and we have county-level production data by land ownership only for oil and gas, we can't assign a portion of county mining sales tax revenues to activity on federal land.

6.4 Natural Resources Property Taxes

The Utah State Tax Commission assesses the fair market value of "natural resources" properties. These comprise oil and gas wells, metal mines, coal mines, sand and gravel pits, and non-metal mines. The assessment covers the mines and mining claims, all machinery used in mining, and all property or surface improvements that belong to the mine or mining claim, including processing plants, mills, reduction works and smelters.[170] The local county treasurer then bills for and collects the tax.

The total taxable value of natural resource properties in the state rose rapidly from 2004 through 2008, increasing by 80 percent (after inflation) from $5.1 billion to $9.2 billion (in constant 2013 dollars). With the onset of the recession, values dipped 8 percent to about $8.5 billion in 2009, but they grew again by one-third to $11.3 billion in 2012 before dropping to $9.5 billion in 2013 (Figure 6.3 and Table 6.8).

Figure 6.3
Total Natural Resources Taxable Value and Taxes Charged, 2004–2013



Source: Utah State Tax Commission, Property Tax Division, Annual Statistical Reports.

170 Utah Code Ann. 59-2-201 (1)(a)(v) and (vi). Mines and mining claims are valued using the capitalized net revenue method.

Table 6.8
Total Natural Resources Taxable Values by County, 2004–2013
(Millions of Constant 2013 Dollars)

County	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Beaver	$26.3	$35.3	$35.7	$21.5	$35.3	$100.5	$90.8	$89.8	$93.2	$116.8
Box Elder	$57.1	$68.6	$77.8	$87.7	$112.8	$130.8	$136.1	$135.6	$144.2	$145.9
Cache	$6.7	$5.9	$5.0	$5.5	$8.2	$10.6	$11.0	$8.5	$9.2	$9.2
Carbon	$1,037.6	$1,082.0	$1,303.0	$1,270.2	$1,328.6	$1,118.2	$1,012.4	$778.0	$751.2	$710.9
Daggett	$36.1	$33.2	$27.3	$23.1	$3.3	$13.1	$11.6	$11.6	$10.4	$12.6
Davis	$14.8	$19.2	$27.5	$31.3	$38.6	$47.9	$47.1	$41.8	$41.0	$41.1
Duchesne	$225.2	$330.9	$502.5	$499.6	$556.6	$585.0	$552.4	$757.0	$992.9	$1,027.9
Emery	$296.1	$301.8	$330.2	$282.6	$299.7	$240.8	$184.2	$170.5	$148.1	$138.8
Garfield	$14.7	$16.8	$22.6	$30.6	$108.1	$43.4	$47.4	$44.9	$59.4	$44.5
Grand	$61.9	$75.7	$105.2	$107.8	$126.0	$125.0	$123.7	$161.9	$182.6	$202.2
Iron	$9.4	$9.3	$9.4	$12.4	$15.4	$17.6	$19.5	$18.0	$72.5	$63.6
Juab	$22.5	$20.0	$23.2	$18.9	$18.5	$19.5	$19.7	$17.6	$20.2	$21.0
Kane	$1.7	$1.7	$3.1	$3.8	$1.9	$4.1	$4.0	$16.8	$5.7	$8.4
Millard	$61.4	$66.4	$81.4	$100.8	$112.7	$127.7	$139.0	$150.9	$164.2	$191.3
Morgan	$11.3	$10.3	$10.6	$9.7	$8.1	$11.1	$9.7	$8.6	$8.9	$8.6
Piute	$1.1	$1.0	$1.0	$0.9	$3.5	$3.9	$4.5	$4.4	$4.2	$4.0
Rich	$1.8	$1.0	$0.6	$0.6	$1.0	$1.2	$0.7	$0.6	$0.6	$0.6
Salt Lake	$1,431.6	$1,778.7	$1,937.8	$2,432.2	$3,084.5	$2,418.1	$4,741.6	$4,421.1	$4,057.9	$2,479.4
San Juan	$192.0	$188.5	$301.5	$340.6	$413.5	$343.5	$418.5	$517.4	$592.4	$451.5
Sanpete	$5.6	$6.9	$6.6	$6.2	$10.3	$14.7	$11.5	$13.8	$11.6	$11.1
Sevier	$131.5	$187.8	$240.3	$217.7	$253.1	$256.7	$327.7	$372.8	$435.5	$411.0
Summit	$451.7	$274.4	$247.5	$200.6	$145.3	$122.0	$95.6	$96.0	$103.9	$96.2
Tooele	$84.5	$87.9	$92.7	$93.8	$120.4	$170.7	$167.4	$164.3	$285.5	$300.3
Uintah	$795.3	$1,040.3	$1,563.8	$1,665.3	$2,238.0	$2,343.5	$2,362.9	$2,509.1	$2,876.8	$2,764.6
Utah	$38.4	$36.5	$40.3	$45.1	$53.2	$64.7	$65.0	$67.7	$79.5	$68.1
Wasatch	$12.9	$13.4	$13.7	$14.1	$13.7	$12.6	$10.7	$9.7	$14.5	$14.0
Washington	$18.4	$25.6	$32.7	$35.0	$41.1	$42.7	$43.1	$40.2	$39.3	$36.7
Wayne	$0.4	$0.5	$0.6	$3.2	$2.6	$2.4	$2.3	$1.7	$1.3	$1.4
Weber	$45.8	$45.2	$47.3	$52.9	$59.4	$73.9	$85.1	$121.7	$138.8	$149.3
Statewide	**$5,093.8**	**$5,764.8**	**$7,090.7**	**$7,613.7**	**$9,213.7**	**$8,466.0**	**$10,745.1**	**$10,752.1**	**$11,345.8**	**$9,530.9**

Source: Utah State Tax Commission, Property Tax Division, Annual Statistical Reports; available at propertytax.utah.gov/generalinformation/reporting-and-statistics/annual-statistical-report/.

Uintah and Salt Lake counties have the highest-valued natural resources properties in the state at almost $2.8 billion and $2.5 billion, respectively, in 2013. Oil and gas extraction accounts for 90 percent of the value in Uintah County, while metal mines—in particular, Kennecott's Bingham Canyon and Barneys Canyon mines in the Oquirrh Mountains—accounted for 95 percent of the value in Salt Lake. The third-highest-valued county was Duchesne, with $1.0 billion in natural resources property, almost all of which was due to oil and gas. Statewide, oil and gas properties and metal mines together account for about 80 percent of the value of natural resource properties. In 2013, oil and gas properties in the state were valued at $4.8 billion and metal mines at $2.7 billion. Non-metal mines were valued at $1.1 billion while coal mines and sand and gravel operations were each valued at less than half a billion dollars (Table 6.9).

Table 6.9
Detail of Natural Resources Taxable Values in 2013

County	Oil & Gas Extraction	Metal Mines	Coal Mines	Sand & Gravel	Non-Metal Mines	Total Natural Resources
Beaver		$35,238,973		$1,394,591	$80,205,439	$116,839,003
Box Elder	$10,499	$283,244		$79,320,261	$66,334,556	$145,948,560
Cache		$97,354		$9,096,196		$9,193,550
Carbon	$465,791,869		$237,736,558	$1,583,840	$5,816,092	$710,928,359
Daggett	$11,060,979			$23,456	$1,474,805	$12,559,240
Davis		$21,681		$41,072,985		$41,094,666
Duchesne	$1,022,895,883			$4,747,916	$226,803	$1,027,870,602
Emery	$61,408,343	$8,328	$73,307,246	$2,371,781	$1,655,239	$138,750,937
Garfield	$30,504,319	$12,856,838		$1,146,692		$44,507,849
Grand	$86,980,312	$120,261		$4,275	$115,089,406	$202,194,254
Iron		$55,361,325	$103,987	$8,046,539	$68,773	$63,580,624
Juab	$7,461	$3,473,759	$1,379,485	$10,587,729	$5,583,230	$21,031,664
Kane			$6,275,665	$1,115,798	$1,025,159	$8,416,622
Millard		$24,601,608		$2,374,626	$164,358,467	$191,334,701
Morgan		$29,854		$3,506,905	$5,048,383	$8,585,142
Piute		$3,773,529		$950	$214,304	$3,988,783
Rich	$14,600			$292,990	$242,511	$550,101
Salt Lake		$2,349,610,576		$128,609,901	$1,167,496	$2,479,387,973
San Juan	$315,333,668	$101,981,360		$6,297,404	$27,927,243	$451,539,675
Sanpete	$1,588,219	$96,679		$2,534,070	$6,861,370	$11,080,338
Sevier	$260,479,122	$182,963	$127,595,706	$2,692,893	$20,002,563	$410,953,247
Summit	$74,899,703	$3,736,761		$4,036,228	$13,559,127	$96,231,819
Tooele		$86,404,353		$9,555,240	$204,327,811	$300,287,404
Uintah	$2,491,506,952	$70,857	$6,000	$6,602,673	$266,443,794	$2,764,630,276
Utah	$31,666	$10,598,795		$54,053,327	$3,374,156	$68,057,944
Wasatch		$9,789,254		$3,731,367	$437,091	$13,957,712
Washington		$521,196		$35,792,623	$381,169	$36,694,988
Wayne		$372,784		$745,737	$327,561	$1,446,082
Weber		$1,503		$3,492,652	$145,758,439	$149,252,594
Statewide	**$4,822,513,595**	**$2,699,233,835**	**$446,404,647**	**$424,831,645**	**$1,137,910,987**	**$9,530,894,709**

Source: Utah State Tax Commission, Property Tax Division, 2013 Annual Statistical Report; available at propertytax.utah.gov/generalinformation/reporting-and-statistics/annual-statistical-report/most-recent-statistical-report.

The corresponding property taxes charged based on these valuations did not rise quite as fast as taxable values between 2004 and 2008, growing by about 60 percent after inflation from $59.1 million to $93.9 million (in constant 2013 dollars). Between 2008 and 2009 total natural resources property taxes shrank by less than 1 percent, to $93.3 million. They then jumped by one-third in 2010, were flat in 2011, grew again in 2012 by 15 percent, then dropped by 18 percent in 2013 to $117.6 million (Figure 6.3, above, and Table 6.10).

Results were not uniform at the county level. Rates of change from 2004 to 2012, after adjusting for inflation, ranged from 60–70 percent declines in taxes charged in Daggett, Rich and Summit counties to over 300 percent increases in Duchesne, Iron, Kane, Piute and Tooele. Even between 2008 and 2009, which saw total taxable value fall and total taxes charged remain flat, local taxes charged declined in 10 counties but increased in the other 19.

Table 6.10
Total Natural Resources Property Taxes Charged by County, 2004–2013
(Constant 2013 Dollars)

County	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Beaver	$292,379	$403,843	$396,353	$207,652	$326,537	$984,335	$810,336	$866,111	$894,099	$1,093,144
Box Elder	$571,775	$687,836	$798,009	$875,433	$1,301,424	$1,616,271	$1,237,214	$1,725,471	$1,865,637	$1,834,571
Cache	$62,646	$53,901	$45,204	$47,312	$68,942	$91,117	$99,847	$81,096	$89,794	$87,440
Carbon	$10,298,098	$10,589,220	$12,125,506	$11,467,834	$11,561,996	$10,549,317	$9,851,575	$8,216,998	$8,026,918	$7,793,079
Daggett	$283,468	$253,378	$204,454	$168,818	$26,069	$107,435	$95,644	$97,332	$87,735	$114,633
Davis	$181,068	$233,380	$315,960	$367,383	$427,776	$554,590	$591,745	$577,748	$574,482	$561,609
Duchesne	$2,946,024	$4,316,239	$6,124,986	$5,803,378	$6,252,226	$6,689,241	$6,569,076	$9,144,699	$11,978,565	$12,273,127
Emery	$3,228,228	$3,267,158	$3,514,085	$2,903,853	$3,088,496	$2,515,048	$1,950,989	$1,827,094	$1,599,370	$1,523,672
Garfield	$140,013	$158,567	$212,137	$237,697	$792,206	$341,606	$369,646	$372,747	$502,058	$372,037
Grand	$565,858	$689,992	$921,925	$782,920	$1,194,776	$1,168,483	$1,171,577	$1,546,854	$1,726,224	$1,944,503
Iron	$105,898	$105,190	$96,030	$113,158	$139,911	$180,385	$241,716	$246,567	$1,058,812	$911,631
Juab	$257,649	$235,324	$276,221	$227,007	$218,779	$234,239	$241,406	$213,117	$247,533	$255,829
Kane	$13,713	$14,032	$23,826	$30,629	$13,712	$37,633	$41,730	$169,635	$56,592	$84,496
Millard	$621,724	$677,711	$819,300	$989,698	$1,081,730	$1,234,866	$1,394,597	$1,529,604	$1,665,936	$1,921,650
Morgan	$106,372	$93,743	$86,689	$76,905	$62,897	$96,315	$91,544	$89,296	$100,421	$97,846
Piute	$9,652	$10,570	$9,305	$8,327	$31,627	$30,651	$50,346	$48,590	$46,502	$43,715
Rich	$15,358	$8,822	$4,742	$3,543	$5,641	$7,084	$4,682	$4,712	$4,795	$4,416
Salt Lake	$20,405,406	$24,552,762	$23,855,495	$26,722,905	$33,345,191	$31,030,692	$61,938,951	$61,739,097	$62,424,779	$39,696,455
San Juan	$2,726,634	$2,681,588	$3,997,678	$4,523,031	$5,509,394	$4,792,832	$5,791,143	$7,145,795	$7,718,435	$5,919,347
Sanpete	$61,636	$78,065	$72,679	$71,735	$115,771	$169,462	$134,622	$161,933	$146,486	$140,005
Sevier	$1,442,297	$2,057,738	$2,533,736	$2,147,451	$2,361,039	$2,420,885	$3,090,185	$3,637,680	$4,270,623	$3,978,678
Summit	$4,587,467	$2,998,914	$2,628,738	$2,094,020	$1,485,549	$1,248,118	$1,129,991	$1,232,224	$1,338,614	$1,253,377
Tooele	$915,560	$957,514	$988,382	$940,190	$1,221,958	$1,772,795	$1,706,187	$1,642,382	$3,387,145	$3,691,790
Uintah	$7,930,374	$10,436,999	$15,531,157	$15,528,938	$21,552,263	$23,213,687	$24,234,721	$26,573,663	$30,163,516	$28,468,260
Utah	$458,861	$438,243	$432,466	$456,063	$549,162	$762,646	$816,741	$887,472	$1,038,341	$883,192
Wasatch	$129,859	$138,575	$132,232	$126,154	$111,852	$111,203	$102,111	$103,041	$163,840	$155,556
Washington	$200,552	$253,480	$279,031	$291,114	$349,115	$458,127	$537,636	$528,028	$513,882	$447,937
Wayne	$3,090	$3,541	$4,277	$20,173	$14,150	$13,472	$12,647	$9,852	$7,662	$8,193
Weber	$555,525	$581,633	$598,022	$608,481	$661,928	$853,379	$1,095,208	$1,629,472	$1,906,072	$2,017,273
Statewide	**$59,117,185**	**$66,977,961**	**$77,028,625**	**$77,841,803**	**$93,872,117**	**$93,285,916**	**$125,403,811**	**$124,902,515**	**$143,604,872**	**$117,577,461**

Numbers based upon year-end data from the TC-233B Reports received from each county.

Source: Utah State Tax Commission, Property Tax Division, Annual Statistical Reports; available at propertytax.utah.gov/generalinformation/reporting-and-statistics/annual-statistical-report/.

Not surprisingly, given that they have the highest valuations, Salt Lake and Uintah collect the most in natural resources property taxes, charging $39.7 million and $28.5 million, respectively, in 2013. Duchesne is next with a $12.3 million bill, followed by Carbon at $7.8 million and San Juan at $5.9 million. Table 6.11 details the sources of these revenues. Salt Lake charged $37.7 million, 95 percent of the total, to metal mines, and in Uintah and Duchesne more than 90 percent of their taxes were on oil and gas operations. In San Juan 70 percent of its natural resources property taxes were assessed on oil and gas operations, but metal mines provided a not insignificant $1.3 million (almost one-quarter of the total) in property taxes. Somewhat surprisingly, two-thirds—$5.1 million—of Carbon County's natural resources property taxes are due to oil and gas operations, with coal mines essentially providing the remaining $2.6 million.

If the state were to allow greater mining activity upon the transfer of federal lands to state ownership, counties would undoubtedly see their natural resources property tax revenues increase. There would be more mines and mining claims, including oil and gas wells, with the accompanying machinery and infrastructure, all with taxable values.

Table 6.11
Detail of Natural Resources Property Taxes Charged in 2013

County	Oil & Gas Extraction	Metal Mines	Coal Mines	Sand & Gravel	Non-Metal Mines	Total
Beaver		$347,235		$12,734	$733,175	$1,093,144
Box Elder	$123	$3,332		$1,054,822	$776,294	$1,834,571
Cache		$922		$86,518		$87,440
Carbon	$5,143,532		$2,569,265	$17,794	$62,488	$7,793,079
Daggett	$100,942			$232	$13,459	$114,633
Davis		$299		$561,310		$561,609
Duchesne	$12,214,363			$56,085	$2,679	$12,273,127
Emery	$675,302	$91	$804,107	$26,016	$18,156	$1,523,672
Garfield	$255,771	$105,773		$10,493		$372,037
Grand	$836,490	$1,157		$41	$1,106,815	$1,944,503
Iron		$789,001	$1,482	$120,207	$941	$911,631
Juab	$93	$40,527	$16,930	$130,370	$67,909	$255,829
Kane			$62,719	$11,532	$10,245	$84,496
Millard		$256,653		$23,713	$1,641,284	$1,921,650
Morgan		$332		$41,318	$56,196	$97,846
Piute		$41,354		$12	$2,349	$43,715
Rich	$113			$2,350	$1,953	$4,416
Salt Lake		$37,706,639		$1,970,408	$19,408	$39,696,455
San Juan	$4,125,255	$1,347,343		$81,433	$365,316	$5,919,347
Sanpete	$20,447	$1,209		$29,981	$88,368	$140,005
Sevier	$2,516,749	$1,768	$1,234,637	$26,019	$199,505	$3,978,678
Summit	$1,058,853	$32,667		$38,797	$123,060	$1,253,377
Tooele		$1,114,739		$121,808	$2,455,243	$3,691,790
Uintah	$25,656,391	$729	$62	$69,748	$2,741,330	$28,468,260
Utah	$440	$137,170		$702,705	$42,877	$883,192
Wasatch		$109,112		$41,573	$4,871	$155,556
Washington		$5,465		$437,997	$4,475	$447,937
Wayne		$2,125		$4,216	$1,852	$8,193
Weber		$20		$47,184	$1,970,069	$2,017,273
Statewide	**$52,604,864**	**$42,045,662**	**$4,689,202**	**$5,727,416**	**$12,510,317**	**$117,577,461**

Numbers based upon year-end data from the TC-233B Reports received from each county.
Source: Utah State Tax Commission, Property Tax Division, 2013 Annual Statistical Report; available at propertytax.utah.gov/generalinformation/reporting-and-statistics/annual-statistical-report/.

The assessed value of natural resources properties covers the capitalized net revenue of mines and mining claims, as well as machinery and property or surface improvements. Since the value of the mine or mining claim generally well outweighs the value of machinery and surface improvements, we estimated the amount of oil and gas property taxes attributable to activity on federal land using data on oil and gas production by county by land owner when it was available. For those counties that charged oil and gas property taxes but did not have any production in 2013 (Juab, Piute, Rich, Sanpete and Utah), we estimated the amount attributable to federal land based on the share of oil and gas wells in the county that are located on federal land. For coal mines, the situation is more complicated. The mine mouth, with its associated surface improvements and at least some machinery, can easily be assigned to a landowner (federal, state or private). However, the coal in the ground, which is probably the largest part of the mine's assessed value, could be federally, state or privately owned, or some combination of the three, and may not correspond to the surface ownership at the mine mouth. We do not have data on coal production by county by landowner (or mineral owner), only production by county *or* production by mineral owner. In 2013, 83.0 percent (14.1 million tons) of the coal mined in Utah came from federal leases, and coal was produced only in Carbon, Emery, Kane and Sevier counties. The production in Kane was on privately owned land and minerals, which means that 86.8 percent of the combined production from Carbon, Emery and Sevier counties was from federal leases. For these four coal-producing counties we apportioned the federal share of the coal mine property taxes based on the estimated federal share of production: 0.0 percent in Kane and 87.1 percent in Carbon, Emery and Sevier. There were three counties that collected property taxes from coal mines in 2013 but that did not have any coal production (and have not since at least 1978), namely Iron, Juab and Uintah. These mines were not included in the State Geographic Information Database's coal mines GIS layer, so we could not apportion the taxes received based on land ownership at the mine mouth. Given the low valuations reported in Table 6.9, with the exception of Juab County there is likely not much of the infrastructure remaining and little to no coal in the ground. Table 6.12 shows the estimated property taxes charged in 2012 for oil and gas extraction and coal mines that can be attributed to activity on federally owned land or minerals.

Table 6.12
Estimated Oil & Gas and Coal Mine Property Taxes Attributable to Activity on Federal Land, 2013

County	Oil & Gas Extraction	Coal Mines
Carbon	$3,043,943	$988,179
Daggett	$93,237	
Duchesne	$3,438,565	
Emery	$188,483	$344,617
Garfield	$255,771	
Grand	$747,514	
Kane		$0
San Juan	$669,754	
Sanpete	$8,890	
Sevier	$2,181,501	$1,234,637
Summit	$98,040	
Uintah	$13,442,299	

Source: BEBR analysis of data from Utah State Tax Commission; Department of Natural Resources, Division of Oil, Gas and Mining; and State of Utah, SGID.

7 CURRENT ACTIVITIES ON FEDERAL LANDS AND THEIR ECONOMIC CONTRIBUTIONS

OVERVIEW

Utah's public lands are accessed by millions of people each year and used for many purposes. The state of Utah is endowed with an abundance of natural resources. It contains significant supplies of oil, natural gas, coal, uranium, and oil shale and oil sands; base metals such as copper, beryllium, magnesium and molybdenum; and industrial minerals such as potash, salt, magnesium chloride and gilsonite. Its vast rangelands provide opportunities for cattle grazing. The state's unique geography, topography, geologic features and climate are ideal for outdoor recreation. Utah residents are more than twice as likely as the national average to participate in several outdoor recreational activities.

Many of the activities that take place on public provide economic benefits that can be estimated using economic models. Some activities, including recreation, have additional value or net benefits. Also known as consumer surplus, this is the value between the user would pay for something and what is paid.

The economic contributions of some activities that take place on federal lands have been estimated as part of this study. These include wildlife recreation; oil, gas, coal, geothermal and mineral production; timber harvesting and grazing. The economic effects produced by spending related to these activities include almost 29,000 jobs, $1.49 billion in earnings and $7.1 billion to the gross state product. These impacts are those limited to activities that occur on federal lands (Table 7.1).

Table 7.1
Estimated Economic Contributions of Activities in Utah
(Millions of 2013 Dollars)

	Contributions from Production on Federal Land			Total Contributions		
Activity	**Employment**	**Earnings**	**GSP**	**Employment**	**Earnings**	**GSP**
Wildlife Recreation[1]	7,617	$219.6	$423.7	11,815	$340.6	$657.2
Coal	6,443	$335.6	$667.7	7,765	$404.5	$804.7
Other Minerals	413	$26.7	$53.8	13,442	$855.8	$1,726.4
Grazing[2]	2,767	$87.2	$110.0	2,767	$87.2	$110.0
Geothermal[2]	41	$1.8	$3.8	41	$1,815.5	$3,829.6
Timber[3]	346	$9.5	$13.6	537	$14.7	$21.1
Oil and Gas	11,286	$814.6	$2,029.7	26,171	$1,889.0	$4,706.9
Total	28,914	$1,495.0	$7,128.1	62,538	$5,407.3	$11,855.9
Recreation (Net Benefit)[4]			**$7,163.3**			

Note: Except where indicated below, amounts are for economic activity in 2013.
1. The contributions of hunting, fishing and wildlife viewing on federal lands were conservatively estimated from statewide amounts for 2011 based on the share of federal land area in Utah, 64.5 percent.
2. All amounts documented here for grazing and geothermal activity are for federal lands.
3. Timber contributions from production federal lands were estimated from statewide amounts for 2012 based on the share of timberland acreage that is federally owned in Utah, 78.4 percent.
4. Net benefits from recreation are for BLM and Forest Service lands in Utah, including wildlife recreation, based on 2010 data.

Source: Analysis by BEBR, University of Utah; Weber State University; and Utah State University.

The fiscal contributions of the economic impacts are shown in Table 7.2. These include earning-related tax revenues, taxable sales, mineral royalties, severance taxes and property taxes. In total, the fiscal effects generated by activities on public lands in 2013 dollars were $738.4 million. This includes $388.6 million in state tax revenue, $134.8 million in revenue to local governments and $265 million in tax revenue that could not be reliably assigned.

Skiing is another outdoor activity that takes place on public lands. During the 2012–13 ski season, skier days totaled 4 million. Estimated skier/snowboarding spending was estimated to be $1.29 billion during the 2012/13 (Leaver 2014). Much of this activity takes place at Utah ski resorts located on federal lands. Due to data limitations, we were not able to calculate the economic impacts of skiing on federal lands; therefore, no impacts of skier spending were estimated as part of this study.

Table 7.2
Estimated Fiscal Contributions of Activities on Federal Lands
(Millions of 2013 Dollars)

Activity	State	Local	Combined[1]	Total
Earnings	$31.4	$2.8	$236.7	$270.9
Taxable Sales	$36.5	$14.3	$28.3	$79.1
Royalties	$226.8	$0.2	$0.0	$227.0
Property Tax	$0.0	$117.6	$0.0	$117.6
Severance Tax	$57.6	$0.0	$0.0	$57.6
Other[2]	$36.2	$0.0	$0.0	$36.2
Total	$388.6	$134.8	$265.0	$788.3

1. Separate amounts were not available for state and local fiscal impacts in some cases. 2. Includes conservations fees, the coal program, and DWR fish and game licenses and related revenue
Source: BEBR analysis.

In addition to the economic contributions associated with activities on federal lands are the consumer surplus benefits of recreation. This has been estimated to be $7.1 billion and represents the aggregate net benefit to Utah residents of 14 outdoor recreation activities that take place on multiple-use lands managed by the Forest Service and Bureau of Land Management.

Economic Contribution Methodology

The economic contributions presented in Table 7.1 were estimated using the RIMS II model published by the U.S. Bureau of Economic Analysis to compute the impacts of each sector on the regional economy. We ran these computations for the state as a whole, for the share of production on federal land (when available), and, in the case of oil and gas and coal production, for the counties where the production took place and for which we had employment and wage data.

Because of linkages in an economy, activity in one industry can affect many other industries. This occurs through the purchases of inputs from local suppliers, those suppliers' purchases of inputs, and the household spending of wages earned by workers in the "impacting" industry and its suppliers. Therefore, for the statewide impacts we report employment impacts by industry, as well as impacts on earnings and gross state product (GSP) and on state and local tax revenues. Employment impacts are in job-years. Earnings are defined as wage and salary payments plus employer contributions for health insurance and proprietors' income, and are reported by place of work. Gross state product is a measure of a state's output, the local counterpart to national GDP. It is the market value of goods and services produced by labor, capital and land in the state.

7.1 Recreation Benefits, Tourism, and Public Lands

7.1.1 Introduction

Outdoor recreation is a growing industry much in part due to the accepted economic, social, and health benefits. According to the Outdoor Industry Association (OIA), the outdoor recreation economy grew approximately 5 percent annually between 2005 and 2011, a notable growth rate given that this period includes the Great Recession when many sectors of the economy were declining. The economy benefits when consumers spend their money on the purchase of recreation gear and accessories, and on trips and related travel expenditures. In 2011, direct outdoor recreation sales were $645.5 billion, exceeding industry sectors like pharmaceuticals, motor vehicles and parts, gasoline and other fuels, and household utilities (see OIA 2012). Of the $645.5 billion, outdoor recreation product sales (gear) contribute $120.7 billion (18.7 percent) whereas trip and travel-related spending contributes $524.8 billion (81.3 percent) (OIA 2012).

Outdoor recreation is part of Utah's culture and heritage, and preserving such opportunities enhances the quality of life for residents and visitors. According to the OIA, 82 percent of Utah residents participate in outdoor recreation each year. Utah's vision statement for outdoor recreation recognizes the importance and values of outdoor recreation to its citizens (Governor's Council on Balanced Resources 2013, p. 4):

> Utah is the premier place for outdoor recreation. With its iconic red-rock deserts, mountain peaks capped with world-class snow, productive lands and waters, and active communities, Utah offers all families and individuals unparalleled outdoor recreation experiences—from the backyard to backcountry—sustaining our prosperity and elevating our quality of life. For generations to come, Utah will continue to be recognized as "the right place" for accessible outdoor adventures.

The State values preserving its natural surroundings, and recognizes that the natural environment and the abundance and diversity of outdoor activities contribute to the Utah economy. The Utah Office of Tourism has estimated that in 2012 there were 23.5 million nonresident visitors, representing an 8 percent increase in travelers since 2011 (see Leaver 2014). Of those 23.5 million visitors, 32 percent visited state and national parks. Unlike resident spending that recirculates dollars within the Utah economy, nonresident spending injects new dollars into circulation, positively contributing to the Utah economy. In addition, several hundred outdoor companies are doing business in Utah, including notable outdoor companies like Amer Sports (brands include Salomon, Atomic, Arc'Teryx, and many more), Black Diamond, Petzl, Enve Composites, and Rossignol (an extensive list is available online at business.utah.gov/programs/outdoor/companies). To help sustain the growing economic prosperity of this industry, Utah has become the first state to establish an Office of Outdoor Recreation.

In section 1, we discuss the economic values of outdoor recreation and provide estimates of the benefits Utah residents receive for recreating on public lands. In section 2, we explore the impact of public lands ownership and management on covered wage growth in the food and accommodations industry, the industry most directly related to tourism and recreation.

7.1.2 Economic Values of Outdoor Recreation

The purpose of this section in the report is to provide estimates for the economic value of outdoor recreation on USFS and BLM land. Land throughout the mountain region provides numerous recreation benefits to society including hiking, backpacking, camping, mountain biking, climbing, fishing, and hunting, and people travel from out the world to experience the outdoors in Utah. Further, according to the Bureau of Economic and Business Research at the University of Utah, Utah residents are more than twice as likely as the national population to participate in outdoor recreation (Thiriot and Wood 2014).

Benefit and cost information could be used to inform policy in deciding how best to manage public land for multiple, often conflicting, uses. A full benefit-cost analysis would entail measuring the value people hold to have access to and recreate on public lands, and comparing it with the value of foregone uses (e.g., foregone uses may include oil and gas exploration). The following discussion lays the foundation for measuring recreational values in monetary terms, which is then followed by a discussion of the method used to calculate the monetary value.

The underlying principle of the study of economics is scarcity. Individuals make choices about activities they engage in and the goods and services they purchase in order to maximize their personal well-being or utility. The ability to maximize utility is, of course, constrained by an individual's scarce time and money. Thus, when a person makes a choice among two alternatives, there is a trade-off in terms of what they must forego. This trade-off is known as the opportunity cost, what the individual *has* to give up when they make the choice. The value a person places on an economic good (goods or activities) is measured by the maximum amount of other things the person values and is *willing* to give up in order to obtain that economic good. This *willingness-to-pay* (WTP) is the value or the benefit an individual places on the good or activity. In a market-based economy, this economic value is measured by the metric of dollars.

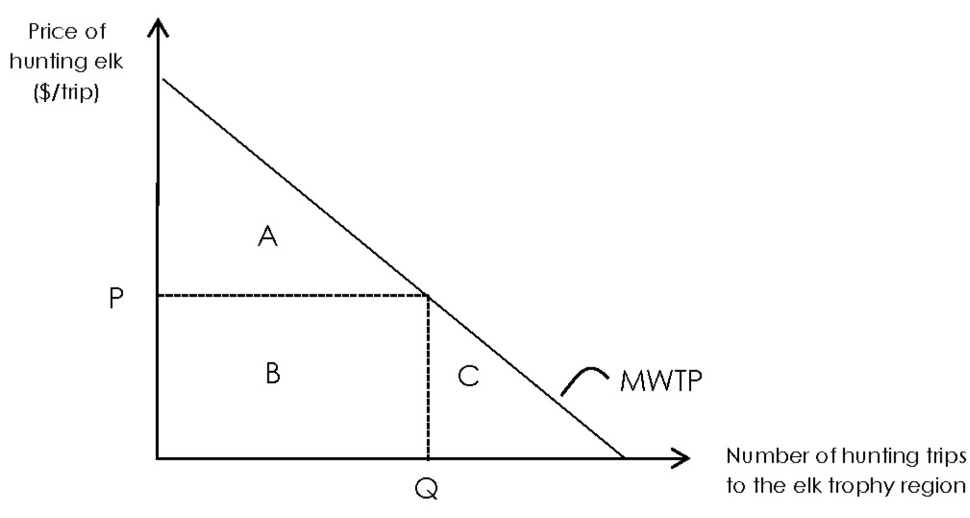
A healthy and natural environment benefits people in the same way as market goods and services. As such, people are willing to sacrifice some market goods and services in order to experience the environment or higher levels of environmental quality. We see examples of WTP for the environment when individuals choose lower paying jobs to live in environmentally rich areas, when people spend more on housing to live near, or benefit from environmental amenities such as a having a view or easy access to trails, or when they spend money on a vacation to experience the richness of the environment. Suppose, for example, a person determines that (s)he is willing-to-pay $1000 for a trip to hunt in an elk trophy region. This individual is willing to forego the opportunity to use that $1000 to purchase other goods and services. Thus, the economic value of a trip reflects individual preferences about how (s)he would like to allocate scarce resources. On the cost side, suppose the entire trip will cost the individual $800; if the person takes the trip, (s)he will forego the opportunity to purchase $800 of *other* goods and services. The economic value of the trip is $1000, and the opportunity cost is $800. The difference between what the individual is willing to pay and what (s)he has to pay ($1000 – $800 = $200) is known as consumer surplus (CS), or the net gain to the consumer because resources have been allocated to maintaining access to and preserving the resources for elk and elk hunters. Even if the cost of a trip were $1000, the individual who has a WTP of $1000, would take the trip, and CS would be $0. It is this consumer gain that captures the net benefit or CS of an economic good or activity (such as a recreational trip). When the difference between what a person has to pay and what (s)he is willing to pay is large, the person feels like they got a good deal, "Wow, what a steal!"

Markets facilitate the process of finding good deals. Consumers shop around to find the lowest cost (holding quality constant), or at least a cost that is lower than their WTP. If they cannot find a good enough deal, then they don't purchase products or take a recreational trip. Because markets exist, consumers and producers benefit; there are gains from trade. The measure of the gain to consumers is CS, and for completeness, the measure of the benefit to producers is the difference between the price paid by consumers and the cost of providing the good or service in the market.

Willingness-to-pay (WTP) is the term routinely used by economists to represent the demand for a good. The more of a particular good an individual has, the less (s)he would be willing to pay to acquire another one. For instance, if an individual has already hunted in a region this year and in prior seasons, (s)he would likely value another trip less than all prior experiences, and he or she may seek hunting opportunities elsewhere. This is known as the law of diminishing marginal benefits. Further, as individuals and societies become wealthier and environmental amenities become scarcer, environmental amenities will become increasingly more valuable to society.

The market demand for elk hunting in a given region, presented in Figure 7.1, is simply the 'horizontal summation' of the demand by all elk hunters; that is, add up how many trips would be taken by individuals at every single price. Demand is labeled MWTP for marginal WTP, and its downward slope reflects the law of diminishing marginal benefits. The entire area under the demand curve (areas A, B and C) represents the total economic benefit to society of being able to hunt in the elk trophy region. Suppose the price of a trip is P. At a price per trip of P, Q trips are taken. Beyond Q, it would be inefficient to engage in a hunt because the marginal benefits of hunting in the elk trophy region are less than the trip costs, P, which means the overall costs of a trip beyond Q exceed the total benefits of taking trips beyond Q. If the price fell, the number of trips (Q) would increase. Area B represents the travel expenditures incurred to hunt in the region. The travel expenditures incurred by travelers are the revenues earned by firms—simply, a transfer from consumers to producers. This amount is what is typically considered in an economic impact analysis. Area A represents CS. If somehow the opportunity to hunt in the elk hunting region was eliminated, the net monetary loss to society would be area A, recalling that area B is a transfer.

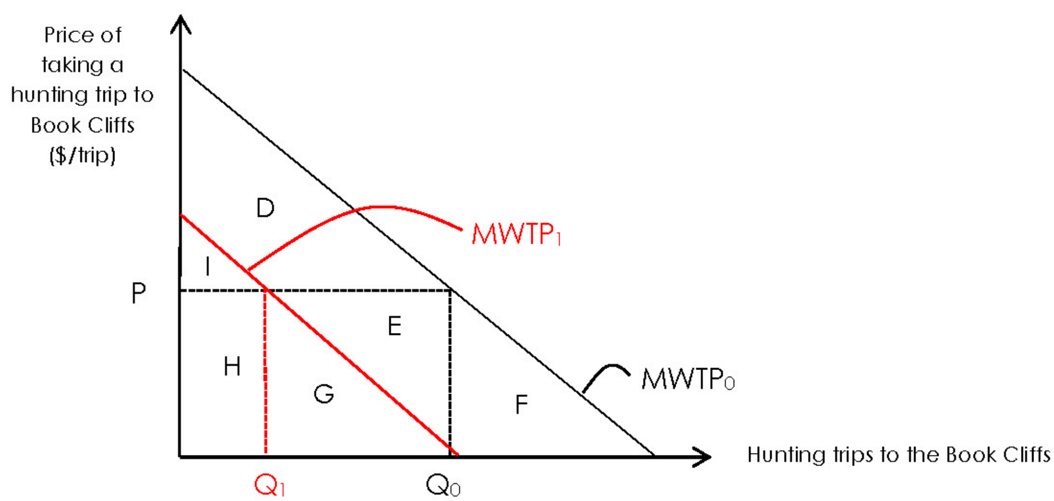
Figure 7.1
Market Demand



We can use Figure 7.1 to evaluate the economic losses and gains when there is a quality change at a recreational resource on public lands. Quality changes may result from natural factors such as wildfires, from policy changes such as access restrictions or restoration projects, or from productive changes in land use such as mining, oil and gas exploration and development. Consider the controversial issue of the proposed oil drilling leases on state-owned land in Utah's southern Book Cliffs. The State School and Institutional Trust Lands Administration (STLA) proposed such leases because the area could provide $120 million annually in royalties to schools. A concern raised by opponents was that STLA did not adequately address the negative effects of energy leases to Utah's hunting community, or the impact on areas with wilderness characteristics. The Utah hunting community asked that a portion of the proposed area be spared from development, as the area offers trophy elk and mule deer hunts. Residents must wait up to 8 years for the opportunity to hunt in the area, whereas the wait for non-residents is up to 13 years. The long waiting period is evidence of the quality of the hunts offered in the Book Cliffs (see, for example, www.backcountryhunters.org).

Using the Book Cliffs example, we can model the losses to hunters if hunting quality suffers as a result of oil exploration in hunting areas. When the quality of the hunting experience declines, fewer hunters will want to hunt; thus, the demand for hunting in the Book Cliffs area shifts from $MWTP_0$ to $MWTP_1$ (Figure 7.2). Again, assuming the price of a trip is P, then the economic value of hunting prior to any oil exploration in the region is represented by the sum of areas D, E, G, H, and I (area F represents an area where the benefit is less than the cost of taking a hunt trip, so no hunting trips are made beyond Q_0). If P falls, then more trips will be taken. Areas D and I represent the initial CS but, with oil exploration, CS is given only by area I representing a loss in CS equal to area D. The loss in revenue from trip expenditures is E and G.

Figure 7.2
Impact on Demand When Site Quality Declines



Why do economists believe area D (the loss in consumer surplus) is important, perhaps even more important than the losses in expenditures given by areas E and G? Think about hunters' experiences to hunt in the Book Cliffs. Hunters value the experience such that they are *willing* to give up their scarce resources of time and money to engage in the activity; the sum of this amount is all the areas D, E, F, G, H, and I. Recall, however, that areas E, G, and H, are simply transfers from consumers to producers, and F represents the area where it would be inefficient for a hunter to take a trip because the cost to take a trip exceeds the benefit to the hunter. The remaining amount is areas D and I, which capture the net value of a hunting trip. Think about it this way. Hunters are willing to give up the opportunity to purchase other goods and services for the right to hunt in the Book Cliffs. Take the experience away—or substantially alter the quality of the experience—and we can see the loss to hunters in monetary terms as well as losses in any trip related spending by hunters.[171] If this amount is ignored then societal resources will not be allocated efficiently. This is why CS estimates are advocated by economists and used in litigation to establish monetary damages in courts of law. The purpose is to ensure that scarce resources are allocated in the most efficient way for society.

Methods for Estimating Recreational Values

Economists have come up with a set of methods, referred to as nonmarket valuation, to estimate recreational and environmental values. A primary reason for the use of these methods is to inform policy makers about benefits and costs of proposed changes to environmental resources or environmental quality. With this information policy-makers are able to assess trade-offs and actions for placing scarce resources in uses that yield the greatest benefit or value (i.e., allocative efficiency). Loomis (2005) points out two advantages of using nonmarket valuation as an informational input in environmental policy-making. First, valuation of environmental quality demonstrates that the environment provides utility to individuals in much the same way as market goods and services. Nonmarket valuation, which estimates the benefits of environmental quality to society, helps alleviate the characterization of pitting environmental policy against the economy. Second, nonmarket environmental valuation demonstrates that there is a balance between market and nonmarket activities—public policies need not embrace an "all or nothing" perspective (Loomis 2005, p. 180). Rarely is zero percent pollution optimal, unless of course the problem poses significant damages to society and can be cleaned up at a relatively low opportunity cost. Nor is allowing all pollution to be emitted an optimal outcome unless damages are very small and eradication expenses very large. Simply, nonmarket valuation helps identify how clean is clean enough. The concept of diminishing marginal benefits suggests that cleaning up initial levels of pollution yields the greatest benefit to society, but at some point removing more pollution may not warrant the additional use of scarce resources because the benefit is simply lower than the opportunity cost. This means that scarce resources would be better used elsewhere. Apply this logic to the conflict between mining and recreational use on public lands; there is a balance between the two, and nonmarket environmental valuation can help policymakers find the appropriate balance of activities.

Nonmarket valuation approaches are classified as either the revealed preference (RP) method or the stated preference (SP) method. The most common RP approach for estimating nonmarket recreational values and calculating changes in CS for recreation resources is the travel cost method (TCM). The idea behind the TCM is quite intuitive: The farther a person lives from a recreational resource, the greater the travel expenditures to visit the site, and the fewer the trips the individual will take. This concept follows directly from the law of demand—when price is higher, individuals will purchase less.

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[171] Again it should be restated that spending by hunters is simply a reallocation from either the hunter to businesses, or from one business to another. The idea is that if hunters do not spend money on trip related expenditures, they will spend that money elsewhere; thus, it is simply a transfer.

The TCM typically involves surveying recreational users (e.g., mail, Internet, etc.) about their trips, or through an on-site inventory of visitors or a survey of visitors. In a survey recreational users are typically asked to provide detailed information about their recreational trips to a particular area (quantity and activity) during a specified period of time as well as trips to other recreational areas they may have visited during the same time period, and importantly, where the user traveled from in order to calculate travel costs. The importance of asking about other recreational areas visited is to control for the availability of substitute sites. If studies do not control for substitution effects, then losses in CS will be overstated if access to or quality of the site is diminished. Indeed, users will be worse off when site quality is diminished, but losses in CS will be less if substitute locations exist. Statistical methods are applied to the trip data to estimate demand and changes in demand if a change in access or site quality occurs. The TCM and other related methods have been applied in many contexts including big game hunting (Bhat et al. 1998), fishing (Loomis 2006; Morey et al. 2002; Bhat et al. 1998), climbing (Grijalva et al. 2002), hiking (Hesseln, Loomis, and Gonzalez-Caban 2004; Hesseln et al. 2003; Englin, Loomis, and Gonzalez-Caban 2001; Loomis, Gonzalez-Caban, and Englin 2001), mountain biking (Hesseln, Loomis, and Gonzalez-Caban 2004; Hesseln et al. 2003; Chakraborty and Keith 2000; Fix and Loomis 1998), camping (Bhat et al. 1998), motorized boating (Bhat et al. 1998), off-highway vehicle access (Jakus et al. 2010), sightseeing (Bhat et al. 1998; Sanders, Walsh, and McKean 1991), and many more, and for many recreational activities and sites throughout the U.S. and Canada.

Stated preference techniques similarly involve surveying individuals and asking them to state their WTP for improved access or site quality (e.g., the contingent valuation method, CVM), or to state how their trip behavior would change if there were a change in site access or quality (e.g., contingent behavior, CB). SP methods are attractive as they allow researchers to measure changes in well-being from a change in site quality that has not yet occurred. Thus, this method provides an effective way to measure benefits and costs from proposed changes in site quality. Another key feature of the CVM is that it allows researchers to estimate total economic value, which includes both recreational and nonuse values such as bequest or existence values (i.e., individuals value knowing the resource exists or is available for future use even if they do not visit it). Similar to the TCM, SP methods have been applied in many recreational contexts.

Support for benefit-cost analysis (BCA), and thus nonmarket valuation as an input in a BCA, is found in many federal land use and environmental policies and Executive Orders issued by the President. BCA has been adopted by the Courts in natural resource damage assessment cases. Congress has passed a number of Acts that resulted in laws directing federal land management practices. The body of legislation recognizes that public lands supply many environmental goods and services, and quality of life benefits. Some of these Acts include the Multiple Use Sustained Yield Act (MUSYA) of 1960, the Wilderness Act of 1964, the Renewable Resources Planning Act (RPA) of 1974, and the National Forest Management Act (NFMA) of 1976. For example, the MUSYA directs the USFS to manage multiple forest outputs based on relative values and to ensure that current harvests do not interfere with future production of renewable resources; and the NFMA includes the explicit objective of managing National Forests, "towards the desired result of maximizing net public benefits" (47 FR 1982, 43026; P.L. 93-378 codified at 16 U.S.C §§1600-1687). The USFS (47 FR 1982, 43039) defines net public benefit as "an expression used to signify the overall long-term value to the nation of all outputs and positive effects (benefits) less all associated inputs and negative effects (costs), whether they can be quantitatively valued or not." Further, beginning in the late 1970s, the U.S. Army Corp of Engineers and Bureau of Reclamation were required to use nonmarket valuation techniques to value recreation benefits for projects with high visitation levels (Loomis 2005). The result of this body of legislation is that federal land managers are directed to manage land for a variety of uses. Federal land managers cannot achieve an optimal (i.e., efficient) balance of uses unless they are able to assess the social values of different potential uses of the land.

Other federal policies such as NEPA and Executive Orders (EOs) 12291 (February 17, 1981, under President Reagan) and 12866 (September 3, 1993, under President Clinton), which affect all federal agencies, establish additional validation for the use of nonmarket valuation. EO 12291 is designed to reduce the burden that federal regulation has on the economy by requiring that all federal agencies use benefit-cost analysis (BCA) to analyze the impact on the private sector of new major regulations. Although EO 12866 supersedes EO 12291, EO 12866 still requires a BCA for significant regulatory actions, where net benefits are parenthetically qualified to include environmental, public health and safety advantages, distributive impacts, and equity.[172] Today, the Environmental Protection Agency (EPA) has economists on hand to conduct BCAs of environmental regulations.

Nonmarket valuation has also been used to assess environmental hazards and economic costs in natural source damage assessment cases (CERCLA 1980) (see for example Jones 1997). When Congress passed the Oil Pollution Act of 1990, NOAA (the responsible agency) recommended CVM be used to measure both recreation and passive use values lost due to oil spills, in which the method found support from a blue ribbon panel chaired by two Nobel Laureates commissioned by NOAA. The U.S. Department of Interior adopted the CVM for valuing the loss in recreation and existence values from toxic waste sites and hazardous material spills. Carefully designed and implemented CVM surveys can provide estimates of total economic values of resources.

Table 7.3
Recreational Values by Valuation Method
(All Land Types, Census Division 8)

Activity	Valuation Method	Number of Estimates[1]	CS/day (2012 $)
Backpacking	SP	2	$41.96
Camping	SP	14	$7.48
	RP	36	$27.09
Freshwater fishing	SP	86	$88.85
	RP	77	$71.29
	Mix of RP and SP	11	$215.56
Floating/rafting/canoeing	SP	22	$173.97
	RP	14	$81.57
Hiking	SP	6	$23.78
	RP	16	$88.65
Big game hunting	SP	69	$102.02
	RP	28	$72.87
Small game hunting	SP	12	$123.47
	RP	5	$59.72
Waterfowl hunting	SP	11	$93.12
Motorized boating	SP	2	$18.33
	RP	14	$36.55
Mountain biking	SP	1	$91.70
	RP	10	$202.88
	Mix of RP and SP	4	$183.25
Off-highway vehicle use	SP	7	$50.20
	RP	3	$61.21
Picnicking	SP	1	$17.33
	RP	4	$21.87
Rock climbing	SP	2	$32.45
	RP	4	$38.47
Sightseeing	SP	3	$41.23
	RP	6	$57.37
Swimming	RP	5	$29.48
Wildlife viewing	SP	28	$65.21
	RP	8	$70.78
General Recreation	SP	11	$63.90
	RP	31	$27.07
Other Recreation	SP	5	$27.11
	RP	48	$27.79
ALL types combined	SP	282 (47% of studies)	$87.57
	RP	309 (51% of studies)	$56.83
	Mix of RP and SP	15 (2% of studies)	$206.94

1. Total number of estimates in Census division 8 is 606.

[172] Executive Orders 13258 (February 26, 2002) and 13422 (January 18, 2007) amended EO 12866. On January 30, 2009, President Obama issued EO 13497 revoking EOs 13258 and 13422.

Professor Randy Rosenberger from Oregon State University has compiled a database of over 2700 CS estimates of various recreational activities from more than 350 recreation demand studies from 1958 to 2006, with 707 CS estimates from the mountain region (U.S. Census Division 8). Table 7.3, above, provides a look at the number of recreational demand studies conducted in the intermountain west. Estimates from these studies can be used for benefit transfer; using previously estimated recreational values to provide insight into the value of recreation on public land in the Intermountain West.

Background on Benefit Transfer

Benefit transfer is the process of using economic values estimated for environmental goods and services at one location at a particular time and applying these values to another location at a different time. "Benefit transfer takes values from one biophysical, economic, temporal, and spatial situation and transfers them to another" (Wilson and Hoehn 2006, p. 336). Resource and time constraints often preclude the ability to conduct a unique study to estimate values for environmental goods and services. Benefit transfer provides a low-cost way to assign monetary values for environmental goods and services. Wilson and Hoehn (2006) suggest that agencies worldwide are increasingly expected to assess the full benefits and costs of proposed legislation or development projects that have an impact on the natural environment. Estimates of benefits and costs help agencies justify their decisions, demonstrate fiscal responsibility, and earn public support.

Benefit transfer has evolved into a viable approach since the mid-1980s. A workshop sponsored by Association of Environmental and Resource Economists in 1992, and an international conference held by the U.S. Environmental Protection Agency and Environment Canada in 2005 were dedicated to furthering our understanding and improving the science of benefit transfer. Further, two academic journals dedicated special issues to benefit transfer: *Water Resources Research* (Vol 28, issue 3, 1992), and *Ecological Economics* (Vol 60, 2006). Because economic analysis can provide important and valuable information for policy decision-making, the U.S. Environmental Protection Agency has prepared guidelines for using sound science in completing an economic analysis or benefits transfer. Such analyses help the agency plan and prioritize as well as meet requirements set forth by Executive Orders such as EO 12866.

There are two common approaches to conducting a benefits transfer. The first approach involves estimating values as a function of variables that explain the attributes of an environmental setting and characteristics of the study (e.g., did the study consider substitute recreational sites). Adjusting for differences between the study site and policy site might be necessary for making meaningful benefit transfers. One approach for doing this is meta-analysis: a statistical way of summarizing results from a number of studies. For example, Smith and Kaoru (1990) used a meta-analysis of recreation valuation studies to estimate values to be used in a benefit transfer.

The second approach involves simply transferring monetary values from one context to another. Value transfers apply a single statistic, for example an average consumer surplus estimate from several study sites, to the policy or target site. A potential drawback of this approach, however, is that value transfers do not account for any differences between the study sites and the site in question. That is, benefit estimates based on assumptions or conditions in original studies may differ from the target site. Further, estimates from original studies may not contain important demand information such as income or prices of substitute sites that would be desirable for facilitating transfers. On the other hand, when there is a need for a general understanding of the benefits of a certain type of recreational activity in a general region or area, then a simple value transfer will likely be cost effective. This is because there is no unique site change that warrants estimating a benefit transfer function from multiple study value estimates.

Methods

We employ the value transfer method for two primary reasons: (1) there are a number of studies that provide value estimates for several recreational activities in the mountain region; and (2) there is no unique quality or policy change at a specific recreational site.[173] If USFS or BLM general use land is acquired by the State of Utah, and the land continues to be managed as in the same manner, individuals will continue to experience the recreational benefits of the land. This assumption is important because we are unable to estimate changes in land use and hence changes in demand. We are only able to indicate the value of recreating on public lands under current conditions.

Data were provided by the Recreational Use values Database for North America (Rosenberger 2011) and supplemented with three additional studies of off-highway vehicle recreation that were not included in the database. Overall the data includes 2,707 CS estimates from 355 valuation studies of recreational use in the U.S. and Canada. Of this total there are 602 CS estimates of recreational activities obtained from 191 studies that take place on public lands in U.S. Census division 8 (Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, and Wyoming). Three additional studies of off-highway vehicle recreation were added to the final data. Four additional estimates from these three OHV studies were added to the 602 estimates obtained from the Rosenberger database; thus there are a total of 606 recreation value estimates for Census division 8. One limitation of the valuation data is that there are no current studies of skiing on public lands. Skiing is one of Utah's premier recreation activities and therefore our benefit estimate , unfortunately, does not include the value of skiing on public land.

Consumer surplus estimates were analyzed from several perspectives. First, we breakdown the CS values by recreational activity and nonmarket valuation method. Again, referring to Table 7.3, average CS estimates (2012 dollars) are presented for 16 specific activities (two additional general categories, general and other recreation are also included) and by valuation method, either RP or SP. Overall for Census division 8, 282 recreational values were estimated using SP methods and 309 values were estimating using RP methods with an average daily CS value of $87.57 and $56.83, respectively. CS estimates from SP methods are approximately 1.5 times greater than those obtained from RP methods; this result is not surprising in that SP methods such as the contingent valuation method measure total economic value, both use and nonuse values (e.g., the value of knowing a natural resource exists or is available for use by those living in the future); whereas the TCM would simply measure recreational use benefits. Second, we compare CS values by recreational activity and by land type. Table 7.4 presents average CS estimates (2012 dollars) by public land type in Census Region 8. Of the 606 recreational values, 171 of the values are from activities that took place on USFS land (12 of the 16 specific activities), whereas only five of the values (but for three activities only) are from activities on BLM land. The activity on USFS land with the greatest value of $129.22 per day is mountain biking. According to the OIA, Americans spend more on bicycling gear and trips ($81 billion) than they do on airplane tickets and fees (p. 4), thus supporting the finding of a high CS estimate. Hiking on BLM land has the

[173] The accuracy of benefit transfer is conditioned, in part, on the measurement errors contained in original studies. A portion of this measurement error is inevitably passed through from original valuation estimation and may even be amplified by benefit transfer if care is not taken to minimize such effects (Wilson and Hoehn 2008, p. 336).

greatest value of $183.53 per day. On average, the value of recreating on USFS land is $52.87 per day, and $79.31 to recreate on BLM land.

Our primary analysis focuses on evaluating recreational activities that take place on USFS and BLM land in Census division 8. Thus, the daily CS estimates for recreational activities on USFS and BLM land are the primary focus of determining aggregate CS, or aggregate net benefit, estimates for recreation in Utah. After obtaining average daily CS estimates for USFS and BLM land, we then compute aggregate CS estimates by obtaining participation data. Aggregate CS, B_j, for activity j is given by the following:

$$B_j = CS_j \times N_j, \tag{1}$$

where CS_j represents the average CS estimate for activity j on USFS and BLM land, and N_j represents annual days of participation by Utah residents in activity j. Two sources are used to obtain participation figures. First, we obtain participation data for fishing, hunting, and wildlife viewing in Utah by Utah as well as non-Utah residents from the National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (FHWAR) administered by U.S. Department of Interior, U.S. Fish and Wildlife Service, and U.S. Department of Commerce, U.S. Census Bureau (2011). Aggregate CS surplus values are based on total annual days of participation in Utah for Utah and non-Utah residents. The results are provided in Table 7.5.

Table 7.4
Recreational Values by Public Land Type
(All Value Methods, Census Division 8)

Activity	Land type	Number of estimates[1]	CS/day (2012 $)[2]
Backpacking	USFS	2	$41.96
Camping	USFS	44	$20.98
	NPS	1	$0.94
	State Park	1	$14.95
	Other	2	$33.39
	Mix	2	$37.03
Freshwater fishing	USFS	38	$75.61
	NPS	2	$73.42
	State Park	4	$14.33
	NRA	3	$82.19
	Other	45	$117.84
	Mix	82	$83.85
Floating/rafting/canoeing	USFS	10	$107.64
	NPS	13	$232.07
	BLM	1	$29.38
	Other	12	$70.56
Hiking	USFS	21	$65.59
	BLM	1	$183.53
Big game hunting	USFS	7	$48.58
	Other	9	$35.35
	Mix	81	$103.97
Small game hunting	USFS	1	$86.47
	Mix	16	$105.86
Waterfowl hunting	Mix	11	$93.12
Motorized boating	State Park	4	$34.17
	Other	10	$29.03
	Mix	2	$60.68

(continued)

Table 7.4
Recreational Values by Public Land Type
(All Value Methods, Census Division 8)

Mountain biking	USFS	8	$129.22
	Other	3	$82.85
	Mix	4	$392.80
Off-highway vehicle use	USFS	2	$51.96
	Other	5	$49.49
	BLM	3	$61.21
Picnicking	USFS	5	$20.96
Rock climbing	State Park	6	$36.46
Sightseeing	USFS	4	$27.89
	NPS	2	$33.74
	Other	2	$55.08
	Mix	1	$178.67
Swimming	State Park	1	$12.15
	Other	4	$33.81
Wildlife viewing	USFS	5	$60.02
	NPS	2	$47.96
	NWR	2	$49.14
	Other	3	$88.71
	Mix	24	$67.98
General recreation	USFS	12	$27.55
	NPS	8	$36.29
	Other	22	$41.86
Other recreation	USFS	12	$24.57
	NPS	2	$25.12
	Other	2	$81.23
	Mix	37	$26.00
ALL types	USFS	171 (28% of studies)	$52.87
ALL types	BLM	5 (0.01% of studies)	
ALL types	USFS and BLM	176 (29% of studies)	$53.62

1. Total number of estimates in Census division 8 is 606.
2. CS estimates converted to 2012 dollars using CPI for all urban consumers, bls.gov.

Table 7.5
Aggregate Measures of Consumer Surplus for Fishing, Hunting, and Wildlife-Associated Recreation on USFS and BLM Lands

Activity	**Estimates**	**CS/Day** (2012 $)	**Total Annual Days** (Millions)[1]	**Mean Days per Participant**[1]	**Aggregate CS** (Millions)
Freshwater fishing	174	$89.09	5.98	14	$532.8
Big game hunting	97	$93.61	1.96	14	$183.5
Small game hunting[2]	17	$104.72	0.45	14	$47.1
Wildlife viewing[3]	36	$66.44	8.14	13	$540.8
Waterfowl/migratory bird hunting[2]	11	$93.12	0.60	Not Available	$55.8
Total					$1,360.0

1. Figures represent participation by Utah residents and nonresidents for activities in Utah during 2011.
2. Small sample of 10-29
3. Total annual days includes both observing, photographing, and feeding wildlife (5.2 away-from-home million), and observing birds (2.97 million away-from-home days)

Sources: U.S. Fish and Wildlife Service, U.S. Census Bureau, 2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation.

Table 7.6
Aggregate Measures of Consumer Surplus for Outdoor Recreation on USFS and BLM Land

Activity	Estimates	CS/day (2012 $)	Participants in Eight Intermountain States (Thousands)[1] (Share of Population)	UT Participants 2013 (Thousands)[2]	Mean [Median] Days per UT Participant	Aggregate CS for UT Residents (Millions)
Backpacking	2	$41.96	3,219.6 (14.9%)	305.46	13.43 [5]	$172.1
Camping	44	$20.98				
Primitive			5,737.9 (26.7%)	547.38	9.89 [6]	$113.6
Developed			7,301.1 (34%)	697.03	8.76 [6]	$128.1
Floating/rafting/canoeing[3]	11	$100.53				
Rafting			2,160.3 (10.2%)	209.11	4.14 [2]	$87.0
Kayaking			948 (4.5%)	92.25	7.47 [3]	$69.3
Rowing			757.8 (3.6%)	73.80	7.76 [41]	$57.6
Canoeing			1,397.5 (6.7%)	137.36	3.04 [2]	$42.0
Swimming in streams, lakes, etc.			7,284.1 (34.5%)	707.28	9.44 [5]	$671.2
Day Hiking[3]	22	$70.95	9,901.7 (46.1%)	945.09	20.24 [6]	$1,357.2
Mountain biking	8	$129.22	97.7 (26.2%)	537.12	18.70 [6.5]	$1,297.9
Off-highway vehicle use	5	$57.51	5,746.6 (27.1%)	555.58	16.13 [7]	$515.4
Motorized boating[4]	16	$34.28	4,935.8 (23.5%)	481.77	8.46 [4]	$139.7
Picnicking	5	$20.96	11,600 (54.6%)	1,119.35	9.46 [5]	$221.9
Sightseeing	4	$27.89	12,208.9 (57.8%)	1,184.95	25.02 [10]	$826.9
Total						$5,699.9

1. Source, Cordell (2012), based on data from the National Survey on Recreation and the Environment
2. Utah civilian population age 16 and over estimate for July 1, 2012 is 2,050,092 (U.S. Census released June 2013). Utah participation is found by multiplying Utah population figure by participation percentage from Cordell (2012).
3. There is a single estimate for BLM land for these activities.
4. No CS estimates on USFS or BLM land; first two columns based on all CS estimates regardless of public land type

Source: Cordell (2012), U.S. Census

Second, if participation data are not available from FHWAR, then we use participation data obtained from the 2000-2009 National Survey of Recreation and the Environment (NSRE) used by the USFS in its Resource Planning Act (RPA) assessment process (see Cordell 2012), and US Census Bureau data to calculate aggregate CS values for backpacking, camping, river activities, hiking, mountain biking, off-highway vehicle (OHV) access, motorized boating, picnicking, and sightseeing. The NSRE provides participation figures and rates for residents aged 16 and older living in the eight mountain states. These figures are provided in Table 7.6, column 4. For example, according to the NSRE, approximately 3.2 million people age 16 and older in the eight mountain states, or 14.9 percent of the population, backpack annually. We multiplied 14.9 percent by the Utah civilian population age 16 or older to obtain a participation figure for Utah residents of 305 thousand. By and large, the participation figures are more conservative than participation figures provided in the 2014 Utah State Comprehensive Outdoor Recreation Plan

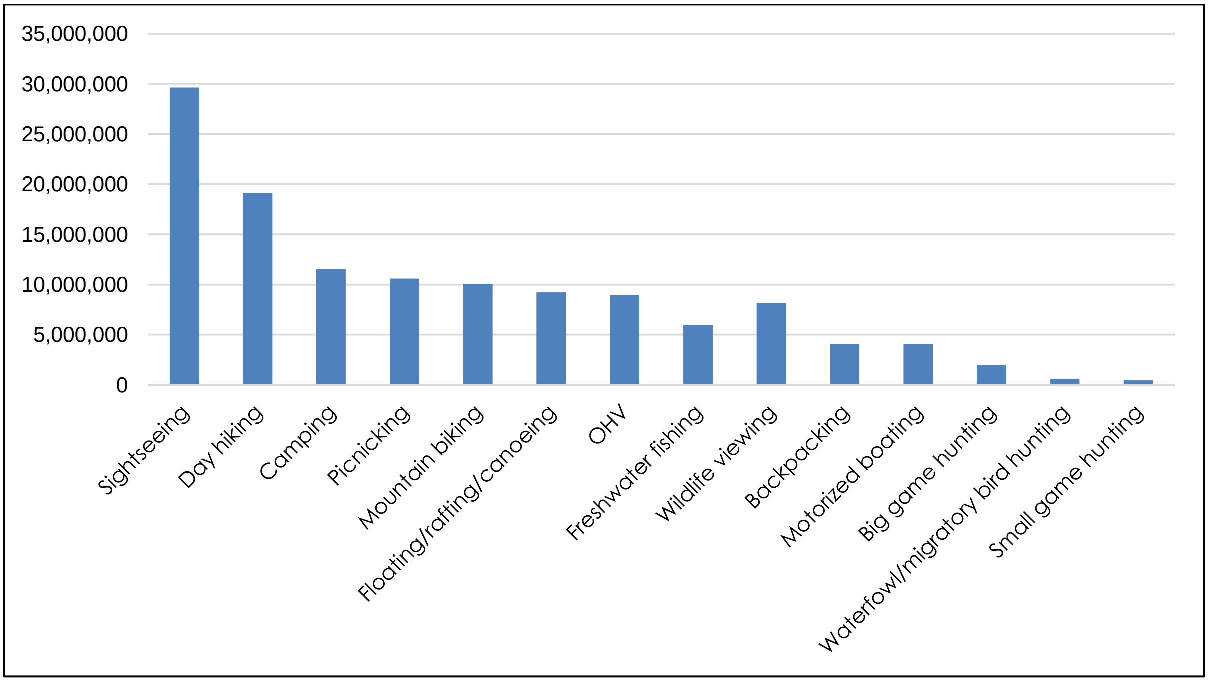
(SCORP) (prepared by Division of State Parks and Recreation). According to the NSRE, the participation rates for mountain biking and OHV use are 26.2 percent and 27.1 percent, respectively, and according to SCORP these two activities have participation rates of 28.2 percent (mountain biking) and 47.5 percent (OHV use). SCORP reports participation rates for hiking and backpacking combined of 78.2 percent. Further, according to SCORP, participation rates are increasing. The NSRE also provided mean and median days of participation by Utah participants. The daily CS values are multiplied by the Utah participation figures and by the mean days per Utah participant to provide aggregate CS values for backpacking, camping, river activities[174], hiking, mountain biking, OHV access, motorized boating, picnicking, and sightseeing.

To be clear, the aggregate CS estimates for backpacking, camping, river activities, hiking, mountain biking, OHV access, motorized boating, picnicking, and sightseeing reflect the benefit that Utah residents received by recreating on USFS or BLM land in Census division 8. By comparison, the estimates for fishing, hunting, and wildlife viewing are strictly based on participation in the state of Utah by both Utah residents and nonresidents.

Discussion

The following discussion is based on information in Tables 7.5 and 7.6.

Figure 7.3
Annual Days Participation



Participation

Of all recreational activities considered, sightseeing has the greatest participation of almost 30 million person-days per year. The activity with the lowest participation is small game hunting with approximately 450 thousand days per year. Figure 7.3 presents total annual days of partici-

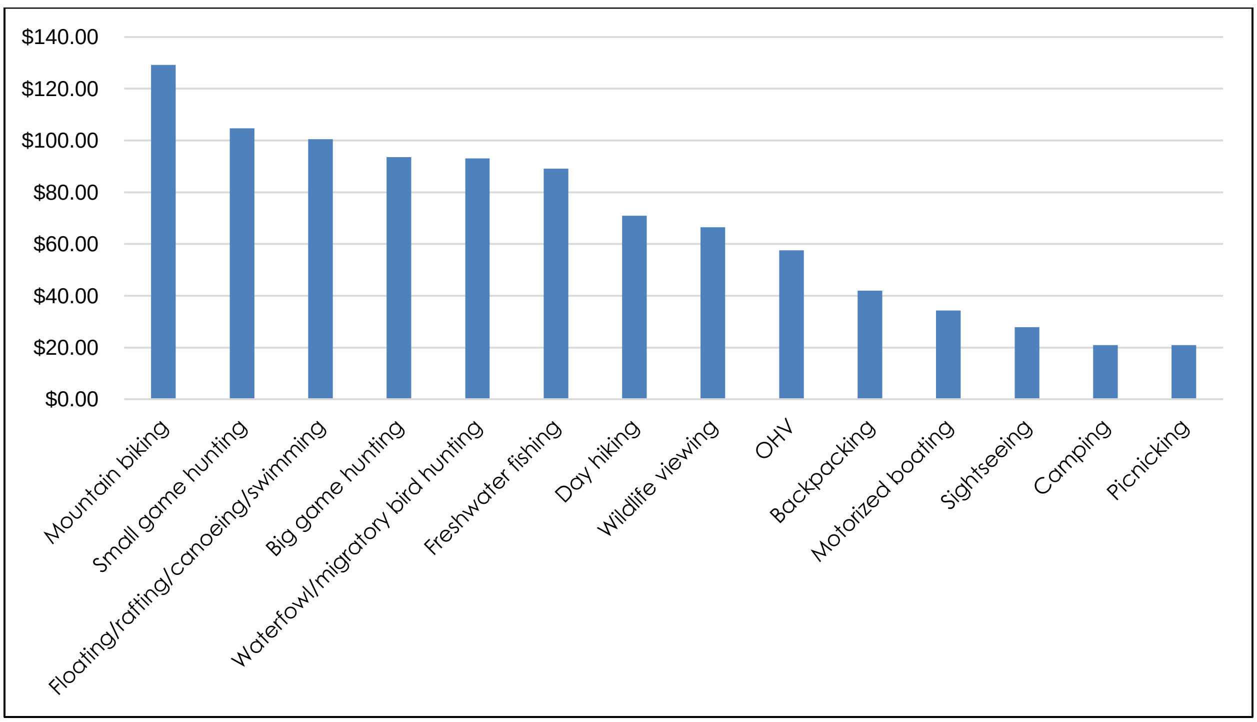
[174] We gathered participation data for the following river activities: rafting, kayaking, rowing, canoeing, and swimming. We use one common CS value, $100.53, for all these activities.

pation for 14 recreational activities. The total annual days of participation in these 14 activities is over 124 million days. Overall participation in hunting, fishing, and viewing wildlife in Utah by residents and nonresidents is over 17 million days annually. Average participation across the 14 recreation activities is over 8.9 million days annually. Using the Utah population aged 16 and over in July 2012 of 2,050,092, and including annual days of participation by Utah residents' only (119 million days versus the total of 124 million days, which also includes nonresidents that fish, hunt, and view wildlife in Utah), on average a Utah resident 16 years or older participate in outdoor activities approximately 58 days per year.

Daily Consumer Surplus

Figure 7.4 presents the daily CS estimates for the 14 recreational activities. Three activities have daily CS estimates above $100: mountain biking, small game hunting, and floating/rafting/ canoeing/ swimming. The activities with the lowest CS/day are picnicking and camping, both at just under $21/day. CS recreational values are the net of the enjoyment value a person receives from participating less the expenditures to participate in a particular activity. Some highly valued activities may have lower CS values simply because travel expenditures to participate in an activity such as motorized boating are relatively high; thus, the extra gain to the consumer (what they are willing to pay over and above what they have to pay) may not be great (e.g., CS/day for motorized boating is $34.28).[175]

Figure 7.4
Consumer Surplus per Day
(2012 Dollars)

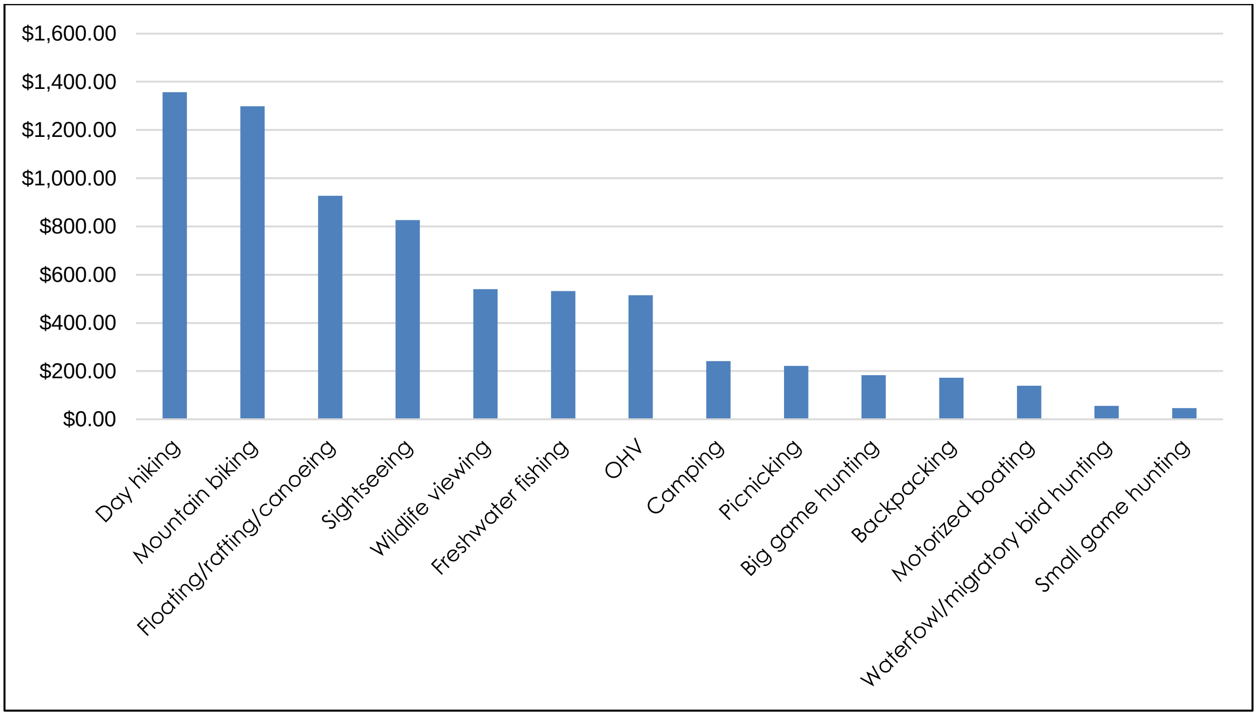


[175] Of course motorized boaters would like the experience to cost less so they received a greater net benefit or CS.

Aggregate CS

Aggregate CS estimates are found in the last columns of Tables 7.5 and 7.6, and presented in Figure 7.5. Day hiking has the greatest aggregate value at $1.357 billion, and mountain biking is not far behind at $1.298 billion. Mountain biking has both a high CS/day estimate and annual participation, but day hiking has significantly greater participation. Sightseeing has a relatively high aggregate net benefit of over $825 million because of the large number of participant days. All of the hunting activities have relatively high CS/day estimates.

Figure 7.5
Aggregate CS
(Millions of 2012 Dollars)



Summing all aggregate CS estimates results in an overall net benefit to Utah residents of approximately $7.1 billion for outdoor recreation. To place this figure in comparison, outdoor recreation generated $12.0 billion in consumer spending in Utah (including gear and travel expenditures) (OIA 2012). Based on the breakdown of national spending on outdoor recreation ($645.5 billion), where 81.3 percent of this amount is generated from trips and travel-related sales, consumer spending on travel in Utah would then be $9.8 billion (81.3 percent of $12 billion).

Utah is known as a world class recreation and tourist destination attracting visitors from throughout the world. The values these nonresident visitors place on recreating in Utah are not included in this CS estimate of $7.1 billion (except for fishing, hunting, and viewing wildlife). Utah Office of Tourism predicts that in 2012 there were 23.5 million nonresident tourists (see Leaver, 2014). Of this amount 32 percent (7.5 million visitors) visited national and state parks, 20 percent visited historic sites, 17 percent hiked, 12 percent camped, 4 percent biked, and 4 percent viewed wildlife. The aggregate CS estimate of $7.1 billion indicates that outdoor recreation is a highly valued commodity by Utah residents.

7.1.3 Recreation and Covered Wages

Outdoor recreation provides many benefits to Utah's economy and it citizens. According to the prior analysis, the estimated net benefit of outdoor recreation to Utah residents is $7.1 billion. Further, nonresident tourism significantly benefits the Utah economy bringing new dollars into the economy, which will have an effect on many Utah industries, particularly accommodation and food services (A&F). In 2012, 23.5 million nonresident tourists visited Utah, representing an increase of 8 percent from the prior year. Sixty eight percent of nonresident tourists spent money in Utah on accommodations including hotels, vacation rentals, and campgrounds (for a detailed breakdown of nonresident tourism and spending in Utah see Leaver, 2014).

Table 7.7 presents annual data on establishments, employment, and wages in A&F for the State of Utah from 2001 to 2013. The Great Recession began at the end of 2007 and continued through 2010, yet during this period, nonresident tourism either declined or stayed flat. For example, nonresident tourism fell only slightly between 2007 and 2008 (20.5 million to 20.4 million), and then took a bigger dip in 2009, dropping to 19.5 million visitors. Presumably, this decline in 2009 would impact establishments, employment, and wages in A&F, which appears to be true; dips these three areas primarily occurred in 2009 only.

Table 7.7
Establishments, Employment, and Wages in Food and Accommodations for the State of Utah, 2001–2013

Year	Establishments	Change	Employment	Change	Covered Wages	Change	Overall State Covered Wages	Change
2001	4,191	—	82,273	—	$917,601,085	—	$32,090,069,420	
2002	4,323	3.1%	84,123	2.2%	$965,162,559	5.2%	$32,367,589,594	0.9%
2003	4,394	1.6%	84,152	0.03%	$971,115,104	0.6%	$32,918,843,488	1.7%
2004	4,645	5.7%	86,308	2.6%	$1,020,529,532	5.1%	$35,024,901,697	6.4%
2005	4,756	2.4%	87,926	1.9%	$1,089,815,783	6.8%	$37,734,330,630	7.7%
2006	4,826	1.5%	91,274	3.8%	$1,204,812,001	10.6%	$41,685,990,646	10.5%
2007	4,729	–2.0%	94,918	4.0%	$1,319,169,098	9.5%	$45,729,539,233	9.7%
2008	4,814	1.8%	97,280	2.5%	$1,401,127,940	6.2%	$46,952,891,915	2.7%
2009	4,848	0.7%	93,532	–3.9%	$1,334,620,595	–4.7%	$45,277,516,223	–3.6%
2010	4,881	0.7%	93,416	–0.1%	$1,368,479,070	2.5%	$45,900,714,126	1.4%
2011	5,007	2.6%	95,780	2.5%	$1,431,222,771	4.6%	$47,974,235,582	4.5%
2012	5,128	2.4%	99,684	4.1%	$1,528,657,827	6.8%	$50,802,443,346	5.9%
2013	5,239	2.2%	104,237	4.6%	$1,603,937,995	4.9%	$53,021,463,298	4.4%

Promoting outdoor recreation and tourism could have a strong impact on the A&F industry. And as tourism grows, the demand for products and services provided by the accommodation and food industry would grow. Thus, as the demand for accommodation and food services grow, so does the demand for workers. Thus, recreation and tourism enhances employment opportunities, and as long as any changes in the supply of workers is less than the increase in demand for workers, wage levels will increase. In this section, we use a regression analysis to assess the effect of tourism and recreation, and public lands ownership and management on the growth in wages generated in the A&F industry. Specifically, we look at county-level annual covered wage growth in A&F for the State of Utah between 2001 and 2012. The reason for not looking at the growth in wages for the entire recreation industry, which presumably benefits from recreation-related tourism, is because recreation is not an established industry structure defined by the North American Industry Classification System (NAICS). NAICS is the standard used by Federal agencies in classifying business established for the purpose of collecting, analyzing, and reporting economic statistics related to the U.S. business economy. A recreation industry is composed of elements from many industry sectors including manufacturing, retail sales, accommodations and food services, rental goods, etc., thus making it challenging to define the industry (e.g., see Thiriot and Wood 2014).[176]

A common concern about the relationship between tourism and wages is that tourism supports low-wage jobs. In 2013 in the state of Utah, payroll per employee in A&F ranked lowest among all economic sectors, at $15,387 compared to the average payroll per employee of $45,911 across the 21 NAICS industry sectors in Utah. Yet A&F employs a relatively high number of workers, 104,238 versus the average of 61,698 across the 21 sectors. While we do not tackle the low-wage job concern directly, as part of our analysis, we include overall State wage growth. For instance, we can ask, "What is the impact on county-level wages in A&F when overall State wage growth increases by 1 percent?" Suppose the relationship is positive but less than 1. Then we can conclude that State wage growth has a spillover benefit on wages in A&F, but wages in A&F are growing more slowly than overall wage growth for the State, all else equal.

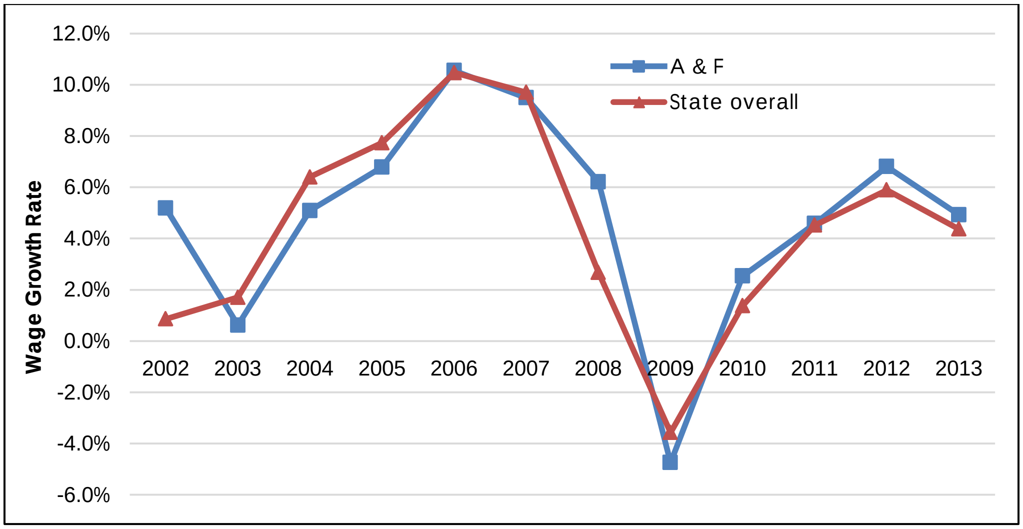
As recreation becomes a focus for rural economic development, it seems important to explore whether there are differences in wage growth in counties that have established a strong recreation-based industry sector with those that have not. In addition to controlling for the role of public lands ownership and management, and State wages, we also include a variable to indicate whether a county's economy relies on outdoor recreation. More details of the model and variables used in the regression equation are described in the next section.

Data and Model

We estimate a cross-section, time series model of covered wage growth in A&F across the 29 Utah counties for the years 2001 through 2012. Table 7.7 presents a side-by-side comparison of overall State wage growth rates and A&F wage growth rates over the twelve year period, and Figure 7.6 graphically demonstrates these growth rates. Wages in A&F services track well with overall state wage growth. During the Great Recession period wages in A&F services fell by 4.7 percent versus 3.6 percent for the State overall.

[176] Thiriot and Wood (2014) attempt to define a recreation industry at the State level by including 19, six-digit NAICS industry categories that captures a large majority of economic activity associated with outdoor recreation. The 19 codes come from the following two-digit NAICS sectors: manufacturing; wholesale trade; retail trade; real estate and rental and leasing; educational services; arts, entertainment, and recreation; and accommodation and food services. Unlike other attempts to define a recreation industry (e.g., see OIA 2012), Thiriot and Wood do not include much of the economic activity associated with tourism which is often classified in the accommodation and food services industry sector (e.g., restaurants and hotels).

Figure 7.6
Annual Covered Wage Growth



The variables we include in the model are presented in Table 7.8. We include four land ownership and management variables: NPS, PROTECTED land, FEDERAL multiple use land, STATE multiple use land, and OTHER land. (Private land is the background category excluded for estimation purposes.) Each of the land ownership variables are measured as the proportion of total state land area held in each particular category. Overall State wage growth (STATEWAGE) is included to control for any economic spillovers from overall State economic performance. Other variables include covered employment in the mining industry (MININGEMP), highway miles in a county (HIGHWAY), an indicator variable for counties that have a large recreation-base (RECREATION), and an indicator variable for Salt Lake County (SLC). The inclusion of MININGEMP as an explanatory variable for wage growth in A&F services is based on the premise that mining communities are often characterized by boom periods during which in-migration of miners outpaces the ability of the construction sector to build more housing, leaving communities with an insufficient stock of housing. Thus, many workers may seek housing in hotels or motels, and eat at restaurants. HIGHWAY miles is included because many hotels and restaurants are found along highway routes to accommodate travelers, an effect which has little to do with public lands ownership and management. RECREATION is included to determine if wages grow quicker in counties that have a strong recreation base versus those that do not. Lastly, we include an indicator variable for Salt Lake County (SLC) to control for the role that large conferences and cultural attractions of the Salt Lake valley have on the A&F industry. We estimate a linear model using a generalized estimating equation (GEE) that accommodates a wide variety of possible error structures that may be present in time series-cross-sectional data.

$$WAGE_{it} = \alpha_0 + \alpha_1 LAND_i + \alpha_2 STATEWAGE_t + \alpha_3 MININGEMP_{it} + \alpha_4 SLC \\ + \alpha_5 HIGHWAY_i + \alpha_5 RECREATION_i + e_{it}$$

The term LAND captures the set of land ownership and management variables. The alpha terms (α) are the population-averaged effects.

Table 7.8
Variable Sources and Descriptive Statistics

Variable	Mean	Standard Deviation	Source
PROTECTED	10.452	7.453	Protected Area Database of the United States (PADUS), USGS
NPS	2.670	5.551	PADUS
OTHER LAND	8.654	12.718	PADUS
FEDGEN	43.706	20.442	PADUS
STATEGEN	6.197	3.410	PADUS
STATEWAGE	1.885	3.227	Utah Department of Workforce Services (DWS), Bureau of Economic Analysis (BEA)
MININGEMP	327.305	693.448	Utah DWS, BEA
HIGHWAY	64.600	69.116	GIS TIGER shapefiles, S1100 primary roads, US Census
RECREATION	0.448	0.498	USDA ERS, county typology codes
SLC	0.034	0.183	

Results

The results are presented in Table 7.9. Of the land class variables, only NPS land and federally-owned land managed for multiple-use purposes have a statistically significant relationship with wage growth in A&F industry. The coefficient on NPS is positive (0.36) and statistically significant at the 0.01 level. This result tells us that, relative to privately-owned land, wages will enjoy annual growth about 0.36 percent faster for each additional percent of a county managed by the NPS.[177] The coefficient on FEDGEN is negative and statistically significant at the 0.10 level. Unlike NPS contributing positively to wage growth, FEDGEN caused wages to experience slower growth; wages fell by 0.067 percent for each additional percentage of county land held in the FEDGEN category. This is consistent with commonly held beliefs about public lands. The establishment of National Parks has led to the development of “gateway communities” that serve the large number of tourists visiting national parks. In Utah, towns such as Springdale (Zion National Park) and Moab (Arches and Canyonlands National Parks) have thriving recreation service sectors built around the millions of annual tourist visits.

Table 7.9
GEE Model Results

Variable	Population-Averaged Parameter	P-value
Constant	1.859	0.372
PROTECTED	0.057	0.486
NPS	0.362	0.002
OTHER LAND	–0.034	0.487
FEDGEN	–0.067	0.073
STATEGEN	0.060	0.755
STATEWAGE	0.934	0.001
MININGEMP	0.002	0.013
HIGHWAY	0.010	0.261
RECREATION	0.170	0.893
SLC	–9.413	0.023
Wald χ^2 Test Statistic	41.60	0.0000

[177] The average proportion of county land managed by the NPS is 2.67 percent. Thus, the model is limited in its ability to predict large changes in land managed by the NPS.

The other variables that explain wage growth in A&F services during the 2001-2012 period are STATEWAGE, MININGEMP, and SLC. Both STATEWAGE and MININGEMP have a positive impact on A&F wage growth. We include STATEWAGE to account for the overall growth rate of the Utah economy; if other economic sectors are growing we would expect a spillover effects from that growth to the A&F sector. Our model indicates that for every 1 percent increase in state wage growth overall, wages in A&F grew 0.96 percent. Employment in mining also contributes to greater growth in A&F wages, but relatively minimally. The coefficient on MININGEMP is 0.002 and statistically significant at the 0.01 level; meaning, for every 100 employees in mining, A&F wage growth is 0.02 percent higher. The last variable that appears to impact A&F wage growth is SLC. Essentially, wages in A&F services grew 9.41 percent less than all other counties. At first glance, this result seems alarming, but consider the following: there are approximately 175 miles of interstate highway and over 3000 individuals employed in the mining industry. Thus, highway miles and mining employment in SLC would contribute 1.75 percent and 6 percent growth to wages in A&F, respectively. Further, wages in A&F in SLC benefits from the spillover from state wage growth by 1.76 percent. These factors alone would suggest that wages in A&F services are growing at 9.51 percent in SLC. The negative coefficient of –9.41 simply scales down the growth in this industry.

7.1.4 Conclusion

Broadly speaking, public land can be managed to harvest marketable resources such as oil, gas, and timber, provide for outdoor recreation, and it may be managed to minimize disturbance of natural land cover to provide amenity and quality of life values associated with the preservation of unique landscapes and ecosystems. Often time conflicts arise among the multiple uses, where ideally there exists a balance among the various uses. As noted by the Utah vision for recreation (Governor's Council on Balanced Resources 2013, p. 3),

> We want Utah to be prosperous. This requires a diversified and enduring economy. To get there, we need to pursue development *and* the recreational economy, and ensure that our efforts to promote one economic sector do not unduly constrain another.

Economic information can be used to aid decision makers in determining policies that are most effective in achieving the goal of a diversified and enduring economy. Typically, the focus of the analysis is in determining actual spending by individuals as spending will potentially benefit the regional economy by creating jobs and wages. This is especially true when nonresident tourists visit a region injecting new money into the economy. However, if new money is not injected into a region, then spending by consumers is simply a transfer or a reallocation among different firms. A true measure the benefits of the consumption or use of any good is consumer surplus, the amount that individuals are willing-to-pay over and above what they have to pay to buy or use the good; it is akin to profit, but realized by the consumer. These values should be included in any proposed changes in public land management. According to our analysis, the total benefit of recreation and travel in Utah is approximately $16.9 billion; this consists of consumer spending of $9.8 billion, and an overall net benefit to Utah residents of approximately $7.1 billion. The actual total benefit to society may be larger if our analysis included nonresident recreational users, or if any policy improves recreational experiences. On the other hand, if recreational resources are degraded, impaired, or polluted, then the demand for travel to recreational destinations would fall, and so would the benefits to society. An economic analysis should include measuring any changes in consumer surplus arising in changes in land management and recreational resources.

The industry most closely aligned with tourism and outdoor recreation is accommodation and food services. What we find is that wage growth in A&F is positively related to mining employment, counties with proportion of their land managed by the National Park Service, and overall state wage growth. For every additional 100 employees in the mining industry, wages in A&F would increase by 0.02 percent. Increasing National Park land by 1 percent in a county would lead to a 0.36 percent growth in wages in the A&F sector. The positive relationship between NPS land and wage growth in A&F is likely because NPS tend to foster gateway communities, communities where a concentrated number of resident and nonresident tourists gather. We also see that overall state wage growth positively impacts wages in A&F. Further, we find that larger proportions of county land owned by the federal government and managed for multiple uses retards growth in wages in the A&F sector. This may be due in part to the fact that these areas do not offer concentrated recreational uses nor are generally located by a gateway community.

7.2 WILDLIFE-ASSOCIATED RECREATION

Millions of people each year participate in outdoor recreation in the state of Utah. One component of outdoor recreation includes hunting, fishing and wildlife watching. In 2011, the U.S. Fish and Wildlife Service estimated more than 1 million people aged 16 and older participated in one or more of these activities in Utah. Of the total number of participants, 414,000 fished, 193,000 hunted, and 717,000 participated in wildlife-watching activities (USFWS 2011).[178] These activities are not mutually exclusive because many individuals participate in more than one activity. Table 7.10 shows both resident and nonresident participation in wildlife-associated activities in Utah for 2011.

Table 7.10
Summary of Wildlife-Associated Recreation, FY2011

Activity	Participants	Days of Participation¹	Trips¹
Hunting Total	**193,000**	**2,720,000**	**2,002,000**
Big game	149,000	1,962,000	856,000
Other game	63,000	452,000	422,000
Birds	30,000	597,000	567,000
Fishing	**414,000**	**5,979,000**	**4,306,000**
Wildlife Watching Total	**717,000**	**–**	**–**
Away-from-home participants	402,000	5169000	4,126,000
Around- the-home	430,000	–	–

Notes: Detail does add to totals because of multiple responses.
1 For wildlife watching, this includes days of participation and number of trips away from home.
Source: U.S. Fish and Wildlife Service and U.S. Census Bureau. 2011 National Survey of Fishing, Hunting and Wildlife-Associated Recreation in Utah. *2011.*

The following wildlife-related recreation analysis is reported in three categories: (1) hunting, (2) fishing, and (3) wildlife watching, which includes observing, photographing, and feeding fish or wildlife. The analysis of hunting provides information about hunting in Utah during 2012; the most recent data available. The hunting analysis draws on information available from the Utah Department of Wildlife Resources.

[178] The sum of anglers, hunters, and wildlife watchers exceeds the total number of participants in wildlife recreation because many individuals engage in more than one wildlife activity.

The analysis of recreational fishing is based on surveys conducted by Utah State University professor, Paul Jakus. The analysis of wildlife watching summarizes information provided in the U.S. Fish and Wildlife Service report "2011 National Survey of Fishing, Hunting and Wildlife-Associated Recreation in Utah."

Finally, this analysis provides information about wildlife-associated recreation on state, private, and federal lands in Utah.

7.2.1 Hunting

The Utah Division of Wildlife Resources (DWR) regulates hunting in Utah for which a permit is needed. This includes hunting for big game, upland game, migratory birds, and other small game (sometimes referred to as furbearers). From information provided in the 2011, National Survey of Hunting and Wildlife-Associated Recreation Survey, most hunters in Utah are residents of the state (an estimated 82 percent). Residents and nonresidents hunted 2.7 million days in 2011, for an average of 14 days per hunter. Hunting-related expenditures totaled $335.4 million in 2011.

Big Game Hunting

Hunting for big game is the most popular hunting activity in Utah. In 2012, DWR estimated a total of 159,400 hunters afield participated in big game hunts. This includes hunting of black bear, deer, elk, pronghorn, moose, Desert Bighorn and Rocky Mountain sheep, and goats. Table 7.11 shows hunters afield, and type of game hunted within hunt regions in 2012. Measured by number of hunters, deer and elk are the most popular big game.

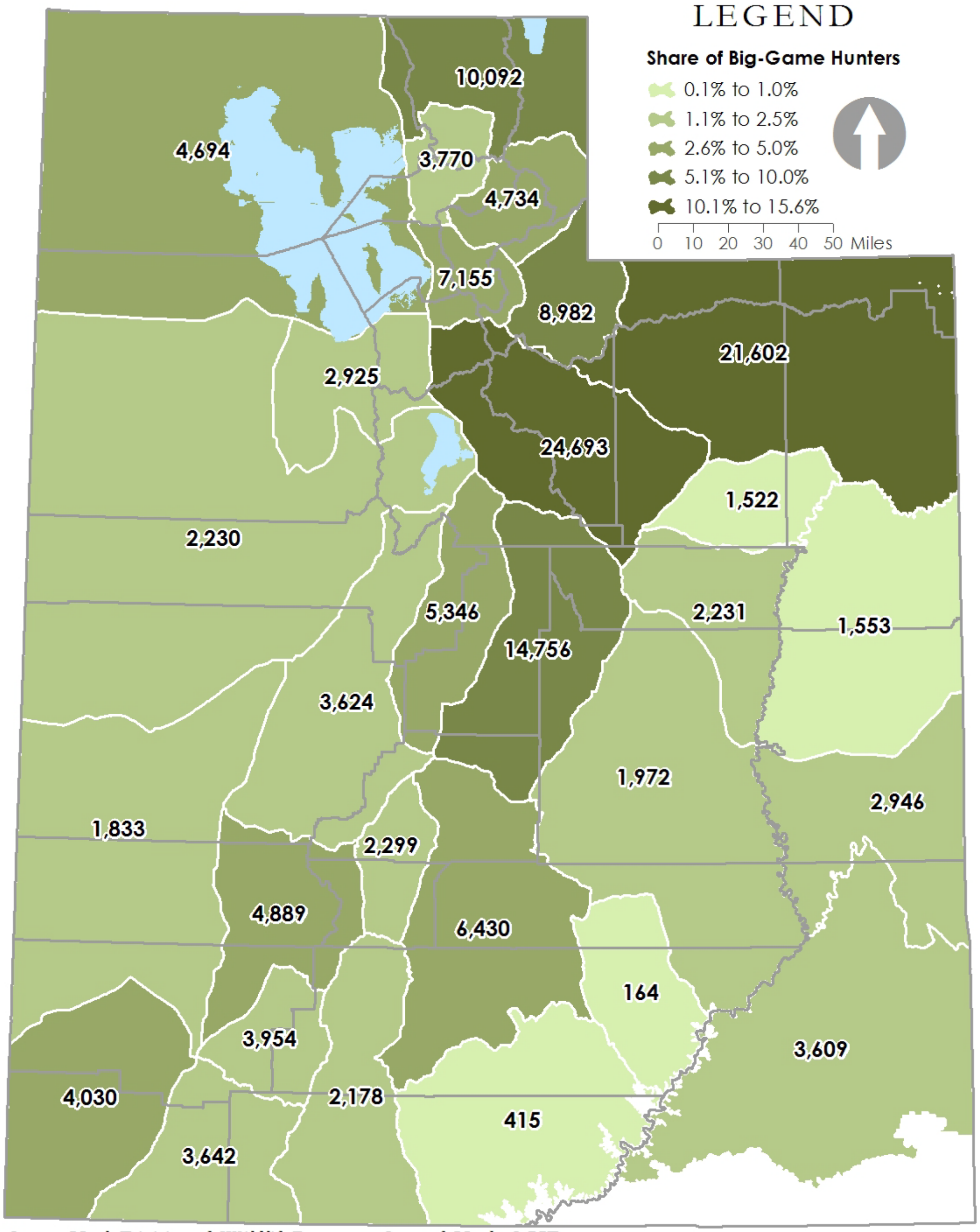
Table 7.11
Number of Big Game Hunters Afield, by Game Type and Region, FY2012

Hunt Unit	Total	Deer[1]	Elk[2]	Pronghorn[3]	Bull Moose	Sheep, Goats[4]	All Other[5]
Box Elder	4,694	4,190	409	89	0	6	–
Cache	10,092	6,637	3,017	427	11	0	–
Ogden	3,770	2,791	895	0	20	64	–
Morgan-South Rich	4,734	2,470	2,004	231	29	0	–
East Canyon	7,155	4,460	2,677	0	18	0	–
Chalk Creek	8,982	5,043	3,898	0	36	5	–
High Uintas	21,602	7,603	13,789	146	20	44	–
Book Cliffs	1,553	559	949	38	0	7	–
Nine Mile:Anthro	1,522	592	883	47	0	0	–
NineMile:Range Creek	2,231	871	1,335	8	0	17	–
San Rafael	1,972	1,688	199	71	0	14	–
La Sal	3,946	1,862	1,075	6	0	3	–
San Juan	3,609	2,477	1,126	2	0	4	–
Henry Mountains	164	77	85	0	0	2	–
Central Mountains:Nebo	5,346	4,248	1,098	0	0	0	–
Central Mountains:Manti	14,756	7,601	7,155	0	0	0	–
Wasatch Mountains	24,693	12,794	11,844	0	38	17	–
Oquirrh-Stansbury	2,925	2,564	359	0	0	2	–
West Desert	2,230	1,653	488	89	0	0	–
Southwest Desert	1,833	746	964	123	0	0	–
Fillmore	3,624	2,311	1,294	19	0	0	–
Beaver	4,889	3,687	1,124	30	0	48	–
Monroe	2,299	1,075	1,224	0	0	0	–
Paunsaugunt	2,178	947	1,166	65	0	0	–
Plateau	6,430	3,447	2,796	187	0	0	–
Kaiparowits	415	370	32	1	0	12	–
Panguitch Lake	3,954	3,045	903	6	0	0	–
Zion	3,642	2,803	831	0	0	8	–
Pine Valley	4,030	3,815	183	30	0	2	–
Statewide	73	0	0	0	0	7	1,123
Total	159,400	92,426	63,802	1,615	172	262	1,123

Note: The number of hunters afield is estimated by the Division of Wildlife Resources based on animal harvest reports.
1 includes buck and antlerless deer. 2 Includes bull and antlerless elk. 3 Includes buck and doe pronghorn. 4 Includes Desert Bighorn sheep, Rocky Mountain sheep and mountain goats. 5 Includes black bear, bison and wild turkeys.
Source: Utah Division of Wildlife Resources, "Big Game Annual Report." 2012.

Hunting takes place on state, federal, and private lands throughout the state. However, the most popular areas for big game hunting are in the northern and central parts of Utah. These areas include the Wasatch Mountains, High Uintas, and Central Mountains where 42 percent of all hunters visited (Figure 7.7).

Figure 7.7
Big-Game Hunters Afield by Wildlife Management Unit, 2012



Source: Utah Division of Wildlife Resources; State of Utah, SGID. Map by John Downen, BEBR | October 2014

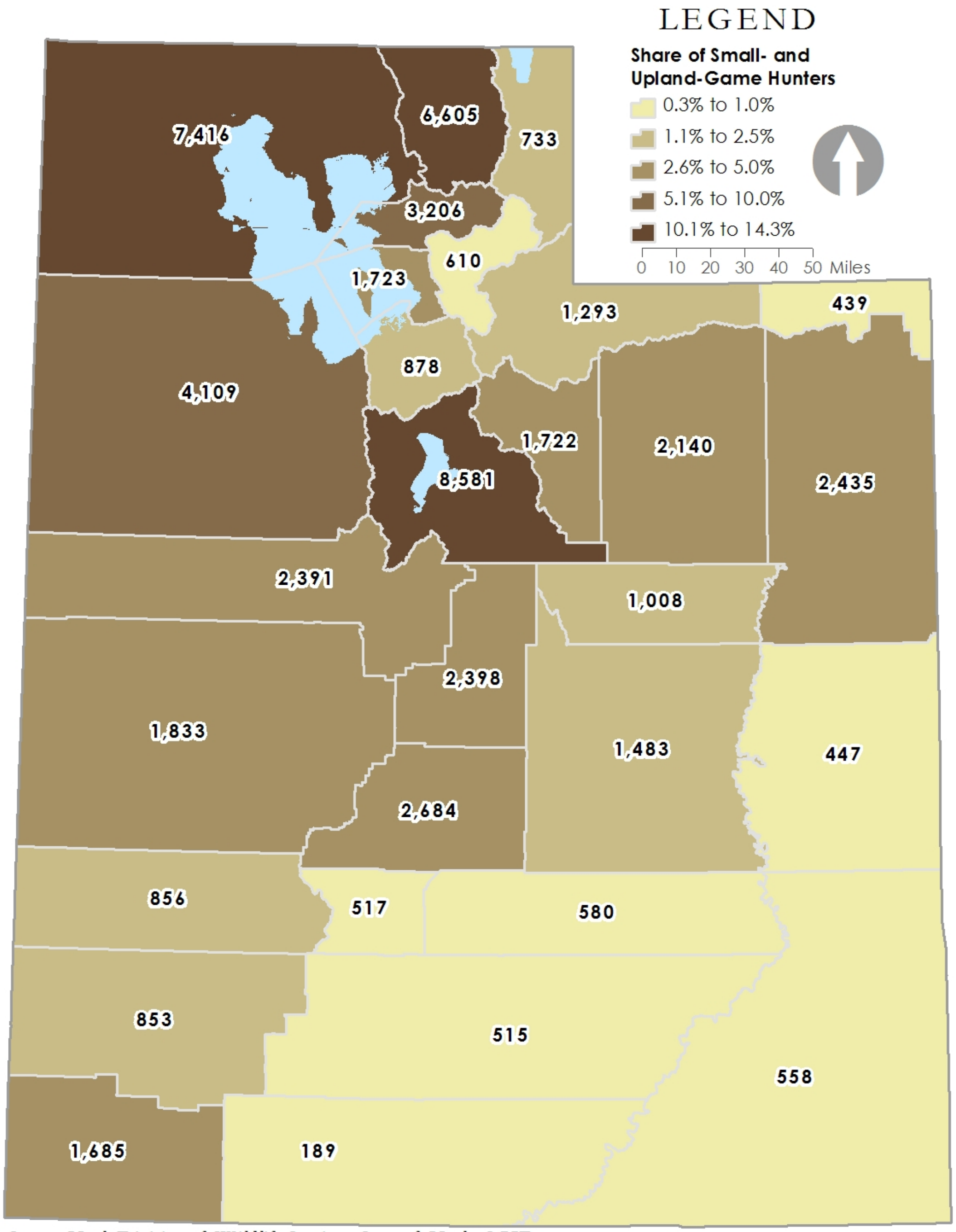
Other Hunting

More than 48,000 hunters afield hunt and trap small game and upland game in Utah each year. The most pursued furbearing animal is the bobcat, with an estimated number of 1,042 hunters afield in 2012. These hunts occur in the rural counties within the Great Basin and the Colorado plateau regional units. Beavers and red fox are pursued with the highest number of hunters afield in the more populated counties that make up the Rocky Mountain regional unit.

Upland game is pursued statewide with ring-necked pheasant, forest grouse, and dove attracting the highest absolute numbers of pursuers afield in the state. All three of these upland game animals are hunted primarily in the northern and central regions of the state, closer to the more populated metropolitan areas.

As shown in Figure 7.8, most hunting and trapping of small game and upland game occurs in the counties of Box Elder, Cache and Utah.

Figure 7.8
Small-Game and Upland-Game Hunters Afield by County, 2012



Source: Utah Division of Wildlife Services; State of Utah, SGID. Map by John Downen, BEBR | October 2014

7.2.2 Fishing

Thousands of people fish Utah's streams, rivers and lakes each year. Fishing opportunities are available throughout the state, providing anglers ample opportunities from easily accessible lakes, rivers, and streams up to high mountain alpine lakes and rivers.

Table 7.12
Summary of Fishing in Utah, 2011

Angler Characteristics	Total Anglers Number	Total Anglers Share	Resident Number	Resident Share	Nonresident Number	Nonresident Share
Total Participants	414,000	100%	343,000	83%	70,000	17%
Total Trips	4,306,000	100%	3,925,000	91%	381,000	9%
Total Days of Fishing	5,979,000	100%	5,373,000	90%	606,000	10%
Average Days of Fishing	14	–	16	–	9	–

Note: Detail does not add to total because of multiple responses and nonresponse.

Source: U.S. Fish & Wildlife Service's 2011 National Survey of Fishing, Hunting, and Wildlife-associated Recreation

The 2011 USFWS survey estimates the total number of anglers in 2011 at 414,000 (Table 7.12). Of these, approximately 17 percent were nonresidents. For all anglers, resident and nonresident, the average number of days spent fishing was 14. Residents fished an average of 16 days in Utah and nonresidents fished an average of 9 days.

Table 7.13
Number of Trips Where Fishing Was the Primary Activity by County, 2011

County	Lake	River	Total
Beaver	16,177	3,033	19,210
Box Elder	174,909	9,605	184,514
Cache	114,247	152,161	266,408
Carbon	72,289	21,232	93,521
Daggett	194,624	3,033	197,657
Davis	75,322	30,837	106,159
Duchesne	108,686	55,607	164,293
Emery	43,980	28,309	72,289
Garfield	30,837	10,616	41,452
Grand	—	17,188	17,188
Iron	40,947	—	40,947
Juab	6,066	—	6,066
Kane	206,251	5,055	211,306
Millard	28,815	22,243	51,057
Morgan	143,062	25,276	168,337
Piute	54,596	13,649	68,245
Rich	120,819	5,055	125,874
Salt Lake	2,022	77,344	79,366
San Juan	29,826	10,616	40,441
Sanpete	51,563	15,671	67,234
Sevier	101,104	23,254	124,357
Summit	255,286	123,852	379,138
Tooele	51,563	—	51,563
Uintah	74,817	27,803	102,620
Utah	184,514	231,527	416,041
Wasatch	694,581	146,095	840,676
Washington	58,640	48,530	107,170
Wayne	12,132	4,044	16,177
Weber	113,741	129,918	243,660
Unknown	3,033	—	3,033
Grand Total	3,064,448	1,241,552	4,306,000

Source: Paul Jakus, 2011 survey on water-based recreation, trips to destinations where fishing was given as the primary activity

In a 2011 survey from Utah State University on water-based recreation, Professor Paul Jakus estimated the number of trips to destinations in Utah where fishing was the primary activity. It is important to note that fishing can be considered a complimentary activity to various other travel and recreational activities including hunting, camping, boating, and hiking. For the purposes of this study, only those trips in which a respondent stated the primary reason for the trip was fishing were included.

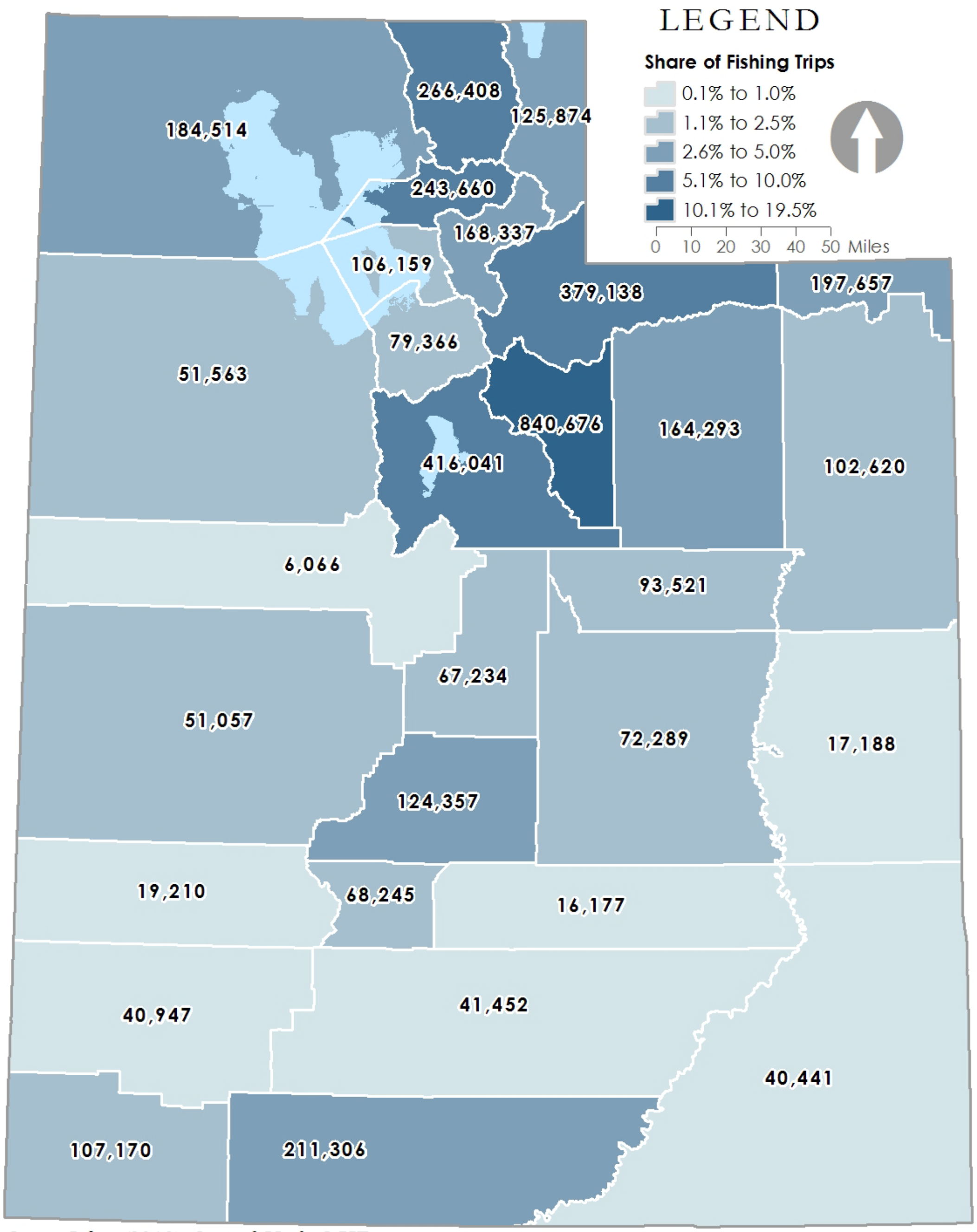
As seen in Table 7.13 there were more than 4 million fishing trips in Utah in 2011. Nearly three-quarters of these trips were to lakes and over 1.2 million trips were to rivers. Wasatch County had the highest number of total trips with 840,676, followed by fishing trips to Utah County (416,041).

Lake trips accounted for 100 percent of trips in Iron and Juab counties and 98 percent in Kane County because of Lake Powell, which accounted for an estimated 184,008 fishing trips. Flaming Gorge Reservoir was visited by about 171,000 people for the express purpose of fishing.

While lake trips tended to account for a higher percentage of total fishing trips, Cache, Grand, Salt Lake, Utah, and Weber Counties had more fishing trips to rivers than lakes.

A large number of anglers fish in the north-central counties of Davis, Morgan, Salt Lake Summit, Utah, Wasatch and Weber. Combined, 52 percent of all fishing trips took place in these counties. Some central to southern counties had very few fishing trips. Beaver (0.4 percent), Juab (0.1 percent), San Juan (0.9 percent), and Wayne (0.4 percent), had less than 1 percent of all statewide fishing trips (Figure 7.9).

Figure 7.9
Fishing Trips by County, 2011



Source: Jakus (2013); State of Utah, SGID.

7.2.3 Wildlife Watching

Wildlife-watching activities are another way for sportspersons to enjoy wildlife-associated recreation in the state of Utah. Similar to fishing, wildlife watching is often a complementary activity to other outdoor recreation including, but not limited to, hunting, fishing, camping, hiking, and visiting state and national parks.

According to the 2011 USFWS survey 717,000 people participated in wildlife-watching activities, 60 percent of whom were around-the-home participants. Approximately, 402,000 people participated in away-from home activities in Utah in 2011—56 percent of all wildlife watchers in Utah. Of the 402,000, 224,000 were state residents and 178,000 were nonresidents. Since some individuals engaged in more than one of the away-from-home activities during the year, the sum of wildlife observers, feeders, and photographers exceeds the total number away-from-home participants.

Because around-the-home participants are considered to be participating in wildlife-watching activities within one mile of their home, it can be assumed all around-the-home participants are Utah residents. In 2011, 430,000 residents participated in these activities within a mile of their homes (Table 7.14). Again, since some individuals engaged in more than one of the around-the-home activities during the year, the sum of wildlife observers, feeders, and photographers exceeds the total number around-the-home participants.

Table 7.14
Wildlife-watching in Utah by State Residents and Nonresidents, 2011
(State Population 16 years old and older)

Participants	Number	Share
Total Participants	717,000	100%
Away-From-Home	402,000	56%
Observe wildlife	378,000	53%
Photograph Wildlife	273,000	38%
Feed Wildlife	*44,000	*6%
Around-the-home	430,000	60%
Observe wildlife	206,000	29%
Photograph Wildlife	197,000	27%
Feed Wildlife	336,000	47%
Visit Parks or natural areas[1]	*48,000	*7%
Maintain Plantings or natural areas	–	–

* Estimate based on a sample size of 10–29.
[1]Includes visits only to parks or natural areas within one mile of home.
Note: Detail does not add to total because of multiple responses and nonresponse.
Source: U.S. Fish & Wildlife Service's 2011 National Survey of Fishing, Hunting, and Wildlife-associated Recreation

Since wildlife watching can be a secondary activity that complements other activities including other wildlife-related activities, the 2011 USFWS survey also accounted for the number of wildlife watchers that also fished or hunted. Just over one-third of wildlife watchers also hunted or fished (Table 7.15).

Therefore, two-thirds of wildlife watchers are not hunters or anglers. Applying this ratio to the total estimate of 717,000 wildlife watchers in the state in 2011, approximately 478,000 were wildlife watchers alone (not hunters or anglers). This is larger than the estimated number of both hunters and anglers in Utah from the USFWS 2011 survey.

It is estimated there were 263,000 Utah resident wildlife watchers that participated away from the home. In many homes around the state wildlife can be viewed from the comfort of one's own property, especially birds and other smaller animals.

Table 7.15
Participation of Utah Resident Wildlife-Watching Participants in Fishing and Hunting: 2011
(State Population 16 years old and older)

	Total Wildlife Watchers		Away-from-Home		Around-the-Home	
Participants	Number	Percent	Number	Percent	Number	Percent
Total Participants	558,000	100%	263,000	100%	430,000	100%
Wildlife-watching participants who:						
Did not fish or hunt	378,000	68%	145,000	55%	309,000	72%
Fished or hunted	180,000	32%	118,000	45%	121,000	28%
Fished	160,000	29%	98,000	37%	113,000	26%
Hunted	88,000	16%	*62,000	*24%	*49,000	*11%

Note: Detail does not add to total because of multiple responses and nonresponse.
Source: U.S. Fish & Wildlife Service's 2011 National Survey of Fishing, Hunting, and Wildlife-associated Recreation

7.2.4 Effects of the Land Transfer

Hunting, fishing, and wildlife watching are all recreation activities that take place on state, federal, and private land in Utah. Hunting and fishing in the state are regulated by the state through the Utah Department of Wildlife Resources. A s such, the Utah DWR issues permits and manages state and federal public land for hunting and fishing in Utah. Therefore it is unlikely from a management standpoint that a transfer of federal public land to state ownership will greatly affect wildlife-associated recreation in the state. Similarly, the transfer is unlikely to affect the general sportsperson or wildlife watching.

DWR does receive federal funding for wildlife, sportfish, and sensitive endangered species each year, as well as revenue allocated by the FWS from federal excise taxes and federal grant money. DWR could lose some of this funding, but could not estimate how much that would be.

Currently, while the DWR manages wildlife in the state, federal land ownership can positively affect wildlife populations, specifically, in areas designated as federal wildlife refuges which are managed specifically to promote wildlife populations. Bill Bates, Wildlife Section Chief at Utah DWR, notes:

> BLM and Forest Service lands are managed for multiple-uses, one of which is to provide wildlife habitat. Through the NEPA process, impacts to wildlife habitat are considered when actions are proposed on federal lands. This process usually serves to balance those needs with the needs of the project. This has allowed us to work with other resource users to provide for other resource needs, while at the same time providing for the habitat needs of many wildlife species."

This has provided habitat protection and allowed DWR to manage wildlife populations in balance with other resource uses. However, not all collaboration with federal agencies has been positive. Some hindrances include the ability to manage wildlife in wilderness areas and federal resistance to wildlife management work due to the threat legal action from Environmental groups. Bill Bates provided BEBR with a specific example:

> An example of this is the Indian Springs Habitat Enhancement Project on the Henry Mountains. Both livestock and wildlife interests support this 1200 acre habitat project, but the BLM has not taken any action on the project over the last 3 years because of the fear of being sued. In some cases, federal agencies have not allowed us to use helicopters to capture animals for transplants or research in wilderness areas, but other times they have.

Overall, hunters, anglers, and wildlife-watchers have benefited from federal ownership of public lands in Utah. While hunting and angling access is not allowed in National Parks and is limited on some areas in federal refuges, in general, hunter and angler access is provided on lands managed the BLM and Forest Service (Bates 2014).

If the state takes over management of the federal land currently used for wildlife-associated activities there is a chance a cost-benefit analysis can be performed to determine the best use of the public land. This could include reallocating hunting and fishing areas for alternative uses including oil and gas production, commercial development, or other types of recreation. This however, would likely have a negative effect on wildlife-associated recreation as wildlife would be displaced by human intervention. Likewise, hunters and anglers may be discouraged from participating near private industry. Similarly, they may not desire an area that becomes developed and crowded by other industrial pursuits.

7.2.5 Economic Contributions of Hunting, Fishing and Wildlife Viewing

Resident and Nonresident Expenditures

Every five years the U.S. Census Bureau conducts the National Survey of Fishing, Hunting, and Wildlife-Associated Recreation for the U.S. Fish and Wildlife Service. The most recent of these covers 2011. Data collected include detailed expenditures for hunting, fishing and wildlife viewing, in each state, by residents and nonresidents. Expenditure categories include trip expenditures like food, lodging and transportation and equipment expenditures like guns, ammunition, decoys, fishing rods and reels, bait, binoculars, cameras and clothing. The survey also asks about purchases of big-ticket items like pickups, campers, motor homes, boats and off-road vehicles. However, because these are such expensive items and the number of respondents reporting such purchases in Utah

Table 7.16
Hunting Expenditures in Utah, 2011
(Constant 2013 Dollars)

Expenditure Category	Residents	Nonresidents	Total
Trip Expenditures			
Food	$34,827,695	$7,449,223	$42,276,919
Lodging	$159,593	$9,620,273	$9,779,867
Airfare	$0	$1,790,721	$1,790,721
Public transport	$5,386	$1,790,721	$1,796,107
Private transportation	$73,982,047	$27,560,573	$101,542,620
Guide fees	$3,664,249	$16,591,801	$20,256,050
Public land fees	$246,216	$0	$246,216
Private land fees	$6,615,901	$2,761,340	$9,377,241
Heat/cook fuel	$2,351,923	$431,213	$2,783,136
Equipment rental	$1,211,925	$0	$1,211,925
Boat fuel	$429,197	$0	$429,197
Boat mooring	$892,558	$0	$892,558
Equipment Expenditures*			
Rifles	$12,229,836	$0	$12,229,836
Shotguns	$8,132,401	$0	$8,132,401
Handgun	$10,387,011	$0	$10,387,011
Bows and arrows	$4,344,522	$304,610	$4,649,133
Scopes-guns	$13,676,541	$17,932,840	$31,609,381
Decoys	$2,152,416	$731,953	$2,884,369
Ammunition	$21,724,111	$304,610	$22,028,721
Handloading equipment	$2,774,285	$0	$2,774,285
Other hunt equipment	$2,165,216	$228,458	$2,393,674
Camping gear	$12,156,550	$0	$12,156,550
Binoculars	$6,626,165	$0	$6,626,165
Special hunting clothing	$15,895,304	$0	$15,895,304
Taxidermy & processing	$8,151,073	$4,391,716	$12,542,789
Books & magazines	$1,423,063	$223,888	$1,646,950
Dues and contributions	$1,287,930	$0	$1,287,930
Other hunting items	$1,068,469	$0	$1,068,469
Other equipment	$2,638,834	$0	$2,638,834
Land leased for hunting	$1,615,698	$0	$1,615,698
Total Expenditures	**$252,836,116**	**$92,113,942**	**$344,950,058**

† Amounts are based on a sample size of fewer than 10 respondents.
* For equipment expenditures where survey data indicate the responder answered "unable to specify" regarding whether the expenditure was for hunting or for fishing, these expenditures are counted only in the hunting results to avoid double counting.
Source: BEBR analysis of microdata from US Fish & Wildlife Service, 2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation.

was very small, we did not included these expenditures in our calculations. Note that many of the detailed expenditure estimates are also based on small sample sizes and thus are not very reliable. Nonetheless, these are the best data available and aggregating them into broader expenditure categories, as was done to calculate the economic contributions, reduces the margins of error.

In 2011, hunters, anglers and wildlife viewers—both residents and nonresidents—spent an estimated $1.0 billion (in 2013 dollars) on their activities in the state of Utah. Two-thirds of this spending, $668.4 million, was by Utah residents, with the remaining $339.8 million coming from nonresident visitors. Wildlife viewers spent the most, an estimated $355.0 million (Table 7.18), followed by hunters at $344.9 million (Table 7.16) and anglers at $308.2 million (Table 7.17). Only among wildlife viewers did nonresidents outspend residents.

Table 7.17
Fishing Expenditures in Utah, 2011
(Constant 2013 Dollars)

Expenditure Category	Residents	Nonresidents	Total
Trip Expenditures			
Food	$65,360,172	$12,890,815	$78,250,987
Lodging	$13,575,046	$3,847,044	$17,422,091
Airfare	$45,305	$2,717,769	$2,763,074
Public transportation	$72,455	$1,790,721	$1,863,176
Private transportation	$58,894,711	$15,564,429	$74,459,140
Boat fuel	$13,416,110	$4,344,746	$17,760,857
Guides	$749,628	$310,179	$1,059,807
Public land use fees	$1,600,570	$468,469	$2,069,039
Private land use fees	$578,770	$0	$578,770
Boat launching	$952,674	$0	$952,674
Boat mooring	$1,186,654	$0	$1,186,654
Equipment rental	$25,489	$12,473,171	$12,498,659
Bait (live, cut, prepared)	$7,000,694	$1,042,315	$8,043,009
Ice	$7,953,473	$867,004	$8,820,476
Heating & cooking fuel	$3,133,499	$148,756	$3,282,255
Equipment Expenditures			
Rods, reels and components	$13,226,429	$7,256,057	$20,482,486
Lines and leaders	$4,135,463	$870,927	$5,006,389
Lures, flies, baits, etc.	$9,193,154	$2,938,778	$12,131,932
Hooks, sinkers, etc.	$3,652,171	$268,866	$3,921,037
Tackle boxes	$2,181,421	$79,425	$2,260,846
Creels, strings, landing nets, etc.	$628,180	$39,713	$667,892
Bait buckets, minnow traps, etc.	$48,451	$0	$48,451
Depth finder, fish finders, etc.	$1,024,974	$0	$1,024,974
Ice fishing equipment	$1,143,403	$0	$1,143,403
Other fishing equipment	$8,387,050	$0	$8,387,050
Camping gear	$7,343,941	$392,903	$7,736,844
Special fishing clothing	$3,190,151	$0	$3,190,151
Books & magazines	$1,135,926	$118,628	$1,254,554
Dues and contributions	$411,097	$213,736	$624,833
Other fishing items	$0	$291,224	$291,224
Boat parts and accessories	$8,918,979	$0	$8,918,979
Other equipment	$0	$137,499	$137,499
Total Expenditures	**$239,166,042**	**$69,073,173**	**$308,239,214**

† Amounts are based on a sample size of fewer than 10 respondents.

Source: BEBR analysis of microdata from US Fish & Wildlife Service, 2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation.

Table 7.18
Wildlife-Viewing Expenditures in Utah, 2011
(Constant 2013 Dollars)

Expenditure Category	Residents	Nonresidents	Total
Trip Expenditures			
Food	$31,692,122	$57,333,615	$89,025,737
Lodging	$888,824	$39,591,801	$40,480,625
Airfare	$0	$6,942,313	$6,942,313
Public transportation	$0	$3,051,466	$3,051,466
Private transportation	$40,767,382	$44,428,296	$85,195,678
Guide fees	$7,890	$706,638	$714,528
Public land access fees	$641,275	$1,674,183	$2,315,458
Private land access fees	$86,539	$117,327	$203,866
Heating & cooking fuel	$103,662	$45,108	$148,770
Equipment rental	$1,260,319	$6,084,382	$7,344,701
Boat fuel*	$0	$657,810	$657,810
Other boat costs	$251,312	$670,400	$921,711
Equipment Expenditures			
Binoculars, scopes	$16,822,651	$0	$16,822,651
Cameras	$29,212,562	$11,168,770	$40,381,331
Film and developing	$8,651,914	$0	$8,651,914
Commercially prepared bird food	$5,306,103	$32,636	$5,338,740
Other bird food	$384,851	$0	$384,851
Food for other wildlife	$0	$3,852,334	$3,852,334
Nest boxes, feeders	$162,138	$0	$162,138
Other special equipment	$86,852	$2,273,525	$2,360,378
Tents, tarps	$497,349	$0	$497,349
Backpacking equipment	$828,915	$0	$828,915
Other camping equipment	$2,346,258	$0	$2,346,258
Day packs, special clothing	$3,626,199	$0	$3,626,199
Magazines and books	$887,572	$38,279	$925,851
Membership dues, contributions	$26,260,576	$0	$26,260,576
Other equipment	$1,139,998	$0	$1,139,998
Boat parts and accessories	$4,140,431	$0	$4,140,431
Plantings for wildlife	$311,048	$0	$311,048
Total Expenditures	**$176,364,745**	**$178,668,882**	**$355,033,627**

† Amounts are based on a sample size of fewer than 10 respondents.
* Amount was adjusted from published figure based on average expenditure for anglers.
Source: BEBR analysis of microdata from US Fish & Wildlife Service, 2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation.

Economic Contributions

We aggregated the detailed expenditure categories from the FHWAR survey into broad industry sectors (such as retail trade), then summed the data across the three activities before applying RIMS II multipliers to estimate contributions to employment, earnings and gross state product. We generated estimated fiscal impacts to the state and counties by applying the state and the average county and city sales tax rates to food (grocery and restaurant), lodging, car rentals and other retail expenditures, and to taxable fishing, hunting and trapping business investments. We also estimated state income and state and local sales tax revenues stemming from earnings contributions, and included Department of Wildlife Resources revenues from big game application fees, fish and game licenses, hunter safety cards, and wildlife drawings.

Expenditures by resident and nonresident hunters, fishers and wildlife viewers supported an estimated 11,815 jobs with $340.6 million in earnings, and contributed $657.2 million to gross state product in 2011 (Table 7.19). About 60 percent of these contributions were due to resident expenditures, with the remaining 40 percent the result of expenditures by nonresident visitors. These latter amounts—4,732 jobs, $139.3 million in earnings, and $268.9 million in GSP—are true economic impacts since they were created by "new," outside dollars coming into the state rather than just the circulation of currently existing money.

Table 7.19
Estimated Economic and Fiscal Contributions of Hunting, Fishing and Wildlife Viewing in Utah, 2011
(Millions of 2013 Dollars)

Economic Contribution	**Jobs**	**Earnings**	**GSP**
Total Economic Contribution	11,815	$340.6	$657.2
Food services and drinking places	2,748	$61.8	$114.0
Hotels and motels, including casino hotels	1,413	$41.2	$84.7
Retail trade	5,493	$164.2	$323.7
Air transportation	184	$7.9	$13.2
Automotive equipment rental and leasing	83	$3.6	$8.1
Animal slaughtering, rendering, and processing	121	$4.4	$7.9
Other amusement and recreation industries	655	$16.6	$32.7
General and consumer goods rental	372	$16.7	$28.5
Civic, social, professional, and similar organizations	608	$19.8	$35.0
Households	138	$4.5	$9.5
Fiscal Impact	**State**	**Local**	**Total**
Total Fiscal Impacts	$88.4	$16.4	$104.8
Sales Tax Revenues	$36.5	$14.3	$50.7
DWR Fish & Game Licenses and Related	$27.9		$27.9
Earnings-Based Impacts	$24.0	$2.1	$26.2

Note: Fiscal impacts are composed of estimated state income and state and local sales taxes generated by the earnings contributions; estimated state and local sales tax revenues from restaurant, grocery, lodging, motor vehicle rental, and retail expenditures; state sales tax revenue from fishing, hunting and trapping taxable business investments; and DWR revenues from big game application fees, fish and game licenses, hunter safety cards, and wildlife drawings.
Source: BEBR analysis of data from US Fish & Wildlife Service, 2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation*; Utah State Tax Commission; and Utah Division of Wildlife Resources.*

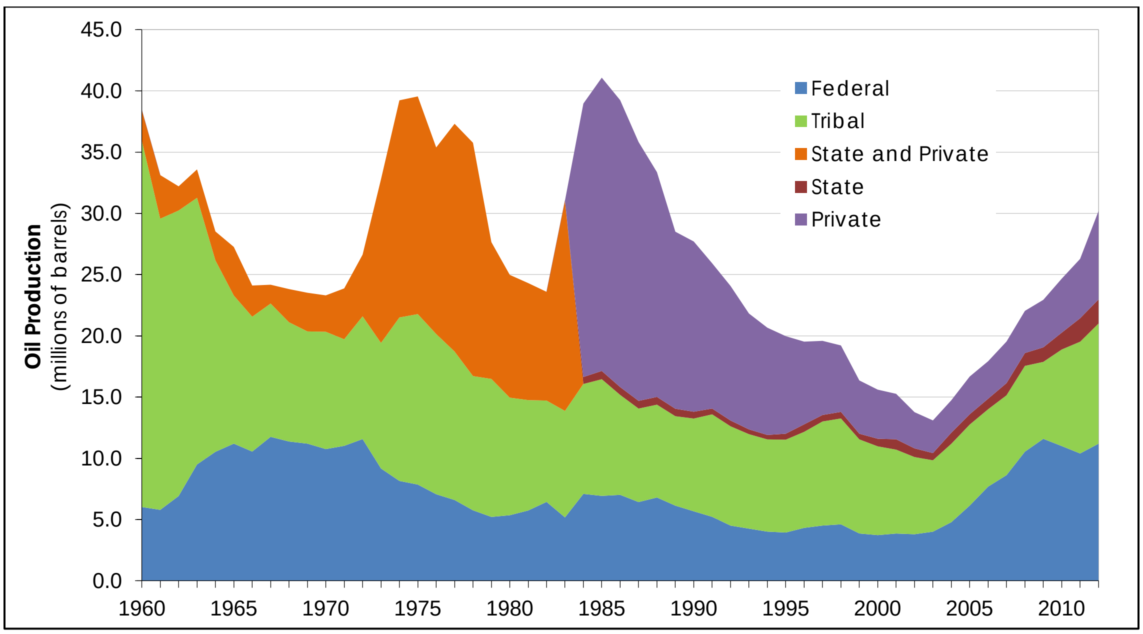
The total fiscal impacts of resident and nonresident spending in 2011 were an estimated $88.4 million in state revenues and $16.4 million in local (county and city) revenues (measured in 2013 dollars). Sales taxes on expenditures by hunters, fishers and wildlife viewers and on business purchases by fishing, hunting and trapping companies contributed an estimated $36.5 million in state revenues and $14.3 million in local revenues. The earnings contribution of $340.6 million generated estimated income and sales tax revenues of $24.0 million for the state and $2.1 million for counties. Hunters and anglers also spent $23.5 million on fish and game licenses, $4.3 million on applications for big game permits, and $14,495 on hunter safety cards—all of which was revenue for the Division of Wildlife Resources.

7.3 Oil and Gas Production

7.3.1 Crude Oil Production

Of the 34.9 million barrels of crude oil produced in Utah in 2013, 12.4 million barrels (36 percent) came from wells on federal land, 11.6 million (33 percent) from tribal land, 8.8 million (25 percent) from private land, and 2.1 million (6 percent) from state land. Between 2003 and 2013, oil production in Utah increased 167 percent from 13.1 million barrels (Figure 7.10 and Tables 7.20 and 7.21). The largest share of this growth, 38 percent or 8.4 million barrels, came from increased production on federal land. Production on private land contributed 28 percent of the growth, or 6.1 million barrels, and increases on tribal land contributed 26 percent, or 5.8 million barrels. Production on state land grew by 1.5 million barrels, accounting for 7 percent of the state's increase in oil production over the period.

Figure 7.10
Crude Oil Production in Utah by Landowner, 1960–2013



Note: Before 1984, production on state and private lands was reported together.
Source: Utah Department of Natural Resources, Division of Oil, Gas and Mining.

The Uinta Basin is the center of Utah's oil industry. Duchesne and Uintah counties together were the source of 77 percent of the state's total crude oil output in 2013, with 16.5 million barrels coming from Duchesne and 10.5 million barrels from Uintah. Not surprisingly, the two counties provided 90 percent of the growth of the state's oil production between 2003 and 2013. Output grew by 12.2 million barrels in Duchesne over the period, representing 56 percent of the state's growth, and by 7.4 million barrels in Uintah, accounting for 34 percent of state growth. In Duchesne County roughly equal amounts of oil were produced from federal, tribal and private lands, with about 4 percent coming from state land. In Uintah County 39 percent of production was from federal land, 30 percent from private land, 18 percent from tribal land, and 13 percent from state land.

Table 7.20
Crude Oil Production in Utah by County and Landowner, 2003–2013
(barrels)

County & Ownership	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Change
Carbon	1,885	4,661	9,468	27,913	40,141	50,682	69,831	46,254	73,360	80,859	38,139	1923.3%
Federal	1,563	3,785	8,475	26,752	36,208	47,033	64,476	37,072	68,251	78,227	33,281	2029.3%
State	322	600	993	1,161	3,933	3,649	5,332	9,177	5,109	2,632	4,858	1408.7%
Private	0	276	0	0	0	0	23	5	0	0	0	–
Daggett	1,644	1,448	1,324	724	395	796	411	480	638	348	444	–73.0%
Federal	1,383	1,286	1,226	608	357	684	332	463	414	137	409	–70.4%
State	261	162	98	116	38	112	79	17	224	211	35	–86.6%
Duchesne	4,341,038	5,837,750	6,674,055	6,402,914	7,610,689	8,701,816	8,767,934	10,917,022	11,939,889	14,415,407	16,527,949	280.7%
Federal	1,378,255	1,720,415	2,064,698	1,972,779	2,841,924	3,433,263	3,740,250	3,870,094	3,902,591	4,474,759	4,805,859	248.7%
State	163,610	272,485	268,516	324,519	373,610	385,413	392,346	537,465	706,513	661,824	604,015	269.2%
Tribal	1,390,706	2,439,719	2,709,341	2,507,029	2,580,566	3,012,275	2,397,133	3,651,609	4,293,284	4,599,422	5,863,886	321.6%
Private	1,408,467	1,405,131	1,631,500	1,598,587	1,814,589	1,870,865	2,238,205	2,857,854	3,037,501	4,679,402	5,254,189	273.0%
Emery	6,191	4,657	3,196	4,036	2,071	6,602	11,120	6,106	3,295	2,440	1,569	–74.7%
Federal	6,191	4,654	3,154	3,680	1,801	6,585	11,009	6,099	2,910	2,105	1,549	–75.0%
State	0	3	42	36	0	17	111	7	350	335	0	–
Private	0	0	0	320	270	0	0	0	35	0	20	–
Garfield	203,309	201,058	197,778	190,862	188,568	177,709	175,154	169,698	166,534	154,566	152,558	–25.0%
Federal	203,309	201,058	197,778	190,862	188,568	177,709	175,154	169,698	166,534	154,566	152,558	–25.0%
Grand	98,975	233,686	197,801	126,558	130,723	268,410	168,751	117,603	82,710	363,559	1,094,102	1005.4%
Federal	97,086	87,569	78,709	74,248	94,167	242,022	143,339	96,879	64,794	348,581	993,373	923.2%
State	675	145,077	117,747	51,024	35,156	24,851	23,666	18,716	16,395	14,095	100,310	14760.7%
Private	1,214	1,040	1,345	1,286	1,400	1,537	1,746	2,008	1,521	883	419	–65.5%
San Juan	4,555,420	3,987,318	3,865,813	3,761,234	3,941,038	3,811,292	3,718,325	3,898,481	4,228,743	4,404,525	4,508,659	–1.0%
Federal	309,834	256,270	243,627	207,062	221,489	224,888	299,253	369,430	602,804	647,136	632,656	104.2%
State	18,986	23,774	16,853	15,385	14,281	14,344	12,604	10,430	9,725	10,327	6,219	–67.2%
Tribal	4,224,706	3,705,472	3,602,418	3,536,169	3,702,992	3,570,091	3,404,524	3,516,433	3,614,092	3,745,031	3,868,215	–8.4%
Private	1,894	1,802	2,915	2,618	2,276	1,969	1,944	2,188	2,122	2,031	1,569	–17.2%
Sanpete	0	21	30	8	3	4,830	16,552	37,099	12,164	0	0	–
Federal	0	0	0	0	0	4,825	16,548	37,099	12,164	0	0	–
Private	0	21	30	8	3	5	4	0	0	0	0	–
Sevier	0	164,508	884,604	2,056,987	1,805,847	2,140,059	3,040,522	2,622,401	2,521,790	2,219,376	1,885,987	1046.4%
Federal	0	13,284	479,326	1,568,103	1,267,745	1,708,032	2,598,988	2,267,387	2,065,726	1,866,476	1,634,761	–
State	0	0	0	0	0	0	109,810	87,989	194,680	147,084	102,634	–
Private	0	151,224	405,278	488,884	538,102	432,027	331,724	267,025	261,384	205,816	148,592	–
Summit	819,793	587,176	472,372	398,579	411,571	320,097	271,147	244,280	233,559	196,085	217,950	–73.4%
Federal	58,112	57,756	50,321	47,066	41,844	40,774	17,868	13,684	13,446	15,386	31,390	–46.0%
Private	761,681	529,420	422,051	351,513	369,727	279,323	253,279	230,596	220,113	180,699	186,560	–75.5%
Uintah	3,069,082	3,721,665	4,374,339	4,959,015	5,405,760	6,558,699	6,631,795	6,609,855	7,021,749	8,347,534	10,489,393	241.8%
Federal	1,957,106	2,439,438	3,016,772	3,598,313	3,932,325	4,656,830	4,471,188	4,135,918	3,496,998	3,602,370	4,136,037	111.3%
State	405,285	465,961	438,088	465,039	564,973	618,460	624,671	709,370	980,177	1,124,027	1,316,513	224.8%
Tribal	214,050	257,179	301,871	276,937	238,507	424,316	481,641	714,421	1,218,937	1,472,252	1,858,082	768.1%
Private	492,641	559,087	617,608	618,726	669,955	859,093	1,054,295	1,050,146	1,325,637	2,148,885	3,178,761	545.2%
State Total	**13,097,337**	**14,743,948**	**16,680,780**	**17,928,830**	**19,536,806**	**22,040,992**	**22,871,542**	**24,669,279**	**26,284,431**	**30,184,699**	**34,916,750**	**166.6%**
Federal	4,012,839	4,785,515	6,144,086	7,689,473	8,626,428	10,542,645	11,538,405	11,003,823	10,396,632	11,189,743	12,421,873	209.6%
State	589,139	908,062	842,337	857,280	991,991	1,046,846	1,168,619	1,373,171	1,913,173	1,960,535	2,134,584	262.3%
Tribal	5,829,462	6,402,370	6,613,630	6,320,135	6,522,065	7,006,682	6,283,298	7,882,463	9,126,313	9,816,705	11,590,183	98.8%
Private	2,665,897	2,648,001	3,080,727	3,061,942	3,396,322	3,444,819	3,881,220	4,409,822	4,848,313	7,217,716	8,770,110	229.0%

Source: Utah Department of Natural Resources, Division of Oil, Gas and Mining well database; data retrieved May 27, 2014.

Table 7.21
Crude Oil Production in Utah by County with Share by Landowner, 2003–2013
(Barrels)

County & Ownership	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Share of Total
Carbon	1,885	4,661	9,468	27,913	40,141	50,682	69,831	46,254	73,360	80,859	38,139	0.1%
Federal	82.9%	81.2%	89.5%	95.8%	90.2%	92.8%	92.3%	80.1%	93.0%	96.7%	87.3%	
State	17.1%	12.9%	10.5%	4.2%	9.8%	7.2%	7.6%	19.8%	7.0%	3.3%	12.7%	
Private	0.0%	5.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Daggett	1,644	1,448	1,324	724	395	796	411	480	638	348	444	0.0%
Federal	84.1%	88.8%	92.6%	84.0%	90.4%	85.9%	80.8%	96.5%	64.9%	39.4%	92.1%	
State	15.9%	11.2%	7.4%	16.0%	9.6%	14.1%	19.2%	3.5%	35.1%	60.6%	7.9%	
Duchesne	4,341,038	5,837,750	6,674,055	6,402,914	7,610,689	8,701,816	8,767,934	10,917,022	11,939,889	14,415,407	16,527,949	47.3%
Federal	31.7%	29.5%	30.9%	30.8%	37.3%	39.5%	42.7%	35.5%	32.7%	31.0%	29.1%	
State	3.8%	4.7%	4.0%	5.1%	4.9%	4.4%	4.5%	4.9%	5.9%	4.6%	3.7%	
Tribal	32.0%	41.8%	40.6%	39.2%	33.9%	34.6%	27.3%	33.4%	36.0%	31.9%	35.5%	
Private	32.4%	24.1%	24.4%	25.0%	23.8%	21.5%	25.5%	26.2%	25.4%	32.5%	31.8%	
Emery	6,191	4,657	3,196	4,036	2,071	6,602	11,120	6,106	3,295	2,440	1,569	0.0%
Federal	100.0%	99.9%	98.7%	91.2%	87.0%	99.7%	99.0%	99.9%	88.3%	86.3%	98.7%	
State	0.0%	0.1%	1.3%	0.9%	0.0%	0.3%	1.0%	0.1%	10.6%	13.7%	0.0%	
Private	0.0%	0.0%	0.0%	7.9%	13.0%	0.0%	0.0%	0.0%	1.1%	0.0%	1.3%	
Garfield	203,309	201,058	197,778	190,862	188,568	177,709	175,154	169,698	166,534	154,566	152,558	0.4%
Federal	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	
Grand	98,975	233,686	197,801	126,558	130,723	268,410	168,751	117,603	82,710	363,559	1,094,102	3.1%
Federal	98.1%	37.5%	39.8%	58.7%	72.0%	90.2%	84.9%	82.4%	78.3%	95.9%	90.8%	
State	0.7%	62.1%	59.5%	40.3%	26.9%	9.3%	14.0%	15.9%	19.8%	3.9%	9.2%	
Private	1.2%	0.4%	0.7%	1.0%	1.1%	0.6%	1.0%	1.7%	1.8%	0.2%	0.0%	
San Juan	4,555,420	3,987,318	3,865,813	3,761,234	3,941,038	3,811,292	3,718,325	3,898,481	4,228,743	4,404,525	4,508,659	12.9%
Federal	6.8%	6.4%	6.3%	5.5%	5.6%	5.9%	8.0%	9.5%	14.3%	14.7%	14.0%	
State	0.4%	0.6%	0.4%	0.4%	0.4%	0.4%	0.3%	0.3%	0.2%	0.2%	0.1%	
Tribal	92.7%	92.9%	93.2%	94.0%	94.0%	93.7%	91.6%	90.2%	85.5%	85.0%	85.8%	
Private	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.0%	0.0%	
Sanpete	0	21	30	8	3	4,830	16,552	37,099	12,164	0	0	0.0%
Federal	–	0.0%	0.0%	0.0%	0.0%	99.9%	100.0%	100.0%	100.0%	–	–	
Private	–	100.0%	100.0%	100.0%	100.0%	0.1%	0.0%	0.0%	0.0%	–	–	
Sevier	0	164,508	884,604	2,056,987	1,805,847	2,140,059	3,040,522	2,622,401	2,521,790	2,219,376	1,885,987	5.4%
Federal	–	8.1%	54.2%	76.2%	70.2%	79.8%	85.5%	86.5%	81.9%	84.1%	86.7%	
State	–	0.0%	0.0%	0.0%	0.0%	0.0%	3.6%	3.4%	7.7%	6.6%	5.4%	
Private	–	91.9%	45.8%	23.8%	29.8%	20.2%	10.9%	10.2%	10.4%	9.3%	7.9%	
Summit	819,793	587,176	472,372	398,579	411,571	320,097	271,147	244,280	233,559	196,085	217,950	0.6%
Federal	7.1%	9.8%	10.7%	11.8%	10.2%	12.7%	6.6%	5.6%	5.8%	7.8%	14.4%	
Private	92.9%	90.2%	89.3%	88.2%	89.8%	87.3%	93.4%	94.4%	94.2%	92.2%	85.6%	
Uintah	3,069,082	3,721,665	4,374,339	4,959,015	5,405,760	6,558,699	6,631,795	6,609,855	7,021,749	8,347,534	10,489,393	30.0%
Federal	63.8%	65.5%	69.0%	72.6%	72.7%	71.0%	67.4%	62.6%	49.8%	43.2%	39.4%	
State	13.2%	12.5%	10.0%	9.4%	10.5%	9.4%	9.4%	10.7%	14.0%	13.5%	12.6%	
Tribal	7.0%	6.9%	6.9%	5.6%	4.4%	6.5%	7.3%	10.8%	17.4%	17.6%	17.7%	
Private	16.1%	15.0%	14.1%	12.5%	12.4%	13.1%	15.9%	15.9%	18.9%	25.7%	30.3%	
State Total	**13,097,337**	**14,743,948**	**16,680,780**	**17,928,830**	**19,536,806**	**22,040,992**	**22,871,542**	**24,669,279**	**26,284,431**	**30,184,699**	**34,916,750**	**100%**
Federal	30.6%	32.5%	36.8%	42.9%	44.2%	47.8%	50.4%	44.6%	39.6%	37.1%	35.6%	
State	4.5%	6.2%	5.0%	4.8%	5.1%	4.7%	5.1%	5.6%	7.3%	6.5%	6.1%	
Tribal	44.5%	43.4%	39.6%	35.3%	33.4%	31.8%	27.5%	32.0%	34.7%	32.5%	33.2%	
Private	20.4%	18.0%	18.5%	17.1%	17.4%	15.6%	17.0%	17.9%	18.4%	23.9%	25.1%	

Source: BEBR calculations based on data from the Utah Department of Natural Resources, Division of Oil, Gas and Mining.

After Duchesne and Uintah counties, San Juan County is the next largest oil producer in the state. Production in 2013 was 4.5 million barrels, representing 13 percent of the state's total output. The lion's share of production in San Juan is from tribal land, with 86 percent in 2013, though production from federal land has increased in recent years to account for 14 percent of the county's production in 2013.

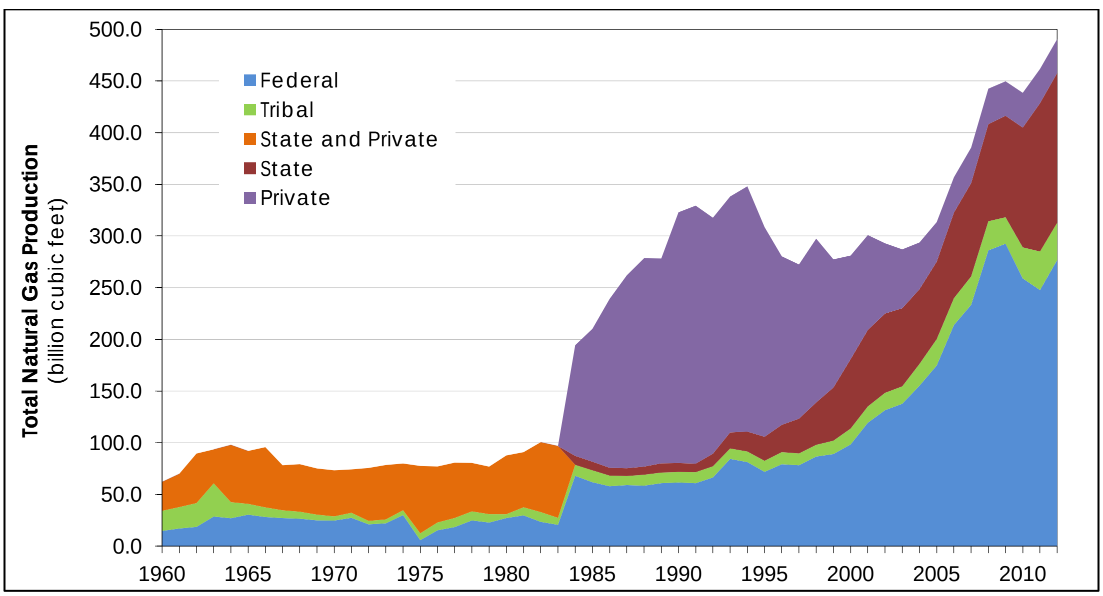
Sevier County produced 1.9 million barrels of oil in 2013, about 5 percent of the state total. This is up from zero production in 2003 and just 164,508 barrels in 2004, but down from a peak of 3.0 million barrels in 2009. Although initial production was largely from private land (92 percent) with a little from federal land, by 2013 87 percent of production was from federal land, 8 percent from private land, and the remainder from state land.

Duchesne, Uintah, San Juan and Sevier counties accounted for over 95 percent of Utah's crude oil production in 2013. Grand County produced 1.1 million barrels in 2013, three times its output in 2012, but the remaining five counties with oil production in 2013 produced only small amounts, from 217,950 barrels in Summit to just 444 barrels in Daggett.

7.3.2 Natural Gas Production

Of the 470.6 billion cubic feet (bcf) of natural gas produced in Utah in 2013, 264.1 bcf (56 percent) came from federal land, 135.4 bcf (29 percent) came from state land, and the remainder was roughly equally split between tribal (38.8 bcf) and private (32.2 bcf) land. Between 2003 and 2013, gas production in Utah increased 64 percent from 287.1 bcf (Figure 7.11 and Tables 7.22 and 7.23). The largest share of this growth, 69 percent or 126.3 bcf, came from increased production on federal land. Production on state land contributed 33 percent of the growth, or 59.9 bcf, and increases on tribal land contributed 12 percent, or 21.9 bcf. Gas production on private land actually fell over the period by 24.7 bcf, subtracting 13 percent from output growth.

Figure 7.11
Gross Withdrawals of Natural Gas in Utah by Landowner, 1960–2013



Note: Before 1984, production on state and private lands was reported together.
Source: Utah Department of Natural Resources, Division of Oil, Gas and Mining.

Table 7.22
Gross Withdrawals of Natural Gas in Utah by County and Landowner, 2003–2013
(Million Cubic Feet)

County & Ownership	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Change
Carbon	85,180	79,239	74,823	82,385	93,816	94,546	96,593	83,620	90,295	90,976	71,647	–15.9%
Federal	24,708	24,835	25,532	36,461	46,811	50,764	54,366	40,887	53,961	58,731	42,152	70.6%
State	46,977	41,617	37,475	34,112	34,395	30,819	29,222	30,658	25,220	21,468	19,363	–58.8%
Private	13,495	12,787	11,816	11,811	12,610	12,963	13,005	12,075	11,114	10,777	10,131	–24.9%
Daggett	1,341	1,435	1,378	1,169	539	1,081	589	1,026	906	548	361	–73.0%
Federal	1,253	1,338	1,292	1,088	497	1,023	548	974	855	512	334	–73.4%
State	88	97	85	80	42	58	41	52	51	37	28	–68.5%
Duchesne	11,955	14,642	20,078	22,530	25,338	26,575	28,876	35,832	40,298	41,675	44,445	271.8%
Federal	3,613	3,628	5,017	4,744	5,702	5,871	7,603	8,178	8,188	8,873	8,962	148.1%
State	434	891	907	999	988	952	1,696	1,581	1,563	1,561	1,096	152.6%
Tribal	4,169	6,471	9,788	11,927	13,660	15,197	14,089	17,562	20,583	19,850	22,196	432.4%
Private	3,739	3,653	4,365	4,861	4,988	4,555	5,488	8,511	9,964	11,391	12,192	226.1%
Emery	17,213	17,443	16,609	16,213	16,948	16,718	16,583	14,390	12,416	10,905	10,256	–40.4%
Federal	2,639	2,933	2,791	3,123	4,386	4,473	4,944	4,241	3,471	2,955	2,837	7.5%
State	11,263	11,581	11,188	10,646	10,301	9,800	9,101	8,128	7,265	6,594	6,176	–45.2%
Private	3,311	2,929	2,630	2,444	2,261	2,445	2,538	2,021	1,679	1,356	1,243	–62.5%
Garfield	6.1	7.6	9.1	9.1	9.1	9.2	9.1	9.1	9.1	9.2	7.6	24.5%
Federal	6.1	7.6	9.1	9.1	9.1	9.2	9.1	9.1	9.1	9.2	7.6	24.5%
Grand	5,624	7,226	6,582	6,866	6,562	6,251	5,069	4,487	4,127	4,149	4,341	–22.8%
Federal	4,837	6,283	5,776	5,710	5,348	5,140	4,044	3,298	3,087	3,265	3,516	–27.3%
State	784	937	801	1,150	1,211	1,034	832	870	801	748	748	–4.6%
Private	3	6	4	6	3	76	193	319	239	136	77	2574.7%
San Juan	20,637	17,386	13,426	12,453	12,573	13,377	10,268	9,846	9,467	9,491	9,723	–52.9%
Federal	16,806	14,249	10,234	8,446	7,676	7,567	5,142	4,384	4,366	4,583	3,885	–76.9%
State	150	142	114	524	615	1,417	1,768	1,212	831	562	330	120.5%
Tribal	3,682	2,995	3,078	3,483	4,265	4,193	3,230	4,182	4,223	4,289	5,477	48.8%
Private	0	0	0	0	15	201	129	69	46	58	31	–
Sanpete	0	0.009	0.010	0.003	0.001	19	66	373	137	0	0	–
Federal	0	0	0	0	0	19	66	373	137	0	0	–
Private	0	0.009	0.010	0.003	0.001							
Summit	33,943	23,769	16,526	11,212	11,189	10,311	8,221	7,219	6,361	4,921	3,857	–88.6%
Federal	186	225	188	172	198	188	112	108	119	96	97	–47.9%
Private	33,757	23,544	16,338	11,040	10,991	10,123	8,109	7,111	6,242	4,825	3,760	–88.9%
Uintah	111,242	132,682	164,089	204,038	218,581	273,685	283,454	283,353	298,602	328,185	325,925	193.0%
Federal	83,757	101,784	123,949	154,171	162,837	211,081	215,791	196,718	173,626	198,066	202,328	141.6%
State	15,849	17,006	24,337	35,274	42,678	49,861	55,474	73,386	107,705	113,744	107,706	579.6%
Tribal	9,011	11,590	12,647	10,578	9,584	8,823	8,298	9,703	13,403	12,047	11,124	23.5%
Private	2,626	2,301	3,157	4,015	3,481	3,919	3,890	3,546	3,868	4,327	4,767	81.6%
State Total	**287,141**	**293,831**	**313,519**	**356,874**	**385,555**	**442,573**	**449,729**	**440,154**	**462,619**	**490,859**	**470,565**	**63.9%**
Federal	137,805	155,284	174,789	213,924	233,465	286,137	292,626	259,171	247,820	277,090	264,119	91.7%
State	75,544	72,272	74,907	82,785	90,232	93,941	98,134	115,886	143,435	144,713	135,448	79.3%
Tribal	16,861	21,057	25,513	25,988	27,510	28,213	25,617	31,447	38,210	36,185	38,797	130.1%
Private	56,930	45,219	38,309	34,177	34,348	34,283	33,352	33,651	33,154	32,871	32,201	–43.4%

Source: Utah Department of Natural Resources, Division of Oil, Gas and Mining well database; data retrieved May 27, 2014.

Uintah County was the source of nearly 70 percent of Utah's natural gas production in 2013, with gross withdrawals of 325.9 bcf. What's more, the growth in gas production in Uintah between 2003 and 2013 was three times the growth rate for the state. This is because increased production in Uintah, Duchesne and Garfield was offset by declines in the other producing counties. Sixty-two percent of Uintah's 2013 production was from federal land, down from roughly 75 percent between 2003 and 2009. There was a large increase in production on state land starting in 2010, which increased its share from less than 20 percent through 2009 to 33 percent in 2013. About 3 percent of gas withdrawals in Uintah in 2013 were from tribal land, and 1.5 percent were from private land.

At 71.6 bcf, Carbon County supplied 15 percent of the state's natural gas gross withdrawals in 2013. However, because production was 13.5 bcf lower in 2013 than in 2003, the county reduced statewide growth by 7 percent. About 60 percent of 2013 production in Carbon was from federal land and 27 percent was from state land. The remainder was from private land. All of Carbon's growth in output over the period came from increases on federal land; production on state land declined by more than half and production on private land shrank by one-quarter.

Table 7.23
Gross Withdrawals of Natural Gas in Utah by County with Shares by Landowner, 2003–2013
(Million Cubic Feet)

County & Ownership	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Share of Total
Carbon	85,180	79,239	74,823	82,385	93,816	94,546	96,593	83,620	90,295	90,976	71,647	15.2%
Federal	29.0%	31.3%	34.1%	44.3%	49.9%	53.7%	56.3%	48.9%	59.8%	64.6%	58.8%	
State	55.2%	52.5%	50.1%	41.4%	36.7%	32.6%	30.3%	36.7%	27.9%	23.6%	27.0%	
Private	15.8%	16.1%	15.8%	14.3%	13.4%	13.7%	13.5%	14.4%	12.3%	11.8%	14.1%	
Daggett	1,341	1,435	1,378	1,169	539	1,081	589	1,026	906	548	361	0.1%
Federal	93.5%	93.2%	93.8%	93.1%	92.2%	94.7%	93.1%	95.0%	94.4%	93.3%	92.4%	
State	6.5%	6.8%	6.2%	6.9%	7.8%	5.3%	6.9%	5.0%	5.6%	6.7%	7.6%	
Duchesne	11,955	14,642	20,078	22,530	25,338	26,575	28,876	35,832	40,298	41,675	44,445	9.4%
Federal	30.2%	24.8%	25.0%	21.1%	22.5%	22.1%	26.3%	22.8%	20.3%	21.3%	20.2%	
State	3.6%	6.1%	4.5%	4.4%	3.9%	3.6%	5.9%	4.4%	3.9%	3.7%	2.5%	
Tribal	34.9%	44.2%	48.8%	52.9%	53.9%	57.2%	48.8%	49.0%	51.1%	47.6%	49.9%	
Private	31.3%	24.9%	21.7%	21.6%	19.7%	17.1%	19.0%	23.8%	24.7%	27.3%	27.4%	
Emery	17,213	17,443	16,609	16,213	16,948	16,718	16,583	14,390	12,416	10,905	10,256	2.2%
Federal	15.3%	16.8%	16.8%	19.3%	25.9%	26.8%	29.8%	29.5%	28.0%	27.1%	27.7%	
State	65.4%	66.4%	67.4%	65.7%	60.8%	58.6%	54.9%	56.5%	58.5%	60.5%	60.2%	
Private	19.2%	16.8%	15.8%	15.1%	13.3%	14.6%	15.3%	14.0%	13.5%	12.4%	12.1%	
Garfield	6.1	7.6	9.1	9.1	9.1	9.2	9.1	9.1	9.1	9.2	7.6	0.0%
Federal	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	
Grand	5,624	7,226	6,582	6,866	6,562	6,251	5,069	4,487	4,127	4,149	4,341	0.9%
Federal	86.0%	87.0%	87.8%	83.2%	81.5%	82.2%	79.8%	73.5%	74.8%	78.7%	81.0%	
State	13.9%	13.0%	12.2%	16.7%	18.5%	16.5%	16.4%	19.4%	19.4%	18.0%	17.2%	
Private	0.1%	0.1%	0.1%	0.1%	0.0%	1.2%	3.8%	7.1%	5.8%	3.3%	1.8%	
San Juan	20,637	17,386	13,426	12,453	12,573	13,377	10,268	9,846	9,467	9,491	9,723	2.1%
Federal	81.4%	82.0%	76.2%	67.8%	61.1%	56.6%	50.1%	44.5%	46.1%	48.3%	40.0%	
State	0.7%	0.8%	0.8%	4.2%	4.9%	10.6%	17.2%	12.3%	8.8%	5.9%	3.4%	
Tribal	17.8%	17.2%	22.9%	28.0%	33.9%	31.3%	31.5%	42.5%	44.6%	45.2%	56.3%	
Private	0.0%	0.0%	0.0%	0.0%	0.1%	1.5%	1.3%	0.7%	0.5%	0.6%	0.3%	
Sanpete	0	0.009	0.010	0.003	0.001	19	66	373	137	0	0	0.0%
Federal	–	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	99.9%	99.9%	–	–	
Private	–	100.0%	100.0%	100.0%	100.0%	0.0%	0.0%	0.1%	0.1%	–	–	
Summit	33,943	23,769	16,526	11,212	11,189	10,311	8,221	7,219	6,361	4,921	3,857	0.8%
Federal	0.5%	0.9%	1.1%	1.5%	1.8%	1.8%	1.4%	1.5%	1.9%	2.0%	2.5%	
Private	99.5%	99.1%	98.9%	98.5%	98.2%	98.2%	98.6%	98.5%	98.1%	98.0%	97.5%	
Uintah	111,242	132,682	164,089	204,038	218,581	273,685	283,454	283,353	298,602	328,185	325,925	69.3%
Federal	75.3%	76.7%	75.5%	75.6%	74.5%	77.1%	76.1%	69.4%	58.1%	60.4%	62.1%	
State	14.2%	12.8%	14.8%	17.3%	19.5%	18.2%	19.6%	25.9%	36.1%	34.7%	33.0%	
Tribal	8.1%	8.7%	7.7%	5.2%	4.4%	3.2%	2.9%	3.4%	4.5%	3.7%	3.4%	
Private	2.4%	1.7%	1.9%	2.0%	1.6%	1.4%	1.4%	1.3%	1.3%	1.3%	1.5%	
State Total	**287,141**	**293,831**	**313,519**	**356,874**	**385,555**	**442,573**	**449,729**	**440,154**	**462,619**	**490,859**	**470,565**	**100%**
Federal	48.0%	52.8%	55.8%	59.9%	60.6%	64.7%	65.1%	58.9%	53.6%	56.4%	56.1%	
State	26.3%	24.6%	23.9%	23.2%	23.4%	21.2%	21.8%	26.3%	31.0%	29.5%	28.8%	
Tribal	5.9%	7.2%	8.1%	7.3%	7.1%	6.4%	5.7%	7.1%	8.3%	7.4%	8.2%	
Private	19.8%	15.4%	12.2%	9.6%	8.9%	7.7%	7.4%	7.6%	7.2%	6.7%	6.8%	

Source: BEBR calculations based on data from the Utah Department of Natural Resources, Division of Oil, Gas and Mining.

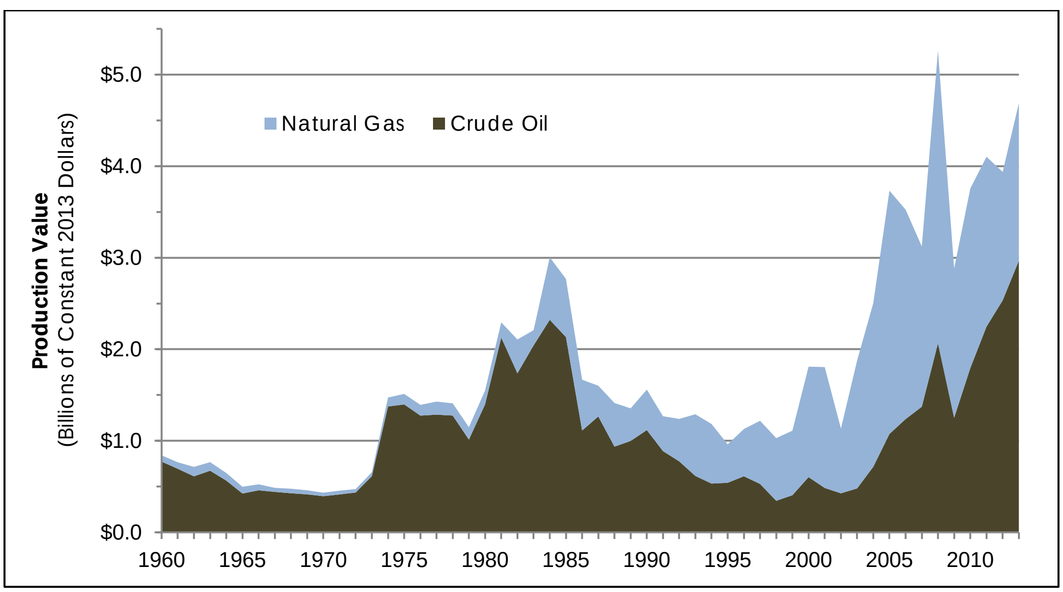
Duchesne County's 2013 natural gas production of 44.4 bcf accounted for 9 percent of the statewide total. However, Duchesne saw the fastest growth in natural gas withdrawals between 2003 and 2013, increasing more than 270 percent from 11.9 bcf and contributing almost 18 percent of state growth. Half of Duchesne's 2013 production was from tribal land, plus 27 percent from private land, 20 percent from federal land, and 2.5 percent from state land. All landowners saw significant growth from 2003 to 2013, ranging from a nearly 150 percent increase from federal land to a 432 percent increase from tribal land. The growth in output from tribal land, 18.0 bcf, accounted for 55 percent of the county's increase, while private land contributed 26 percent with an additional 8.5 bcf.

The remaining six natural gas–producing counties combined represented only 6 percent of the state's total withdrawals in 2013. In five of these counties production declined between 2003 to 2013, with only Garfield seeing an increase of 25 percent from 6.1 million cubic feet to 7.6. However, 2013's production was 16 percent below the 2005–12 average of 9.1 bcf. All of Garfield's production is on federal land.

7.3.3 Value of Oil and Gas Production

Between 2003 and 2013 the value of oil and marketed natural gas production in Utah increased by almost 150 percent, after adjusting for inflation, from $1.9 billion to $4.7 billion (in constant 2013 dollars) (Figure 7.12 and Table 7.24). The fastest growth was in production from Indian tribal lands, which increased by 280 percent to $1.1 billion in 2013. The value of production from federal lands grew by 145 percent to $2.0 billion in 2013, and production from private lands increased by 128 percent to $861.4 million. Production value from state lands grew by 72 percent to $676.5 million in 2013.

Figure 7.12
Value of Crude Oil and Marketed Natural Gas Production in Utah, 2003–2013



Source: Utah Geological Survey, Utah Energy and Mineral Statistics.

Table 7.24
Value of Crude Oil and Marketed Natural Gas Production in Utah by County and Landowner, 2003–2013
(Millions of Constant 2013 Dollars)

County & Ownership	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Change*
Carbon	$418.5	$487.8	$638.2	$531.1	$429.4	$689.7	$354.4	$378.8	$369.6	$267.2	$265.3	–36.6%
Federal	$121.4	$153.0	$218.1	$236.1	$215.4	$372.2	$200.9	$186.3	$222.9	$174.7	$157.0	29.3%
State	$230.8	$256.1	$319.4	$219.2	$156.7	$223.6	$106.4	$138.3	$101.9	$61.7	$71.2	–69.1%
Private	$66.3	$78.7	$100.7	$75.9	$57.3	$93.9	$47.2	$54.2	$44.7	$30.9	$37.1	–44.1%
Daggett	$6.6	$8.9	$11.8	$7.6	$2.5	$7.9	$2.2	$4.6	$3.7	$1.6	$1.4	–79.5%
Federal	$6.2	$8.3	$11.1	$7.0	$2.3	$7.5	$2.0	$4.4	$3.5	$1.5	$1.3	–79.8%
State	$0.4	$0.6	$0.7	$0.5	$0.2	$0.4	$0.2	$0.2	$0.2	$0.1	$0.1	–76.4%
Duchesne	$217.5	$373.4	$600.8	$586.4	$649.5	$1,007.7	$582.9	$955.0	$1,182.7	$1,329.4	$1,564.0	619.2%
Federal	$68.1	$105.8	$175.7	$166.6	$225.4	$364.2	$231.6	$318.2	$366.5	$401.0	$440.3	546.1%
State	$8.1	$18.7	$25.0	$28.8	$30.7	$43.0	$27.6	$46.2	$66.7	$60.0	$55.2	580.6%
Tribal	$71.3	$158.2	$257.9	$249.6	$243.3	$392.3	$181.9	$344.5	$449.8	$442.9	$578.4	710.9%
Private	$69.9	$90.7	$142.2	$141.5	$150.1	$208.3	$142.0	$246.1	$299.7	$425.4	$490.1	601.5%
Emery	$84.8	$107.5	$141.7	$104.4	$77.2	$121.7	$60.8	$65.1	$50.2	$31.4	$37.7	–55.6%
Federal	$13.2	$18.3	$24.0	$20.3	$20.1	$33.0	$18.5	$19.5	$14.2	$8.6	$10.5	–20.3%
State	$55.3	$71.3	$95.3	$68.4	$46.8	$71.0	$33.0	$36.5	$29.3	$18.9	$22.6	–59.2%
Private	$16.3	$18.0	$22.4	$15.7	$10.3	$17.7	$9.2	$9.1	$6.8	$3.9	$4.5	–72.0%
Garfield	$7.5	$9.8	$12.8	$13.2	$13.3	$16.7	$9.6	$12.4	$14.3	$13.0	$13.0	73.7%
Federal	$7.5	$9.8	$12.8	$13.2	$13.3	$16.7	$9.6	$12.4	$14.3	$13.0	$13.0	73.7%
Grand	$31.2	$55.8	$68.8	$52.8	$39.0	$70.4	$27.6	$28.7	$23.7	$42.4	$108.7	247.7%
Federal	$27.3	$42.9	$54.3	$41.8	$30.9	$59.9	$22.5	$21.9	$18.0	$38.6	$97.1	255.5%
State	$3.9	$12.8	$14.4	$10.9	$8.0	$9.8	$4.3	$5.3	$4.6	$3.3	$11.2	190.0%
Private	$0.1	$0.1	$0.1	$0.1	$0.1	$0.7	$0.8	$1.6	$1.1	$0.5	$0.3	440.1%
San Juan	$267.9	$300.5	$363.3	$339.5	$333.8	$454.0	$240.0	$327.8	$399.5	$396.9	$417.9	55.9%
Federal	$93.9	$100.1	$102.9	$68.5	$50.4	$75.9	$35.0	$46.6	$69.1	$67.4	$67.9	–27.7%
State	$1.4	$2.0	$2.1	$4.4	$3.8	$11.6	$7.1	$6.2	$4.2	$2.5	$1.7	21.4%
Tribal	$172.6	$198.2	$258.2	$266.3	$279.3	$364.8	$197.4	$274.6	$325.9	$326.6	$348.0	101.7%
Private	$0.1	$0.1	$0.2	$0.2	$0.2	$1.6	$0.6	$0.5	$0.4	$0.3	$0.2	258.1%
Sanpete	$0.0	$0.0011	$0.0020	$0.0006	$0.0002	$0.6	$1.1	$4.4	$1.6	$0.0	$0.0	–
Federal	$0.0	$0.0	$0.0	$0.0	$0.0	$0.6	$1.1	$4.4	$1.6	$0.0	$0.0	–
Private	$0.0	$0.0011	$0.0020	$0.0006	$0.0002	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	–
Sevier	$0.0	$8.0	$57.0	$141.9	$126.8	$200.5	$165.8	$190.8	$215.5	$186.3	$159.9	1903.1%
Federal	$0.0	$0.6	$30.9	$108.2	$89.0	$160.0	$141.7	$164.9	$176.6	$156.7	$138.6	21402.1%
State	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$6.0	$6.4	$16.6	$12.3	$8.7	45.3%
Private	$0.0	$7.3	$26.1	$33.7	$37.8	$40.5	$18.1	$19.4	$22.3	$17.3	$12.6	71.7%
Summit	$196.7	$174.7	$171.2	$99.5	$79.8	$104.7	$44.6	$50.2	$45.6	$30.5	$32.6	–83.4%
Federal	$3.0	$4.2	$4.8	$4.4	$3.8	$5.2	$1.4	$1.5	$1.6	$1.6	$3.0	–0.7%
Private	$193.7	$170.5	$166.4	$95.2	$75.9	$99.5	$43.2	$48.7	$43.9	$29.0	$29.6	–84.7%
Uintah	$658.7	$997.0	$1,679.8	$1,652.7	$1,373.3	$2,597.3	$1,390.5	$1,753.1	$1,801.6	$1,640.2	$2,081.7	216.0%
Federal	$483.0	$744.6	$1,250.4	$1,238.6	$1,016.4	$1,965.5	$1,027.1	$1,184.1	$997.5	$869.4	$1,090.9	125.8%
State	$92.7	$127.2	$235.6	$258.7	$233.7	$419.2	$235.4	$381.1	$517.1	$420.0	$505.6	445.6%
Tribal	$52.1	$83.8	$127.2	$87.1	$60.3	$103.7	$56.4	$95.5	$158.1	$158.1	$198.2	280.6%
Private	$30.9	$41.3	$66.7	$68.5	$62.9	$108.9	$71.6	$92.3	$128.9	$192.8	$287.0	828.4%
State Total	**$1,889.5**	**$2,523.3**	**$3,745.5**	**$3,529.2**	**$3,124.4**	**$5,271.2**	**$2,879.7**	**$3,770.9**	**$4,107.9**	**$3,939.0**	**$4,682.0**	**147.8%**
Federal	$823.7	$1,187.6	$1,884.9	$1,904.6	$1,667.0	$3,060.7	$1,691.4	$1,964.2	$1,885.7	$1,732.5	$2,019.5	145.2%
State	$392.7	$488.7	$692.5	$590.9	$479.9	$778.7	$419.9	$620.2	$740.6	$578.8	$676.5	72.3%
Tribal	$296.0	$440.2	$643.2	$602.9	$582.9	$860.8	$435.6	$714.6	$933.8	$927.6	$1,124.7	280.0%
Private	$377.1	$406.7	$524.8	$430.8	$394.6	$571.1	$332.7	$471.9	$547.8	$700.0	$861.4	128.4%

* Change is measured from 2003, or the next earliest year with data, to 2013.

Source: BEBR analysis of production data from Utah Department of Natural Resources, Division of Oil, Gas and Mining and first purchase prices (oil) and wellhead prices (gas) from Utah Geological Survey.

Table 7.25
Value of Crude Oil and Marketed Natural Gas Production in Utah by County with Shares by Landowner, 2003–2013
(Millions of Constant 2013 Dollars)

County & Ownership	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Share of Total
Carbon	$418.5	$487.8	$638.2	$531.1	$429.4	$689.7	$354.4	$378.8	$369.6	$267.2	$265.3	5.7%
Federal	29.0%	31.4%	34.2%	44.4%	50.2%	54.0%	56.7%	49.2%	60.3%	65.4%	59.2%	
State	55.1%	52.5%	50.0%	41.3%	36.5%	32.4%	30.0%	36.5%	27.6%	23.1%	26.9%	
Private	15.8%	16.1%	15.8%	14.3%	13.4%	13.6%	13.3%	14.3%	12.1%	11.5%	14.0%	
Daggett	$6.6	$8.9	$11.8	$7.6	$2.5	$7.9	$2.2	$4.6	$3.7	$1.6	$1.4	0.0%
Federal	93.4%	93.2%	93.8%	93.1%	92.1%	94.6%	93.0%	95.0%	94.0%	92.3%	92.4%	
State	6.6%	6.8%	6.2%	6.9%	7.9%	5.4%	7.0%	5.0%	6.0%	7.7%	7.6%	
Duchesne	$217.5	$373.4	$600.8	$586.4	$649.5	$1,007.7	$582.9	$955.0	$1,182.7	$1,329.4	$1,564.0	33.4%
Federal	31.3%	28.3%	29.2%	28.4%	34.7%	36.1%	39.7%	33.3%	31.0%	30.2%	28.2%	
State	3.7%	5.0%	4.2%	4.9%	4.7%	4.3%	4.7%	4.8%	5.6%	4.5%	3.5%	
Tribal	32.8%	42.4%	42.9%	42.6%	37.5%	38.9%	31.2%	36.1%	38.0%	33.3%	37.0%	
Private	32.1%	24.3%	23.7%	24.1%	23.1%	20.7%	24.4%	25.8%	25.3%	32.0%	31.3%	
Emery	$84.8	$107.5	$141.7	$104.4	$77.2	$121.7	$60.8	$65.1	$50.2	$31.4	$37.7	0.8%
Federal	15.6%	17.0%	16.9%	19.5%	26.0%	27.1%	30.5%	30.0%	28.3%	27.5%	27.9%	
State	65.3%	66.3%	67.3%	65.5%	60.7%	58.3%	54.3%	56.1%	58.2%	60.2%	60.0%	
Private	19.2%	16.8%	15.8%	15.1%	13.3%	14.5%	15.2%	13.9%	13.5%	12.4%	12.1%	
Garfield	$7.5	$9.8	$12.8	$13.2	$13.3	$16.7	$9.6	$12.4	$14.3	$13.0	$13.0	0.3%
Federal	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	
Grand	$31.2	$55.8	$68.8	$52.8	$39.0	$70.4	$27.6	$28.7	$23.7	$42.4	$108.7	2.3%
Federal	87.4%	76.9%	78.9%	79.1%	79.3%	85.1%	81.5%	76.2%	75.9%	91.1%	89.4%	
State	12.4%	23.0%	20.9%	20.6%	20.4%	13.9%	15.6%	18.3%	19.5%	7.8%	10.3%	
Private	0.2%	0.2%	0.2%	0.2%	0.3%	1.0%	2.9%	5.5%	4.6%	1.1%	0.3%	
San Juan	$267.9	$300.5	$363.3	$339.5	$333.8	$454.0	$240.0	$327.8	$399.5	$396.9	$417.9	8.9%
Federal	35.0%	33.3%	28.3%	20.2%	15.1%	16.7%	14.6%	14.2%	17.3%	17.0%	16.2%	
State	0.5%	0.7%	0.6%	1.3%	1.1%	2.6%	3.0%	1.9%	1.0%	0.6%	0.4%	
Tribal	64.4%	66.0%	71.1%	78.5%	83.7%	80.4%	82.2%	83.8%	81.6%	82.3%	83.3%	
Private	0.0%	0.0%	0.1%	0.1%	0.1%	0.4%	0.2%	0.1%	0.1%	0.1%	0.1%	
Sanpete	$0.0	$0.0	$0.0	$0.0	$0.0	$0.6	$1.1	$4.4	$1.6	$0.0	$0.0	0.0%
Federal		0.0%	0.0%	0.0%	0.0%	99.9%	100.0%	100.0%	100.0%			
Private		100.0%	100.0%	100.0%	100.0%	0.1%	0.0%	0.0%	0.0%			
Sevier	$0.0	$8.0	$57.0	$141.9	$126.8	$200.5	$165.8	$190.8	$215.5	$186.3	$159.9	3.4%
Federal		8.1%	54.2%	76.2%	70.2%	79.8%	85.5%	86.5%	81.9%	84.1%	86.7%	
State		0.0%	0.0%	0.0%	0.0%	0.0%	3.6%	3.4%	7.7%	6.6%	5.4%	
Private		91.9%	45.8%	23.8%	29.8%	20.2%	10.9%	10.2%	10.4%	9.3%	7.9%	
Summit	$196.7	$174.7	$171.2	$99.5	$79.8	$104.7	$44.6	$50.2	$45.6	$30.5	$32.6	0.7%
Federal	1.5%	2.4%	2.8%	4.4%	4.8%	5.0%	3.1%	2.9%	3.6%	5.1%	9.3%	
Private	98.5%	97.6%	97.2%	95.6%	95.2%	95.0%	96.9%	97.1%	96.4%	94.9%	90.7%	
Uintah	$658.7	$997.0	$1,679.8	$1,652.7	$1,373.3	$2,597.3	$1,390.5	$1,753.1	$1,801.6	$1,640.2	$2,081.7	44.5%
Federal	73.3%	74.7%	74.4%	74.9%	74.0%	75.7%	73.9%	67.5%	55.4%	53.0%	52.4%	
State	14.1%	12.8%	14.0%	15.7%	17.0%	16.1%	16.9%	21.7%	28.7%	25.6%	24.3%	
Tribal	7.9%	8.4%	7.6%	5.3%	4.4%	4.0%	4.1%	5.4%	8.8%	9.6%	9.5%	
Private	4.7%	4.1%	4.0%	4.1%	4.6%	4.2%	5.2%	5.3%	7.2%	11.8%	13.8%	
State Total	**$1,889.5**	**$2,523.3**	**$3,745.5**	**$3,529.2**	**$3,124.4**	**$5,271.2**	**$2,879.7**	**$3,770.9**	**$4,107.9**	**$3,939.0**	**$4,682.0**	**100%**
Federal	43.6%	47.1%	50.3%	54.0%	53.4%	58.1%	58.7%	52.1%	45.9%	44.0%	43.1%	
State	20.8%	19.4%	18.5%	16.7%	15.4%	14.8%	14.6%	16.4%	18.0%	14.7%	14.4%	
Tribal	15.7%	17.4%	17.2%	17.1%	18.7%	16.3%	15.1%	19.0%	22.7%	23.5%	24.0%	
Private	20.0%	16.1%	14.0%	12.2%	12.6%	10.8%	11.6%	12.5%	13.3%	17.8%	18.4%	

Source: BEBR analysis of production data from Utah Department of Natural Resources, Division of Oil, Gas and Mining and first purchase prices (oil) and wellhead prices (gas) from Utah Geological Survey.

Federal lands provided the largest share of the value of oil and gas production in 2013 with 43 percent of the total. Tribal lands were next with 24 percent, followed by private and state lands with 18 and 14 percent, respectively (Table 7.25). Not surprisingly, Uintah and Duchesne counties are the largest counties by value. In 2013 the two counties together accounted for more than three-quarters of the state's total oil and gas production value. Uintah provided 44.5 percent and Duchesne provided 33.4 percent. The next largest county was San Juan, with 9 percent of the total value of production.

Looking at straight production by landowner may be misleading because it does not take account of the amount of land a landowner has in the state or in a particular county. That is, the value of oil and gas production from federal lands may be large simply because the federal government owns a lot of land. To try to adjust for this we divided the 2013 value of production for each landowner by the number of acres it holds. In the cases of federal and state government land, we counted only "developable" land, which excludes national parks, monuments and recreation areas, designated wilderness, state parks, and the like.

Table 7.26 shows both the total 2013 oil and gas production value of each landowner in a county and the value per acre. In a few cases landowner rankings by production per acre are not the same as rankings by total production. Most notably, in Uintah County total production from federal land was twice the value of production from state land, almost four times the production from private land, and more than five times the production from tribal land. But when adjusted for acreage, federal land was about a third as productive as state land, equally productive as private land, and only one and a half times as productive as tribal land. Federal land was also less productive on a per-acre basis than by total production value in Carbon, Emery and Sevier counties. Variations in production value per acre across counties are due mostly to variations in geology and available oil and gas resources.

Table 7.26
Oil and Gas Production Value per Acre by County and Landowner, 2013

County & Ownership	Production Value	Acreage*	Value per Acre	County & Ownership	Production Value	Acreage*	Value per Acre
Carbon				**San Juan**			
Federal	$157,023,822	451,435	$348	Federal	$67,854,504	2,380,525	$29
State	$71,248,045	123,278	$578	State	$1,735,584	267,277	$6
Private	$37,063,048	371,937	$100	Tribal	$348,021,773	1,280,261	$272
Daggett				Private	$247,992	410,629	$0.6
Federal	$1,255,926	277,851	$5	**Sevier**			
State	$103,781	40,521	$3	Federal	$138,611,385	938,238	$148
Duchesne				State	$8,702,337	46,025	$189
Federal	$440,273,270	640,567	$687	Private	$12,599,116	236,369	$53
State	$55,224,963	149,856	$369	**Summit**			
Tribal	$578,395,504	393,473	$1,470	Federal	$3,016,103	367,981	$8
Private	$490,102,595	597,982	$820	Private	$29,574,252	646,197	$46
Emery				**Uintah**			
Federal	$10,509,202	2,275,820	$5	Federal	$1,090,859,368	1,634,774	$667
State	$22,594,361	344,181	$66	State	$505,641,033	271,525	$1,862
Private	$4,549,655	234,752	$19	Tribal	$198,241,355	473,515	$419
Garfield				Private	$286,965,526	434,181	$661
Federal	$12,963,287	1,925,366	$7	**State Total**			
Grand				Federal	$2,019,458,648	12,495,250	$162
Federal	$97,091,781	1,602,694	$61	State	$676,493,429	1,796,982	$376
State	$11,243,324	367,439	$31	Tribal	$1,124,658,633	2,347,092	$479
Private	$315,759	101,727	$3	Private	$861,417,943	3,253,508	$265

* Federal and state acreages are only "developable" land, e.g., they exclude national parks, monuments, and recreation areas; designated wilderness; state parks; etc. The state totals are the sums of the county-level acreages shown, not statewide totals.

Source: Utah Department of Natural Resources, Division of Oil, Gas and Mining and first purchase prices (oil) and wellhead prices (gas) from Utah Geological Survey; BEBR GIS analysis of land ownership from the State of Utah, SGID.

7.3.4 Economic Contributions

Statewide Contributions

At the state level we analyzed the economic contribution of three facets of the oil and gas industry: oil and gas extraction, support activities for oil and gas operations, and drilling oil and gas wells. We calculated contributions based on employment and earnings in the three sectors. For the oil and gas extraction sector we were able to include an estimate of proprietors' employment and income, something that is not included in the other two sectors. The economic contributions of the support activities for oil and gas operations and drilling oil and gas wells sectors are based on only full- and part-time jobs and their earnings that are covered by the unemployment insurance program; they do not include the effects of the self-employed in these sectors. Thus they are conservative estimates of the sectors' contributions to Utah's economy.

Due to linkages in an economy, activity in one industry can affect many other industries. This occurs through the purchases of inputs from local suppliers, those suppliers' purchases of inputs, and the household spending of wages earned by workers in the "impacting" industry and the supplying industries. Therefore, for the statewide calculations we report employment, earnings and gross state product contributions by industry, as well as fiscal impacts on state and county revenues. Earnings are defined as wage and salary payments, employer contributions for health insurance, and proprietors' income, and are reported by place of work (as opposed to place of residence of the earner, which is not always in the same county or even the same state as the job). Gross state product (GSP) is a measure of a state's output, the local counterpart to national GDP. It is the market value of goods and services produced by labor, capital and land in the state.

In 2013, Utah's oil and gas industry consisted of over 8,500 full- and part-time jobs earning $768.2 million (Table 7.27). The largest sector was oil and gas extraction, with 4,104 jobs (including the self-employed) earning $442.7 million. Support activities for oil and gas operations was nearly as large, with 3,656 jobs earning $249.6 million. There were 798 covered jobs drilling oil and gas wells; they received $75.9 million in earnings.

Table 7.27
Direct Employment and Earnings in Utah's
Oil and Gas Industry, 2013

Sector	Employment	Earnings
Oil and gas extraction	4,104	$442,682,881
Support activities for oil and gas operations	3,656	$249,625,722
Drilling oil and gas wells	798	$75,914,019
Total	8,558	$768,222,622

Note: Only oil and gas extraction includes an estimate of proprietors' employment and earnings.

Source: Utah Department of Workforce Services, U.S. Bureau of Economic Analysis and U.S. Bureau of Labor Statistics.

The oil and gas industry supported a total of 26,171 jobs, $1.9 billion in earnings, and $4.7 billion in GSP in Utah in 2013 (Table 7.28). This includes the direct jobs and their associated earnings noted above, and which are included below in the mining sector contributions. This is a conservative estimate as it does not account for the employment and income of the self-employed in the support activities and drilling sectors, and the economic effects of their purchases. The economic contribution of oil and gas activity on federal lands consisted of 11,286 jobs, of which 3,690 were direct oil and gas employment; $814.6 million in earnings, of which $331.3 million was direct; and $2.0 billion in GSP. Outside of the mining sector, the largest employment contributions from the oil and gas industry were in professional, scientific and technical services; finance and insurance; and real estate and rental and leasing. Because of differences in wage rates and production processes, the largest earnings and GSP contributions were not necessarily in the same sectors as the employment contributions. The largest earnings contributions were in professional, scientific and technical services; health care and social assistance; and manufacturing. The largest GSP contributions were in real estate and rental and leasing; professional, scientific and technical services; and finance and insurance.

Table 7.28
Total Estimated Economic Contribution of the Oil and Gas Industry in Utah, 2013
(Dollar amounts are millions)

	Total Contribution			Contribution from Production on Federal Land		
Industry Sector	**Jobs**	**Earnings**	**GSP**	**Jobs**	**Earnings**	**GSP**
Agriculture, forestry, fishing, and hunting	109	$5.3	$10.0	47	$2.3	$4.3
Mining	8,951	$809.3	$2,636.9	3,860	$349.0	$1,137.1
Utilities*	118	$20.4	$71.6	51	$8.8	$30.9
Construction	734	$67.6	$85.9	317	$29.2	$37.0
Manufacturing	1,215	$107.3	$183.6	524	$46.3	$79.2
Wholesale trade	646	$60.3	$126.1	279	$26.0	$54.4
Retail trade	1,626	$74.8	$142.1	701	$32.2	$61.3
Transportation and warehousing*	617	$52.2	$81.9	266	$22.5	$35.3
Information	320	$25.3	$62.8	138	$10.9	$27.1
Finance and insurance	1,812	$84.8	$191.1	781	$36.6	$82.4
Real estate and rental and leasing	1,775	$49.9	$339.4	766	$21.5	$146.4
Professional, scientific, and technical services	1,904	$161.8	$236.1	821	$69.8	$101.8
Management of companies and enterprises	962	$107.2	$155.1	415	$46.2	$66.9
Administrative and waste management services	1,129	$42.8	$66.1	487	$18.5	$28.5
Educational services	381	$16.2	$21.8	164	$7.0	$9.4
Health care and social assistance	1,513	$112.2	$146.4	652	$48.4	$63.1
Arts, entertainment, and recreation	337	$10.2	$17.3	145	$4.4	$7.5
Accommodation	262	$10.5	$22.0	113	$4.5	$9.5
Food services and drinking places	1,051	$28.3	$47.6	453	$12.2	$20.5
Other services	590	$40.4	$60.9	255	$17.4	$26.3
Households	117	$2.3	$2.3	51	$1.0	$1.0
Total	26,171	$1,889.0	$4,706.9	11,286	$814.6	$2,029.7

Note: Mining sector contributions include the direct employment, earnings and GSP of the oil and gas industry.
Source: BEBR analysis of data from the Utah Department of Workforce Services, U.S. Bureau of Labor Statistics Quarterly Census of Employment and Wages, and the U.S. Bureau of Economic Analysis using BEA's RIMS II multipliers.

In 2013, oil and gas extraction was an approximately $1.7 billion industry in Utah, accounting for about 1.2 percent of Utah's gross state product. There were an estimated 4,100 oil and gas jobs in the state, paying roughly $468.0 million in earnings.[179]

The economic contribution of oil and gas extraction in Utah in 2013 comprised 12,537 jobs, more than $1.1 billion in earnings, and $3.3 billion in GSP. Oil and gas extraction on federal land supported 5,400 jobs, of which 1,770 were direct extraction jobs; $484.5 million in earnings, of

179 Employment here includes wage-and-salary employment as well as proprietors' (self-) employment. Earnings are the full BEA definition and cover wages and salaries, employer contributions for employee pension and insurance funds and for government social insurance, and proprietors' income. Thus they are higher than the amount shown in Table 7.27. Earnings as used in RIMS II economic impact analysis comprise only wages and salaries, employer contributions for health insurance, and proprietors' income.

which $190.9 million was direct; and $1.4 billion in GSP (Table 7.29). Outside of the mining sector, the largest employment contributions from oil and gas extraction were in professional, scientific and technical services; real estate and rental and leasing; and retail trade. The largest earnings contributions were in professional, scientific and technical services; health care and social assistance; and construction. The largest GSP contributions were in real estate and rental and leasing; professional, scientific and technical services; and manufacturing.

Table 7.29
Estimated Economic Contribution of Oil and Gas Extraction in Utah, 2013
(Dollar amounts are millions)

	Total Contribution			Contribution from Production on Federal Land		
Industry Sector	**Jobs**	**Earnings**	**GSP**	**Jobs**	**Earnings**	**GSP**
Agriculture, forestry, fishing, and hunting	52	$3.1	$5.0	22	$1.3	$2.1
Mining	4,423	$478.7	$2,086.4	1,908	$206.4	$899.7
Utilities*	63	$13.0	$50.2	27	$5.6	$21.7
Construction	668	$63.6	$80.6	288	$27.4	$34.8
Manufacturing	520	$59.5	$103.5	224	$25.7	$44.7
Wholesale trade	288	$33.5	$69.4	124	$14.4	$29.9
Retail trade	799	$45.0	$86.2	345	$19.4	$37.2
Transportation and warehousing*	261	$29.8	$47.7	113	$12.8	$20.6
Information	122	$12.7	$34.1	52	$5.5	$14.7
Finance and insurance	618	$42.5	$101.1	267	$18.3	$43.6
Real estate and rental and leasing	839	$31.3	$194.7	362	$13.5	$84.0
Professional, scientific, and technical services	899	$92.1	$133.3	388	$39.7	$57.5
Management of companies and enterprises	452	$62.3	$87.7	195	$26.9	$37.8
Administrative and waste management services	447	$22.3	$34.4	193	$9.6	$14.8
Educational services	220	$11.2	$14.9	95	$4.8	$6.4
Health care and social assistance	777	$69.8	$92.1	335	$30.1	$39.7
Arts, entertainment, and recreation	159	$5.9	$10.2	68	$2.5	$4.4
Accommodation	101	$5.3	$10.9	44	$2.3	$4.7
Food services and drinking places	469	$15.8	$27.3	202	$6.8	$11.8
Other services	309	$25.1	$35.7	133	$10.8	$15.4
Households	49	$1.2	$1.2	21	$0.5	$0.5
Total	12,537	$1,123.5	$3,306.6	5,407	$484.5	$1,426.0

Note: Mining sector contributions include the direct employment, earnings and GSP of the oil and gas extraction subsector: 4,104 jobs, $442.7 million in earnings, and $1.7 billion in GSP.

Source: BEBR analysis of data from the Utah Department of Workforce Services and the U.S. Bureau of Economic Analysis using BEA's RIMS II multipliers.

In 2013 there were an estimated 3,658 covered jobs with $249.6 million in earnings in the support activities for oil and gas operations sector. The total economic contribution of these support activities consisted of 11,059 jobs, $584.6 million in earnings, and $1.0 billion in GSP. Support activities on federal land contributed 4,769 jobs, 1,577 of which were direct support jobs; $252.1 million in earnings, $107.6 of which was direct; and $447.2 million in GSP (Table 7.30). Keep in mind that these are conservative estimates as they do not include the effects of the operations of self-employed support providers. Outside of the mining sector, the largest employment contributions from this sector were in finance and insurance; professional, scientific and technical services; and real estate and rental and leasing. The largest earnings contributions were in professional, scientific and technical services; management of companies and enterprises; and finance and insurance. The largest GSP contributions were in real estate and rental and leasing; professional, scientific and technical services; and finance and insurance.

Table 7.30
Estimated Economic Contribution of Support Activities for Oil and Gas Operations in Utah, 2013
(Dollar amounts are millions)

	Total Contribution			Contribution from Production on Federal Land		
Industry Sector	**Jobs**	**Earnings**	**GSP**	**Jobs**	**Earnings**	**GSP**
Agriculture, forestry, fishing, and hunting	43	$1.6	$3.6	19	$0.7	$1.5
Mining	3,712	$253.4	$388.8	1,601	$109.3	$167.7
Utilities*	43	$5.5	$16.0	19	$2.4	$6.9
Construction	53	$3.1	$4.0	23	$1.3	$1.7
Manufacturing	528	$34.0	$56.6	228	$14.7	$24.4
Wholesale trade	271	$19.3	$40.6	117	$8.3	$17.5
Retail trade	661	$22.8	$42.8	285	$9.9	$18.5
Transportation and warehousing*	271	$16.2	$24.4	117	$7.0	$10.5
Information	161	$9.8	$22.4	70	$4.2	$9.7
Finance and insurance	1,025	$34.3	$72.4	442	$14.8	$31.2
Real estate and rental and leasing	756	$14.4	$111.9	326	$6.2	$48.3
Professional, scientific, and technical services	810	$53.2	$78.9	349	$22.9	$34.0
Management of companies and enterprises	410	$34.6	$51.9	177	$14.9	$22.4
Administrative and waste management services	564	$16.4	$25.3	243	$7.1	$10.9
Educational services	129	$3.9	$5.3	55	$1.7	$2.3
Health care and social assistance	587	$32.4	$41.5	253	$14.0	$17.9
Arts, entertainment, and recreation	145	$3.3	$5.5	63	$1.4	$2.4
Accommodation	136	$4.3	$9.1	59	$1.8	$3.9
Food services and drinking places	478	$9.9	$16.0	206	$4.3	$6.9
Other services	224	$11.6	$19.3	97	$5.0	$8.3
Households	54	$0.8	$0.8	23	$0.3	$0.3
Total	11,059	$584.6	$1,037.1	4,769	$252.1	$447.2

Note: Mining sector contributions include the direct employment, earnings and GSP of the support activities for oil and gas operations subsector: 3,658 jobs and $249.6 million in earnings.

Source: BEBR analysis of data from the Bureau of Labor Statistics Quarterly Census of Employment and Wages using BEA's RIMS II multipliers.

In 2013 there were an estimated 798 covered jobs with $75.9 million in earnings in the drilling oil and gas wells sector. These jobs and earnings supported an additional 1,777 jobs and $104.9 million in earnings, for a total contribution of 2,575 jobs with $180.9 million in earnings. The drilling sector also contributed $363.2 million in GSP. Drilling oil and gas wells on federal land contributed 1,110 jobs, 344 of which were direct drilling jobs; $78.0 million in earnings, $32.7 million of which was direct; and $156.5 million in GSP (Table 7.31). These are conservative estimates as they do not include the effects of the operations of any sole proprietors or partnerships in the drilling sector. Similar to the other oil and gas subsectors, outside of the mining sector the largest employment contributions from this sector were in professional, scientific and technical services; real estate and rental and leasing; and finance and insurance. The largest earnings contributions were in professional, scientific and technical services; manufacturing; and management of companies and enterprises. The largest GSP contributions from drilling oil and gas wells were in real estate and rental and leasing; professional, scientific and technical services; and manufacturing.

Table 7.31
Estimated Economic Contribution of Drilling Oil and Gas Wells in Utah, 2013
(Dollar amounts are millions)

	Total Contribution			Contribution from Production on Federal Land		
Industry Sector	Jobs	Earnings	GSP	Jobs	Earnings	GSP
Agriculture, forestry, fishing, and hunting	14	$0.6	$1.5	6	$0.3	$0.6
Mining	816	$77.3	$161.7	352	$33.3	$69.7
Utilities*	12	$1.9	$5.4	5	$0.8	$2.3
Construction	14	$1.0	$1.3	6	$0.4	$0.5
Manufacturing	166	$13.8	$23.4	72	$5.9	$10.1
Wholesale trade	87	$7.6	$16.0	38	$3.3	$6.9
Retail trade	166	$7.0	$13.1	71	$3.0	$5.7
Transportation and warehousing*	86	$6.2	$9.7	37	$2.7	$4.2
Information	37	$2.8	$6.3	16	$1.2	$2.7
Finance and insurance	169	$8.0	$17.6	73	$3.5	$7.6
Real estate and rental and leasing	180	$4.2	$32.8	78	$1.8	$14.1
Professional, scientific, and technical services	196	$16.5	$23.9	84	$7.1	$10.3
Management of companies and enterprises	100	$10.3	$15.4	43	$4.4	$6.6
Administrative and waste management services	118	$4.1	$6.4	51	$1.8	$2.8
Educational services	32	$1.2	$1.6	14	$0.5	$0.7
Health care and social assistance	149	$10.0	$12.9	64	$4.3	$5.5
Arts, entertainment, and recreation	33	$0.9	$1.5	14	$0.4	$0.7
Accommodation	25	$0.9	$2.0	11	$0.4	$0.9
Food services and drinking places	105	$2.6	$4.3	45	$1.1	$1.8
Other services*	57	$3.6	$6.0	25	$1.6	$2.6
Households	14	$0.2	$0.2	6	$0.1	$0.1
Total	2,575	$180.9	$363.2	1,110	$78.0	$156.5

Note: Mining sector contributions include the direct employment, earnings and GSP of the drilling oil and gas wells subsector: 798 jobs and $75.5 million in earnings.

Source: BEBR analysis of data from the Bureau of Labor Statistics Quarterly Census of Employment and Wages using BEA's RIMS II multipliers.

We also calculated the fiscal impacts due to oil and gas activity in 2013. Earnings contributions generate income and sales tax revenues for the state and counties. Oil and gas production generates federal royalty payments (49 percent of which is returned to the state and a portion of that is then distributed to most of the counties), state royalty payments, state excise taxes, local property taxes, and state and local taxable sales. (For a detailed discussion of these and other revenue impacts, see Chapter 6.) Total estimated fiscal impacts of oil and gas production in 2013 amounted to approximately $470.8 million, with $236.4 million of this due to production on federal lands (Table 7.32). The largest sources of revenue were federal and state royalties ($205.1 million total, $121.8 million from production on federal land), income and sales taxes from earnings ($141.9 million total, $61.2 million federal), the oil and gas severance tax ($57.6 million total, $24.9 million federal), and county property taxes on oil and gas wells and infrastructure ($52.6 million total, $22.7 million federal). Note that the fiscal impacts from earnings shown here do not include income tax revenues from corporate income[180] or from production royalties paid to private landowners.

Table 7.32
Estimated Fiscal Impacts of the Oil and Gas Industry in Utah, 2013

Source	Total	Federal
Royalties[1]	$205,062,490	$121,815,984
Earnings	$141,948,527	$61,211,795
Severance Tax	$57,647,672	$24,860,405
Conservation Fee	$6,456,539	$2,784,365
Property Taxes	$52,604,864	$22,685,707
Taxable Sales[2]	$7,079,934	$3,053,500
Total Fiscal Impact	$470,800,026	$236,411,757

1 Estimated state royalties plus the state share (49%) of estimated federal royalties.
2 These are state sales tax revenues from taxable sales in the oil and gas extraction sector.

Source: BEBR analysis, Utah State Tax Commission.

180 In 2012 mining firms paid $24.0 million in corporate income taxes to the state of Utah.

County–Level Contributions

For oil and gas production, we calculated economic contributions based on direct employment and earnings in the oil and gas extraction, drilling oil and gas wells, and support activities for oil and gas operations sectors. These are jobs and wages (adjusted to include employer contributions for health insurance) covered by the unemployment insurance program and, as such, do not include the self-employed, for whom we do not have county-level data. Unfortunately, oil and gas employment and earnings data are not available for every county from which oil and/or gas are produced. However, the counties for which we were able to obtain employment and earnings data represented 98.5 percent of the state's total oil and gas production value in 2013. In addition, we have oil and gas employment and earnings for Salt Lake County. While that county has no oil or gas wells, it is home to several companies classified in the oil and gas extraction, drilling oil and gas wells, and support activities for oil and gas operations sectors. These too add to the economic contribution of the oil and gas industry in the state. Available county-level data for drilling oil and gas wells accounted for 87 percent of the state total, while data for support activities represented 95 percent of the state total. Note that because of the omission of proprietors from the input data, the following economic contribution estimates are conservative. Statewide, proprietors account for about 55 percent of total oil and gas extraction employment and 57 percent of total earnings. In the support activities for mining sector, which includes both drilling oil and gas wells and support activities for oil and gas operations, proprietors represent about 9 percent of employment and 15 percent of earnings.

Uintah, Duchesne and Salt Lake counties saw the largest economic contributions from the oil and gas industry in 2013 (Table 7.33). Uintah and Salt Lake had employment and earnings from all three sectors that make up the oil and gas industry: oil and gas extraction, drilling oil and gas wells, and support activities for oil and gas operations. Duchesne did not have any drilling jobs, but did have activity in the other sectors.

Table 7.33
Estimated Economic Contributions of the Oil and Gas Industry by County, 2013
(Dollar amounts are millions)

County	2013 Direct Employment	2013 Direct Earnings	Total Contributions Jobs	Total Contributions Earnings	Total Contributions GSP	Contributions from Production on Federal Land Jobs	Contributions from Production on Federal Land Earnings	Contributions from Production on Federal Land GSP
Carbon	43	$4.2	122	$10.7	$45.6	72	$6.3	$27.0
Duchesne	2,221	$171.9	3,503	$253.0	$521.4	986	$71.2	$146.8
Emery	36	$2.90	13	$0.3	$1.1	4	$0.1	$0.3
Garfield	9	$0.6	14	$0.8	$2.3	14	$0.8	$2.3
Grand	38	$2.4	64	$3.4	$7.7	57	$3.0	$6.9
Salt Lake	745	$73.8	2,434	$182.8	$269.2			
San Juan	146	$8.3	216	$11.1	$25.0	35	$1.8	$4.1
Sevier	11	$0.7	17	$1.0	$2.9	15	$0.9	$2.5
Uintah	2,754	$227.3	4,658	$338.7	$540.2	2,440	$177.4	$283.1
Utah	15	$0.8	34	$1.4	$2.8			
Washington	3	$0.3	6	$0.4	$0.5			

Note: Direct employment is covered employment only. Direct earnings are wages plus an adjustment for employer contributions to health insurance. GSP = gross state product.

Source: BEBR analysis of data from the Utah Department of Workforce Services and the U.S. Bureau of Labor Statistics using BEA's RIMS II multipliers.

In Uintah, the oil and gas industry contributed a total estimated 4,658 jobs, $338.7 million in earnings, and $540.2 million in GSP. This included direct employment and earnings of 2,754 jobs and $227.3 million: 581 jobs with $64.1 million from extraction, 371 jobs with $33.6 million from drilling, and 1,802 jobs with $129.6 million from support activities. Production on federal land was responsible for an estimated 2,440 jobs; $177.4 million in earnings, and $283.1 million in GSP.

In Duchesne County the oil and gas industry supported an estimated 3,503 jobs, $253.0 million in earnings, and $521.4 million in GSP. This included direct employment and earnings of 896 jobs and $85.5 million in extraction and 1,325 jobs with $86.3 million in support activities. Production on federal land contributed an estimated 986 jobs, $71.2 million in earnings, and $146.8 million in GSP.

In Salt Lake, with no actual oil or gas production but employment in all three component sectors, the industry contributed an estimated 2,434 jobs, $182.8 million in earnings, and $269.2 million in GSP. This included direct employment and earnings of 194 extraction sector jobs with $26.7 million in earnings, 298 drilling sector jobs with $27.3 million in earnings, and 253 support jobs with $19.8 million in earnings. Although there is no production in Salt Lake County and these are likely headquarters jobs, perhaps roughly 40 percent of the economic contributions could be attributed to production on federal land, the share of the total statewide value of oil and gas production in 2013 that came from federal leases.

Oil and gas industry contributions in other counties ranged from 216 jobs, $11.1 million in earnings, and $25.0 million in GSP in San Juan to 6 jobs, $430,000 in earnings, and $524,000 in GSP in Washington. Note that the figures for Emery County do not include contributions from oil and gas extraction, even though both oil and gas were produced in the county in 2013. There is only one extraction establishment reported there, so employment and earnings data are not disclosed. Carbon, Emery, Garfield, Grand, San Juan and Sevier all saw economic contributions attributable to production on federal land.

Oil and gas extraction made the largest economic contributions in Duchesne County. The oil and gas extraction sector in Duchesne supported an estimated total of 1,550 jobs, $138.4 million in earnings, and $326.0 million in gross state product in 2013 (Table 7.34). This comprised nearly 900 direct jobs and $85.5 million in earnings, which supported an additional 655 jobs with $52.9 million in earnings. Oil and gas production on federal land in the county supported a total of 437 jobs, of which 252 were direct oil and gas extraction jobs; $39.0 million in earnings, of which $24.1 million was direct earnings; and $91.8 million in GSP.

Uintah County had the second-largest economic contribution from oil and gas extraction, with the sector supporting a total of 1,017 jobs, $102.2 million in earnings, and $179.2 million in GSP. This was composed of 581 direct oil and gas extraction jobs paid $64.1 million in earnings, which supported an additional 436 jobs and $38.1 million in earnings. Production on federal land in the county was accomplished by 304 direct extraction jobs that were paid $33.6 million in direct earnings. These supported an additional 229 jobs with $20.0 million in earnings, plus a total of $93.9 million in GSP.

Despite there being no oil and gas production in Salt Lake County, in 2013 it was home to 194 jobs with $26.7 million in earnings in the oil and gas extraction sector. These supported an additional 329 jobs with $33.3 million in earnings and $80.5 million in GSP. None of these effects stem directly from activity on federal land; but if these are jobs at company headquarters, then perhaps about 40 percent of the economic contribution could be attributed to extraction from federal land, which is roughly the share of statewide oil and gas production in 2013 that came from federal leases.

Table 7.34
Estimated Economic Contribution of Oil and Gas Extraction by County, 2013
(Dollar amounts are millions)

	2013 Direct		Total Contributions			Contributions from Production on Federal Land		
County	**Jobs**	**Earnings**	**Jobs**	**Earnings**	**GSP**	**Jobs**	**Earnings**	**GSP**
Carbon	43	$4.2	122	$10.7	$45.6	72	$6.3	$27.0
Duchesne	896	$85.5	1,551	$138.4	$326.0	437	$39.0	$91.8
Garfield	9	$0.6	14	$0.8	$2.3	14	$0.8	$2.3
Grand	17	$1.2	29	$1.9	$4.9	26	$1.7	$4.4
Salt Lake	194	$26.7	523	$60.0	$80.5			
San Juan	60	$4.0	96	$5.9	$15.5	16	$1.0	$2.5
Sevier	11	$0.7	17	$1.0	$2.9	15	$0.9	$2.5
Uintah	581	$64.1	1,017	$102.2	$179.2	533	$53.6	$93.9

Note: Direct employment is covered employment only. Direct earnings are wages plus an adjustment for employer contributions to health insurance. GSP = gross state product.
Source: BEBR analysis of data from the Utah Department of Workforce Services and the U.S. Bureau of Labor Statistics using BEA's RIMS II multipliers.

The economic contributions of oil and gas extraction were considerably lower in the remaining five counties with employment and earnings data. Total impacts in these counties ranged from 122 jobs, $10.7 million in earnings, and $45.6 million in GSP in Carbon County to 14 jobs, $806,000 in earnings, and $2.3 million in GSP in Garfield County. Impacts from production on federal land ranged from 72 jobs, $6.3 million in earnings, and $27.0 million in GSP in Carbon to 14 jobs, $806,000 in earnings, and $2.3 million in GSP in Garfield, where all oil and gas production is on federal land.

The support activities for oil and gas operations and drilling oil and gas wells sectors made the largest contributions in Uintah, Duchesne and Salt Lake counties (Table 7.35). In Uintah, the two sectors contributed 3,640 jobs, 2,173 of which were direct; $236.4 million in earnings, $163.2 million of which was direct; and $361.0 million in GSP. Of these impacts, production on federal land accounted for 1,907 jobs, $123.9 million in earnings, and $189.2 million in GSP. In Duchesne County, support activities alone contributed 1,952 jobs, $114.6 million in earnings, and $195.4 million in GSP. The portions attributable to production on federal land were 550 jobs, $32.3 million in earnings, and $55.0 million in GSP. In Salt Lake, the drilling and support sectors contributed 1,911 jobs, of which 551 were direct; $122.7 million in earnings, of which $47.1 million was direct; and $188.8 million in GSP. As noted above, perhaps 40 percent of these contributions could be attributed to activity on federal land. Other counties with economic contributions from drilling and/or support activities attributable to production on federal land were Emery, Grand and San Juan.

Table 7.35
Economic Contribution of Drilling Oil and Gas Wells and Support Activities for Oil and Gas Operations by County, 2013
(Dollar amounts are millions)

County	2013 Direct		Total Contributions			Contributions from Production on Federal Land		
	Employment	Earnings	Jobs	Earnings	GSP	Jobs	Earnings	GSP
Duchesne	1,325	$86.3	1,952	$114.6	$195.4	550	$32.3	$55.0
Emery	8	$0.2	13	$0.3	$1.1	4	$0.1	$0.3
Grand	21	$1.1	35	$1.5	$2.8	31	$1.4	$2.5
Salt Lake[1]	551	$47.1	1,911	$122.7	$188.8			
San Juan[2]	86	$4.2	120	$5.3	$9.5	20	$0.9	$1.5
Uintah[3]	2,173	$163.2	3,640	$236.4	$361.0	1,907	$123.9	$189.2
Utah	15	$0.8	34	$1.4	$2.8			
Washington	3	$0.3	6	$0.4	$0.5			

Note: Direct employment is covered employment only. Direct earnings are wages plus an adjustment for employer contributions to health insurance. GSP = gross state product.
1. Salt Lake direct employment and earnings consist of 298 drilling jobs with $27.3 million in earnings and 253 support jobs with $19.8 million in earnings.
2. San Juan direct employment and earnings consist of 27 drilling jobs with $1.6 million in earnings and 59 support jobs with $2.6 million in earnings.
3. Uintah direct employment and earnings consist of 371 drilling jobs with $33.6 million in earnings and 1,802 support jobs with $129.6 million in earnings.
All other counties have only support jobs.
Source: BEBR analysis of data from the Utah Department of Workforce Services and the U.S. Bureau of Labor Statistics using BEA's RIMS II multipliers.

We estimated the local fiscal impacts of county-level oil and gas activities. These comprise earnings-based impacts (sales tax revenues), property taxes assessed on oil and gas extraction, and federal mineral lease royalties distributed to the counties by the Utah Department of Transportation. They do not include revenues from taxable sales in the oil and gas extraction sector, since county-level taxable sales data are available for only the mining sector as a whole. See Chapter 6, Tables 6.4, 6.20 and 6.24 for more information on these revenues.

Table 7.36, below, shows 2013 estimated fiscal impacts for all counties with oil and gas production and/or reported oil and gas–related employment. The largest impacts were in Uintah County at $59.0 million, of which an estimated $45.1 million was due to production on federal land. Federal royalties distributed by UDOT to Uintah in 2013 amounted to $29.7 million. The county received $25.6 million in property taxes on oil and gas extraction, of which $13.4 million is attributable to production on federal land. There was also an estimated $3.6 million in sales tax revenue due to the earnings contributions of the oil and gas extraction sector; $1.9 million of this can be attributed to production on federal land. Not surprisingly, Duchesne saw the second largest fiscal impacts from oil and gas extraction. The estimated total revenue impact of $22.2 million comprised $12.2 million in oil and gas property taxes, $8.5 million in federal mineral royalties from UDOT, and almost $1.5 million in earnings-related sales tax revenues. Over $12.3 million of the total revenues were due to oil and gas production on federal land. At the other end of the scale, Utah County, which has no oil or gas production, received an estimated $6,700 in sales tax revenues due to oil and gas earnings impacts and $440 in oil and gas property taxes. Washington County also has no oil and gas production but received an estimated $1,500 in earnings-related sales tax revenues. There were a handful of counties with neither oil and gas production nor oil and gas industry employment, but which charged property taxes on oil and gas extraction in 2013: Box Elder, $123; Juab, $93; Rich, $113; and Sanpete, $20,447.

Table 7.36
Estimated Local Fiscal Impacts of Oil and Gas Extraction in Utah Counties
by Source, 2013

	Earnings		Property Taxes		Federal	Total Fiscal Impact	
County	Total	Federal[1]	Total	Federal[1]	Royalties[2]	Total	Federal[1]
Carbon	$45,221	$26,762	$5,143,532	$3,043,943	$2,907,622	$8,096,374	$5,978,326
Daggett			$100,942	$93,237	$34,901	$135,843	$128,138
Duchesne	$1,484,928	$418,034	$12,214,363	$3,438,565	$8,503,299	$22,202,590	$12,359,898
Emery	$872	$243	$675,302	$188,483	$249,112	$925,286	$437,838
Garfield	$15,196	$15,196	$255,771	$255,771	$329,706	$600,673	$600,673
Grand	$25,638	$22,911	$836,490	$747,514	$1,878,139	$2,740,267	$2,648,564
Salt Lake	$475,178				$373	$475,550	$373
San Juan	$96,122	$15,606	$4,125,255	$669,754	$1,104,182	$5,325,559	$1,789,542
Sevier	$3,755	$3,255	$2,516,749	$2,181,501	$3,910,411	$6,430,916	$6,095,168
Summit			$1,058,853	$98,040	$73,619	$1,132,472	$171,659
Uintah	$3,658,322	$1,916,725	$25,656,391	$13,442,299	$29,715,954	$59,030,667	$45,074,979
Utah	$6,709		$440			$7,149	
Washington	$1,505					$1,505	

Note: Impacts are shown for all counties with oil and gas production and/or reported employment.
1. Federal amounts are the portion of the total attributable to production on federal land.
2. Federal royalty amounts are distributions of a portion of federal mineral lease disbursements made by UDOT to the counties. Distributions were made to other counties not shown here. See Chapter 5, Table 5.4.
Source: BEBR analysis; Utah State Tax Commission, Property Tax Division; Utah Department of Transportation.

7.4 Coal Production

7.4.1 Historical and Current Production

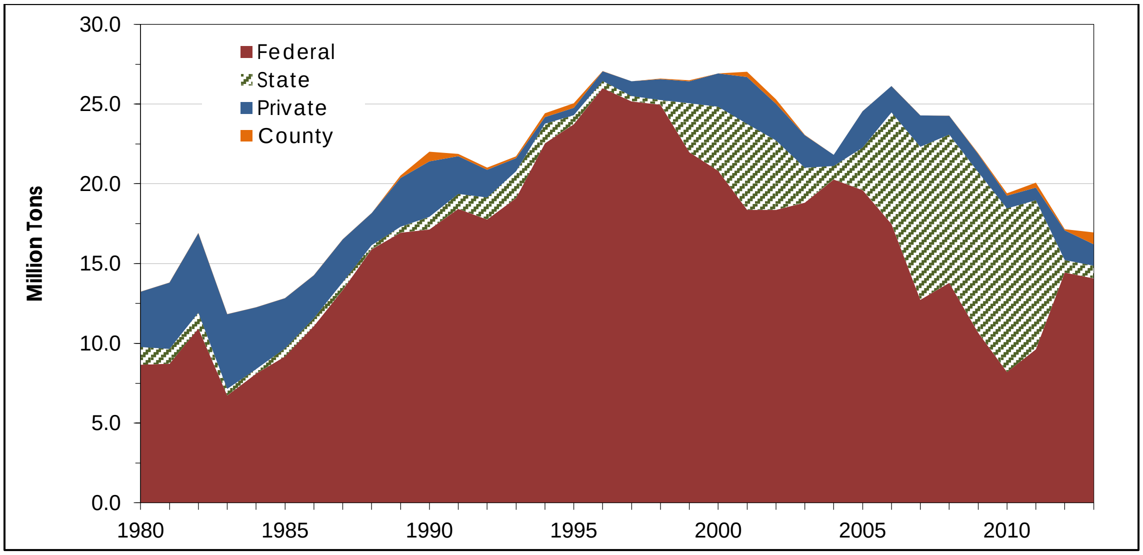
Of the 16.9 million tons of coal mined in Utah in 2013, 14.1 million tons (83 percent) came from federal leases, 1.3 million tons (8 percent) came from private leases, 801,000 tons (almost 5 percent) came from state leases, and 742,000 tons (4 percent) came from county leases. Utah's coal production in 2013 was 26 percent less than the 23.1 million tons produced in 2003 and 37 percent below the 1996 peak of 27.1 million tons (Table 7.37 and Figure 7.13). Production declined from all lease owners except counties, who saw coal production grow almost 30-fold between 2003 and 2013.

Table 7.37
Coal Production by County and Lease Owner, 2003–2013
(Thousand Tons)

County	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Change	Share
Carbon	7,091	8,772	9,618	11,560	11,811	11,533	9,457	8,982	9,281	6,331	6,326	–10.8%	37.3%
Emery	8,852	5,477	7,372	6,662	5,765	5,796	5,722	4,026	3,891	4,603	3,921	–55.7%	23.1%
Sevier	7,126	7,568	7,567	7,908	6,712	6,946	6,748	6,398	6,498	5,651	5,959	–16.4%	35.2%
Kane									403	570	747	–	4.4%
Ownership													
Federal	18,815	20,268	19,602	17,478	12,729	13,788	10,668	8,198	9,626	14,437	14,067	–25.2%	83.0%
State	2,192	849	2,665	6,995	9,591	9,295	10,069	10,256	9,344	783	801	–63.5%	4.7%
County	25	0	6	0	0	10	50	150	310	75	742	2868.0%	4.4%
Private	2,037	701	2,283	1,657	1,968	1,182	1,140	802	793	1,860	1,343	–34.1%	7.9%
Total	23,069	21,817	24,556	26,131	24,288	24,275	21,927	19,406	20,073	17,155	16,953	–26.5%	100%

Source: Utah Geological Survey, Utah Energy and Mineral Statistics*, http://geology.utah.gov/emp/energydata/coaldata.htm.*

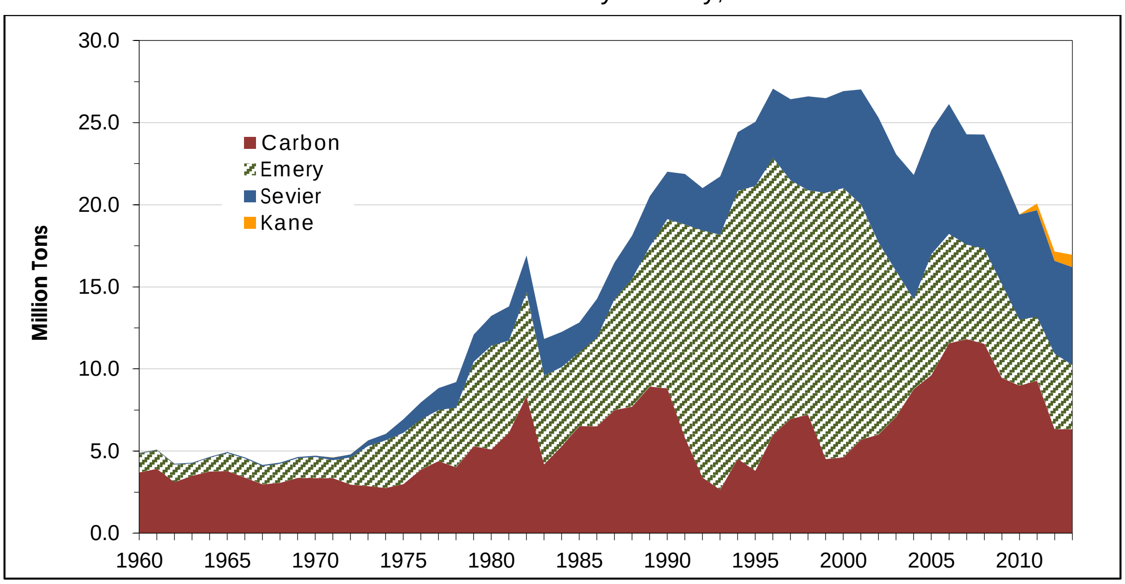
Figure 7.13
Coal Production in Utah by Lease Owner, 1980–2013



Source: Utah Geological Survey, Utah Energy and Mineral Statistics.

In recent years, Carbon County has been the source of most of the state's coal, averaging about 42 percent between 2003 and 2013. Over this same period, about 32 percent came from Sevier and 26 percent from Emery. In 2013, Carbon produced 6.3 million tons of coal (37 percent of the state total), Sevier produced 5.9 million tons (35 percent), Emery produced 3.9 million tons (23 percent), and a new surface mine in Kane produced 747,000 tons (4 percent) (Table 7.37, above, and Figure 7.14). The volume of coal production in Utah decreased by 26 percent between 2003 and 2013, from 23.1 million short tons to 16.9 million. Carbon County's production was down by 11 percent, Emery's by 56 percent, and Sevier's by 16 percent. Production from the new surface mine in Kane County increased by 85 percent between 2011 and 2013.

Figure 7.14
Coal Production in Utah by County, 1960–2013



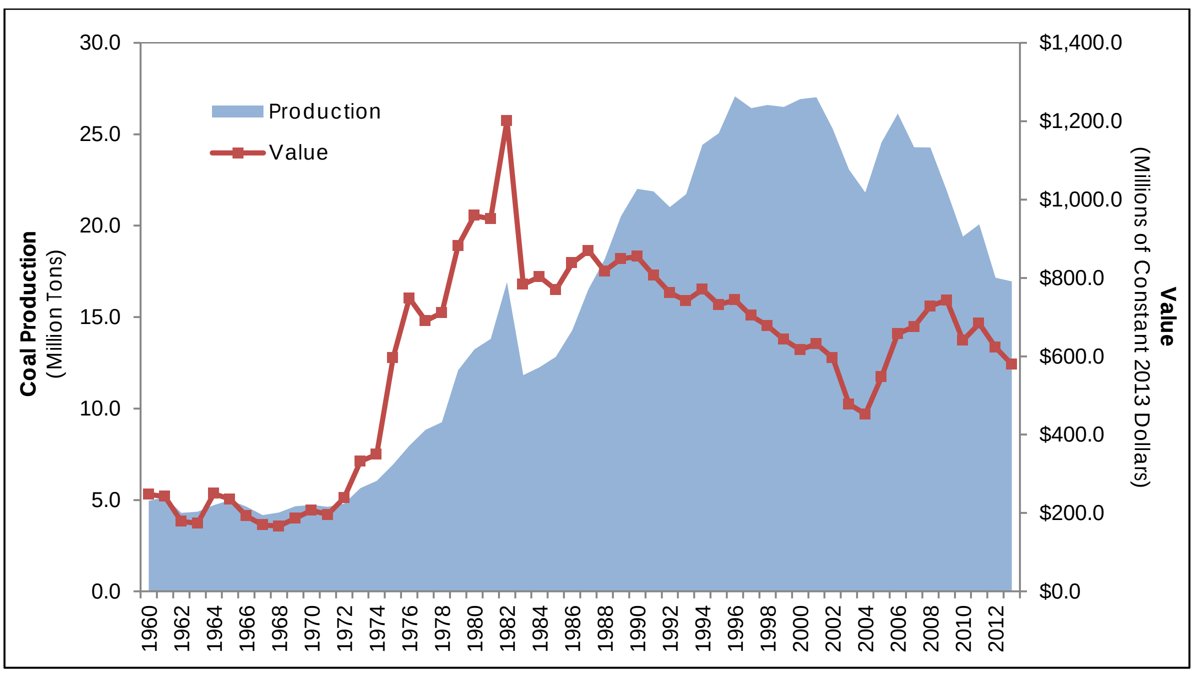
Source: Utah Geological Survey, Utah Energy and Mineral Statistics.

7.4.2 Value of Coal Production

Despite the decline in volume, the value of coal produced in Utah, measured in constant 2013 dollars, increased by 21 percent between 2003 and 2013 due to a 65 percent increase in the mine price of coal over the period. The value of total coal produced in the state grew from $477.8 million in 2003 to a high of $743.1 million in 2009, then declined to $579.3 million in 2013 (Figure 7.15 and Table 7.38). This recent decline mirrors a longer-term decline in the value of Utah's coal production that began in about 1980 (ignoring the spike in 1982) and was interrupted by the boom years of 2005 through 2009. Much of this decline occurred even while production was increasing. The real, inflation-adjusted price of coal declined steadily from 1976 to 2003, rose through 2009, and has more or less plateaued since.

The inflation-adjusted value of coal produced from Carbon and Sevier counties increased between 2003 and 2013, by 47 percent and 38 percent respectively, but it fell by 27 percent in Emery. The value of Kane County's production increased by 86 percent from 2011 to 2013. The value of coal mined from county leases grew almost 50-fold, from half a million dollars in 2003 to $25.4 million in 2013. This was due to an almost 30-fold increase in production from county leases. The value production from federal leases was 23 percent higher in 2013 than in 2003; production value from private leases was 9 percent higher over the period; but the value of production from state leases was 40 percent lower in 2013 than in 2003.

Figure 7.15
Value of Coal Production in Utah, 1960–2013



Source: Utah Geological Survey, Utah Energy and Mineral Statistics.

Table 7.38
Value of Coal Production by County and Land Ownership, 2003–2013
(Millions of Constant 2013 Dollars)

County	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Change
Carbon	$146.9	$182.0	$214.6	$290.8	$328.5	$345.7	$320.5	$296.4	$316.1	$229.8	$216.1	47.2%
Emery	$183.4	$113.6	$164.5	$167.6	$160.3	$173.7	$193.9	$132.9	$132.5	$167.1	$134.0	–26.9%
Sevier	$147.6	$157.0	$168.9	$198.9	$186.7	$208.2	$228.7	$211.2	$221.3	$205.1	$203.6	38.0%
Kane									$13.7	$20.7	$25.5	–
Ownership												
Federal	$389.7	$420.4	$437.5	$439.7	$354.0	$413.3	$361.5	$270.5	$327.9	$524.1	$480.7	23.3%
State	$45.4	$17.6	$59.5	$176.0	$266.8	$278.6	$341.2	$338.5	$318.3	$28.4	$27.4	–39.7%
County	$0.5	$0.0	$0.1	$0.0	$0.0	$0.3	$1.7	$5.0	$10.6	$2.7	$25.4	4796.3%
Private	$42.2	$14.5	$51.0	$41.7	$54.7	$35.4	$38.6	$26.5	$27.0	$67.5	$45.9	8.8%
Total	$477.8	$452.5	$548.0	$657.3	$675.5	$727.6	$743.1	$640.4	$683.7	$622.8	$579.3	21.2%

Source: Utah Geological Survey, Utah Energy and Mineral Statistics*,*
http://geology.utah.gov/emp/energydata/coaldata.htm.

7.4.3 Economic Contributions

Statewide Contributions

At the state level we analyzed the economic contribution of both coal mining itself and support activities for coal mining. For coal mining, we calculated contributions based on the free-on-board value of coal produced in 2013, which is the value of coal at the mine without any insurance or freight transportation charges added. This is the value shown in Table 7.38 above and it is treated as a measure of output or "final demand" for the industry. The contributions of support activities for coal mining were calculated based on employment and earnings in the sector. The available data were for full- and part-time jobs and their payroll that are covered by the unemployment insurance program; they do not include the self-employed. An estimate of employer contributions for health insurance was added to the payroll figures to derive earnings. To the extent that there are sole proprietors operating in this industry, our estimates of the economic contributions are conservative. We report employment, earnings and gross state product contributions by industry, to reflect the cross-sector linkages in the economy.

Table 7.39
Direct Employment and Earnings in Utah's
Coal Industry, 2013

Sector	Employment	Earnings
Coal mining	1,415	$113,320,848
Support activities for coal mining	214	$26,943,333
Total	1,629	$140,264,181

Source: Utah Department of Workforce Services and U.S. Bureau of Labor Statistics.

In 2013, Utah's coal industry provided over 1,600 full- and part-time jobs earning almost $140. 3 million (Table 7.39). Coal mining provided 1,415 jobs with $113.3 million in earnings, while support activities for coal mining were much smaller, with 214 jobs statewide and $26.9 million in earnings.

The overall coal sector, comprising coal mining and support activities for coal mining, supported an estimated total of 7,765 jobs, $404.5 million in earnings, and $804.7 million in gross state product (GSP) in Utah in 2013 (Table 7.40). This includes the direct jobs and their earnings mentioned above, and which are part of the mining sector contributions below. Coal mining from federal leases and its associated support activities contributed an estimated 6,443 jobs, 1,352 of which were direct; $335.6 million in earnings, $116.4 million of which was direct; and $667.7 million in GSP. Outside of the mining sector, the largest employment contributions from the coal mining industry were in finance and insurance; professional, scientific and technical services; and real estate and rental and leasing. The largest earnings contributions were in professional, scientific and technical services; health care and social assistance; and management of companies and enterprises. The largest GSP contributions were in real estate and rental and leasing; professional, scientific and technical services; and finance and insurance.

Table 7.40
Total Estimated Economic Contribution of the Coal Mining Industry in Utah, 2013
(Dollar amounts are millions)

	Total Contributions			Contributions from Production on Federal Land		
Industry Sector	**Jobs**	**Earnings**	**GSP**	**Jobs**	**Earnings**	**GSP**
Agriculture, forestry, fishing, and hunting	37	$1.2	$2.8	31	$1.0	$2.3
Mining	2,434	$181.5	$362.6	2,020	$150.6	$300.9
Utilities*	55	$6.2	$18.0	46	$5.1	$15.0
Construction	48	$2.5	$3.2	40	$2.0	$2.6
Manufacturing	342	$19.0	$31.6	284	$15.8	$26.2
Wholesale trade	222	$13.9	$29.2	184	$11.5	$24.3
Retail trade	529	$16.0	$30.1	439	$13.3	$25.0
Transportation and warehousing*	310	$17.0	$29.4	257	$14.1	$24.4
Information	111	$6.0	$13.4	92	$4.9	$11.2
Finance and insurance	653	$20.8	$44.9	542	$17.2	$37.2
Real estate and rental and leasing	516	$10.2	$75.5	428	$8.4	$62.6
Professional, scientific, and technical services	550	$35.3	$52.6	456	$29.3	$43.6
Management of companies and enterprises	293	$21.4	$32.1	243	$17.7	$26.6
Administrative and waste management services	383	$10.1	$15.8	318	$8.4	$13.1
Educational services	101	$2.6	$3.7	84	$2.2	$3.0
Health care and social assistance	463	$22.4	$28.8	384	$18.6	$23.9
Arts, entertainment, and recreation	105	$2.1	$3.5	87	$1.7	$2.9
Accommodation	75	$2.1	$4.5	62	$1.7	$3.7
Food services and drinking places	323	$5.9	$9.6	268	$4.9	$8.0
Other services*	172	$7.8	$13.0	143	$6.5	$10.8
Households	43	$0.5	$0.5	35	$0.4	$0.4
Total	7,765	$404.5	$804.7	6,443	$335.6	$667.7

Note: Mining sector contributions include the direct employment, earnings and GSP of the coal industry.

Source: BEBR analysis of data from the Utah Geological Survey, Utah Energy and Mineral Statistics*, and the Bureau of Labor Statistics using BEA's RIMS II multipliers.*

The economic contribution of coal mining itself to Utah's economy consisted of 6,792 jobs, $327.2 million in earnings, and $673.1 million in GSP. Coal mining from federal leases supported 5,636 jobs, of which 1,174 were direct; $271.5 million in earnings, of which $94.0 million was direct; and $558.5 million in GSP (Table 7.41). Aside from the mining sector, the largest employment contributions from coal mining were in finance and insurance, retail trade, and real estate and rental and leasing. The largest earnings contributions were in professional, scientific and technical services; management of companies and enterprises; and health care and social assistance. The largest GSP contributions were in real estate and rental and leasing; finance and insurance; and professional, scientific and technical services.

Table 7.41
Estimated Economic Contribution of Coal Mining in Utah, 2013
(Dollar amounts are millions)

Industry Sector	Total Contributions			Contributions from Production on Federal Land		
	Jobs	Earnings	GSP	Jobs	Earnings	GSP
Agriculture, forestry, fishing, and hunting	31	$0.9	$2.1	26	$0.8	$1.8
Mining	2,205	$152.8	$325.9	1,830	$126.8	$270.4
Utilities*	51	$5.4	$15.7	42	$4.5	$13.0
Construction	42	$2.0	$2.6	35	$1.7	$2.2
Manufacturing	290	$14.5	$24.1	241	$12.0	$20.0
Wholesale trade	194	$11.2	$23.6	161	$9.3	$19.6
Retail trade	465	$13.0	$24.4	386	$10.8	$20.3
Transportation and warehousing*	287	$15.1	$26.5	238	$12.5	$22.0
Information	96	$4.8	$10.7	80	$3.9	$8.9
Finance and insurance	577	$16.7	$35.6	479	$13.8	$29.6
Real estate and rental and leasing	443	$8.3	$60.1	368	$6.9	$49.9
Professional, scientific, and technical services	410	$22.1	$32.1	340	$18.4	$26.6
Management of companies and enterprises	265	$18.1	$27.2	220	$15.0	$22.5
Administrative and waste management services	318	$7.4	$11.5	264	$6.2	$9.6
Educational services	88	$2.1	$3.0	73	$1.8	$2.5
Health care and social assistance	407	$18.1	$23.3	337	$15.0	$19.3
Arts, entertainment, and recreation	91	$1.7	$2.8	76	$1.4	$2.3
Accommodation	64	$1.6	$3.5	53	$1.3	$2.9
Food services and drinking places	280	$4.7	$7.6	232	$3.9	$6.3
Other services*	149	$6.2	$10.3	124	$5.1	$8.6
Households	37	$0.4	$0.4	31	$0.3	$0.3
Total	6,792	$327.2	$673.1	5,636	$271.5	$558.5

Note: Mining sector contributions include the direct employment, earnings and GSP of the coal mining subsector.

Source: BEBR analysis of data from the Utah Geological Survey, Utah Energy and Mineral Statistics*, using BEA's RIMS II multipliers.*

Support activities for coal mining contributed a total of 973 jobs, $77.3 million in earnings, and $131.5 million in GSP (Table 7.42). Support activities associated with coal mining on federal leases supported 807 jobs, $64.1 million in earnings, and $109.1 million in GSP. Aside from the mining sector, the largest employment contributions were in professional, scientific and technical services; finance and insurance; and real estate and rental and leasing. The largest earnings contributions were in professional, scientific and technical services; manufacturing; and health care and social assistance. The largest GSP contributions were in professional, scientific and technical services; real estate and rental and leasing; and finance and insurance.

Table 7.42
Estimated Economic Contribution of Support Activities for Coal Mining in Utah, 2013
(Dollar amounts are millions)

	Total Contributions			Contributions from Production on Federal Land		
Industry Sector	**Jobs**	**Earnings**	**GSP**	**Jobs**	**Earnings**	**GSP**
Agriculture, forestry, fishing, and hunting	6	$0.3	$0.6	5	$0.2	$0.5
Mining	229	$28.7	$36.7	190	$23.8	$30.5
Utilities*	5	$0.8	$2.3	4	$0.7	$1.9
Construction	5	$0.4	$0.6	5	$0.4	$0.5
Manufacturing	52	$4.5	$7.5	43	$3.7	$6.2
Wholesale trade	27	$2.7	$5.6	23	$2.2	$4.7
Retail trade	64	$3.0	$5.7	53	$2.5	$4.7
Transportation and warehousing*	23	$1.9	$2.8	19	$1.6	$2.4
Information	14	$1.2	$2.7	12	$1.0	$2.3
Finance and insurance	75	$4.1	$9.3	63	$3.4	$7.7
Real estate and rental and leasing	73	$1.9	$15.4	60	$1.6	$12.7
Professional, scientific, and technical services	139	$13.2	$20.5	116	$11.0	$17.0
Management of companies and enterprises	29	$3.3	$4.9	24	$2.7	$4.1
Administrative and waste management services	65	$2.7	$4.3	54	$2.2	$3.5
Educational services	12	$0.5	$0.7	10	$0.4	$0.6
Health care and social assistance	57	$4.3	$5.5	47	$3.5	$4.5
Arts, entertainment, and recreation	13	$0.4	$0.7	11	$0.3	$0.6
Accommodation	11	$0.5	$1.0	9	$0.4	$0.8
Food services and drinking places	44	$1.2	$2.0	36	$1.0	$1.7
Other services*	23	$1.6	$2.7	19	$1.4	$2.3
Households	5	$0.1	$0.1	4	$0.1	$0.1
Total	973	$77.3	$131.5	807	$64.1	$109.1

Note: Mining sector contributions include the direct employment, earnings and GSP of the support activities for coal mining subsector.

Source: BEBR analysis of data from the Bureau of Labor Statistics using BEA's RIMS II multipliers.

We also calculated the fiscal impacts due to coal mining and its support activities in 2013. Earnings contributions generate income and sales tax revenues for the state and counties. Coal production generates federal royalty payments (49 percent of which is returned to the state and a portion of that is then distributed to some of the counties), local property taxes, and state and local taxable sales. (For a detailed discussion of these and other revenue impacts, see Chapters 5 and 6.) Total estimated fiscal impacts of coal mining in 2013 amounted to approximately $57.9 million, with almost $52.0 million of this attributable to production from federal leases (Table 7.43). The largest sources of revenue were income and sales taxes from earnings ($30.4 million total, $25.2 million from production on federal leases) and federal mineral lease royalty disbursements ($20.0 million). Note that the fiscal impacts from earnings shown here do not include income tax revenues from corporate income[181] or from production royalties paid to private landowners.

Table 7.43
Estimated Fiscal Impacts of Coal Mining, 2013

Source	**Total**	**Federal**
Earnings	$30,402,626	$25,226,649
Royalties[1]	$20,007,435	$20,007,435
Property Taxes	$4,689,202	$4,070,181
Taxable Sales[2]	$1,034,000	$858,000
Coal Program	$1,806,188	$1,806,188
Total Fiscal Impact	$57,939,451	$51,968,417

1 State share (49%) of estimated federal royalties.
2 These are state sales tax revenues from taxable sales in the coal mining sector. Actual revenues were less than the amounts shown.

Source: BEBR analysis, transparent.utah.gov, Utah State Tax Commission.

[181] In 2012 mining firms paid $24.0 million in corporate income taxes to the state of Utah.

County-Level Contributions

As with the statewide impacts, the county-level impacts for coal mining proper were calculated from the value of coal production, treated as final demand, and the impacts of support activities were calculated from employment and earnings. The Bureau of Labor Statistics reports 2013 employment and earnings data for support activities for coal mining in Carbon and Emery counties and for the state as a whole. The BLS also reports the number of support activities establishments in Carbon, Emery, Salt Lake and Uintah counties. From the Department of Workforce Services' FirmFind, we discovered that the single establishment in Uintah County has just one to four employees. We assumed there to be two employees, with an average wage equal to that of the broader support activities for mining sector in the county ($71,900). From this we were able to estimate the employment and earnings for support activities for coal mining in Salt Lake County (Table 7.44). The average wage in Sale Lake was almost $140,000, significantly higher than in any other county, which implies that these are company headquarters with executives and their salaries. Nonetheless, they are still support activities for coal mining jobs and add to the sector's economic contribution.

Table 7.44
Support Activities for Coal Mining Employment and Wages by County, 2013

County	Employment	Wages	Average Wage
Carbon	24	$1,250,000	$52,083
Emery	18	$520,000	$28,889
Salt Lake	170	$23,588,200	$138,754
Uintah	2	$143,800	$71,899
State	214	$25,502,000	$119,168

Source: Bureau of Labor Statistics, Quarterly Census of Employment and Wages, and BEBR calculations.

Carbon County has the largest employment and gross state product contributions from the coal industry. Coal mining and its support activities combined supported an estimated 1,037 jobs, $54.5 million in earnings, and $184.7 million in GSP (Table 7.45). Of this, 900 jobs, $47.3 million in earnings, and $160.4 million in GSP are attributable to production from federal coal leases. Coal mining itself contributed 996 jobs, $52.7 million in earnings, and $181.0 million in GSP (Table 7.46), while support activities for coal mining supported 40 jobs, $1.9 million in earnings, and $3.8 million in GSP (Table 7.47).

Table 7.45
Estimated Economic Contribution of Coal Mining and Support Activities in Utah by County, 2013
(Dollar amounts are millions)

	Total Contributions			Contributions from Production on Federal Leases		
County	Jobs	Earnings	GSP	Jobs	Earnings	GSP
Carbon	1,037	$54.5	$184.7	900	$47.3	$160.4
Emery	470	$25.4	$101.7	408	$22.1	$88.3
Sevier	920	$49.3	$155.6	799	$42.8	$135.0
Kane	105	$5.7	$18.1			
Salt Lake	590	$64.9	$153.3			
Uintah	3	$0.2	$0.3			

GSP = gross state product.

Source: BEBR analysis of data from the Utah Geological Survey using BEA's RIMS II multipliers.

Coal mining in Sevier County contributed an estimated 920 jobs, $49.3 million in earnings, and $155.6 million in GSP. Of this, mining on federal leases accounted for 799 jobs, $42.8 million in earnings, and $135.0 million in GSP (Tables 7.45 and 7.46). There were no support activities for coal mining establishments in Sevier.

Somewhat surprisingly, Salt Lake County saw the third-largest contribution from the coal mining industry. All of it was due to support activities, which contributed an estimated 590 jobs, $64.9 million in earnings, and $153.3 million in GSP (Tables 7.45 and 7.47). The large impacts are due, in part, to the significant number of jobs and the high wages, but also to the fact that Salt Lake's economy is well diversified, so the multiplier effects are much larger than in the other counties.

Table 7.46
Estimated Economic Contribution of Coal Mining in Utah by County, 2013
(Dollar amounts are millions)

County	Total Contributions Jobs	Total Contributions Earnings	Total Contributions GSP	Contributions from Production on Federal Leases Jobs	Contributions from Production on Federal Leases Earnings	Contributions from Production on Federal Leases GSP
Carbon	996	$52.7	$181.0	865	$45.7	$157.1
Emery	441	$24.6	$99.2	383	$21.4	$86.1
Sevier	920	$49.3	$155.6	799	$42.8	$135.0
Kane	105	$5.7	$18.1			

GSP = gross state product.
Source: BEBR analysis of data from the Utah Geological Survey using BEA's RIMS II multipliers.

Emery and Kane are the other two counties with coal mining, and of them only Emery also has employment in support activities for coal mining. The coal industry in Emery supported an estimated 470 jobs, $25.4 million in earnings, and $101.7 million in GSP (Table 7.45). Most of this stemmed from coal mining itself (Table 7.46), with support activities contributing just 29 jobs, $800,000 in earnings, and $2.5 million in GSP (Table 7.47). The contributions attributable to production from federal leases consisted of 408 jobs, $22.1 million in earnings, and $88.3 million in GSP. In Kane County, the contributions of coal mining were relatively more modest, with the industry supporting 105 jobs, $5.7 million in earnings, and $18.1 million in GSP (Tables 7.45 and 7.46). There is currently no coal mining from federal leases in Kane.

Table 7.47
Estimated Economic Contribution of Support Activities for Coal Mining in Utah by County, 2013
(Dollar amounts are millions)

County	Total Contributions Jobs	Total Contributions Earnings	Total Contributions GSP	Contributions from Production on Federal Leases Jobs	Contributions from Production on Federal Leases Earnings	Contributions from Production on Federal Leases GSP
Carbon	40	$1.9	$3.8	35	$1.6	$3.3
Emery	29	$0.8	$2.5	25	$0.7	$2.2
Salt Lake	590	$64.9	$153.3			
Uintah	3	$0.2	$0.3			

GSP = gross state product.
Source: BEBR analysis of data from the Utah Geological Survey using BEA's RIMS II multipliers.

In Uintah County, as noted above, there is no coal mining and just one firm in the support activities for coal mining sector. With an estimated two employees, the firm's economic contribution consists of three jobs, $220,000 in earnings, and $330,000 in GSP (Table 7.47).

The local fiscal impacts of coal mining activities arise from sales taxes tied to earnings in the mining and support sectors themselves, as well as those generated in the impacted industries; county property taxes on coal mines; and federal coal royalty disbursements distributed to the counties by UDOT. Federal royalties and property taxes were the most significant sources of county revenues related to coal mining and its support activities. The counties with the largest fiscal impacts were those with coal production. Carbon received an estimated $5.6 million in revenues, Sevier received $4.7 million, and Emery received $3.1 million (Table 7.48). The fiscal impacts in Kane, Salt Lake and Uintah counties were primarily from sales taxes on earnings, with some property taxes in Kane ($62,719) and Uintah ($62).

Table 7.48
Estimated Local Fiscal Impacts of Coal Mining and Support Activities in Utah Counties by Source, 2013

	Earnings		Property Taxes		Federal	Total Fiscal Impact	
County	Total	Federal[1]	Total	Federal[1]	Royalties[2]	Total	Federal
Carbon	$229,991	$199,630	$2,569,265	$2,230,097	$2,773,001	$5,572,257	$5,202,728
Emery	$80,716	$70,061	$804,107	$697,957	$2,202,824	$3,087,647	$2,970,842
Kane	$79,416		$62,719			$142,135	$0
Salt Lake	$168,846					$168,846	$0
Sevier	$177,055	$153,682	$1,234,637	$1,071,653	$3,338,693	$4,750,385	$4,564,028
Uintah	$2,377		$62			$2,439	$0

Note: Impacts are shown for all counties with coal production and/or employment in support activities for coal mining.
1. Federal amounts are the portion of the total attributable to production from federal leases.
2. Federal royalty amounts are distributions of a portion of federal mineral lease disbursements made by UDOT to the counties.
Source: BEBR analysis; Utah State Tax Commission, Property Tax Division; Utah Department of Transportation.

7.5 OTHER MINERAL PRODUCTION

7.5.1 Historical and Current Production

Utah produces a wide variety of minerals besides oil, natural gas and coal. These include metals such as copper, gold, silver, iron and molybdenum (Table 7.49), and industrial minerals like gilsonite, potash, magnesium chloride, and salt (Table 7.50).

Metals[182]

Copper production comes primarily from Rio Tinto's Bingham Canyon mine in Salt Lake County. Since 2002, the state's copper output has fluctuated between 240,000 and 315,000 tons. There was a sharp decline in 2012 to 186,965 tons, but production recovered in 2013 to 243,450 tons, despite a large landslide in the mine.

Gold production in Utah varied between 330,000 ounces and 525,000 ounces from 2002 through 2011. However, production declined in 2012 to 201,000 ounces and was just 207,000 ounces in 2013. Most of the state's production comes from the Bingham Canyon mine and could have been affected by the 2013 landslide.

Rio Tinto's Bingham Canyon mine also produces all of the state's molybdenum and most of its silver. Molybdenum production has averaged 26.2 million pounds per year since 2002, but production declined from 30.0 million pounds in 2011 to 20.6 million in 2012 and 12.7 million pounds in 2013. Annual silver production remained between 3.5 and 4.5 million ounces from 2002 through 2011, but dropped to less than 2.5 million ounces in 2012. Production recovered somewhat in 2013 with almost 2.9 million ounces.

Utah's iron ore production has grown rapidly from just 33,000 tons in 2009 to 1.4 million tons in 2013. Most of this comes from CML Metals' Iron Mountain project near Cedar City.

[182] Much of the following discussion of metallic minerals was informed by Boden et al. (2014).

Table 7.49
Metals Production in Utah, 2002–2013

Year	Beryllium (tons)	Copper (tons)	Gold (ounces)	Iron (tons)	Magnesium (tons)	Molybdenum (lbs)	Silver (ounces)	U_3O_8 (000 lbs)	Vanadium (tons)
2002	78	286,257	486,733		0	22,256,960	3,662,549		
2003	83	309,912	339,700		0	16,987,782	3,547,914		
2004	87	290,729	330,000		41,600	24,990,000	3,584,000		
2005	108	243,322	417,000		39,242	34,413,600	3,958,000		
2006	152	298,000	522,700		42,900	36,980,000	4,214,000		
2007	150	248,487	395,100		47,600	34,220,000	3,575,400	201	302
2008	185	314,500	449,800		55,750	29,580,000	4,355,000	621	932
2009	116	309,900	507,400	33,000	36,577	23,120,000	4,083,500	576	864
2010	157	283,270	466,000	209,000	47,324	28,444,450	3,815,000	612	918
2011	227	266,486	495,972	1,272,000	50,000	30,000,000	3,814,540	508	901
2012	193	186,965	201,000	1,182,000	55,078	20,642,000	2,086,000	553	900
2013	175	243,450	207,000	1,400,000	65,502	12,673,000	2,876,000	55	90

Source: Utah Geological Survey, Utah Energy and Mineral Statistics, geology.utah.gov/emp/energydata/index.htm.

Uranium and vanadium production in Utah ceased in 2013 due to low prices. There are currently no plans to resume production. Utah is the only American source of beryllium ore produced from bertrandite. About 175 tons of beryllium were produced from 110,000 tons of bertrandite in 2013. There were also 65,500 tons of magnesium metal produced from evaporated magnesium chloride brine.

Of the metalliferous minerals produced in Utah, as far as we were able to ascertain only a small amount of copper was produced from federal land. About 7,580 tons were produced in 2013 from the Lisbon Valley Mining Company's mine near Moab, which operates on federal land.

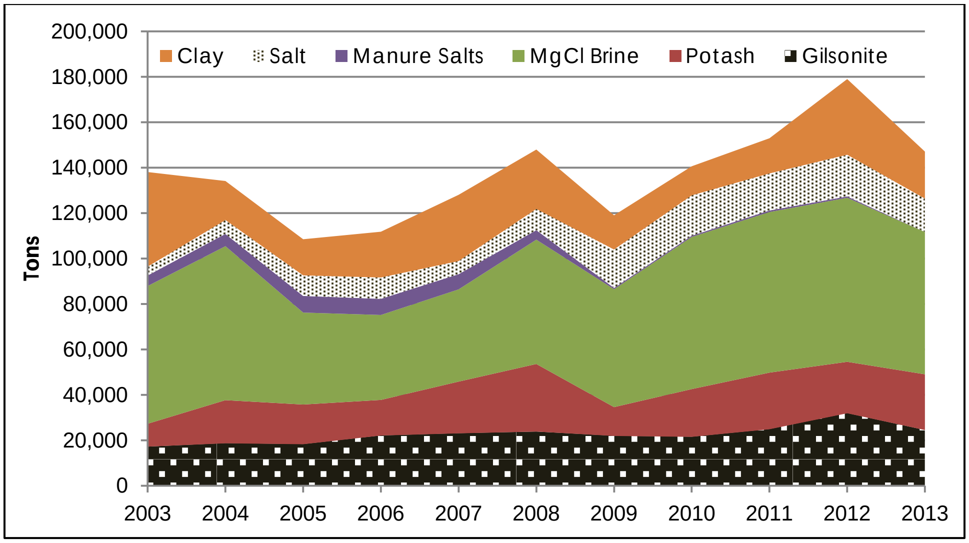
Industrial Minerals

The Department of Interior's Office of Natural Resources Revenue reports production volumes and sales values for minerals produced on federal land. Besides oil and natural gas (Section 7.3), coal (Section 7.4), and geothermal steam (Section 7.7), several industrial minerals are produced in Utah from federal lands (Figure 7.16 and Table 7.50). Total production grew from almost 140,000 tons in federal fiscal year 2003 to nearly 180,000 tons in FY2012. Production in 2013 was 147,000 tons.

The largest of these by weight is magnesium chloride brine. Annual production from federal lands averaged 57,000 tons between FY2003 and FY2013, with 2013 production at 62,640 tons (Table 7.50). Total magnesium chloride brine production in calendar year 2013 was 770,000 tons (Boden et al. 2014).

Gilsonite and clay had the next largest production by weight, with production from federal land averaging about 22,500 tons per year for each. Total gilsonite production in calendar year 2013 was 64,000 tons (Boden et al. 2014), with 24,500 tons from federal lands in fiscal year 2013. Total clay production was 171,000 tons in CY2013 (Boden et al. 2014); 20,700 tons were produced from federal lands in FY2013.

Figure 7.16
Mineral Production on Federal Lands in Utah, FY2003–2013



Source: Department of the Interior, Office of Natural Resources Revenue, statistics.onrr.gov/ReportTool.aspx.

Production of both potash and salt from federal lands has grown significantly since FY2003. That year, about 10,000 tons of potash and 3,900 tons of salt were produced. In FY2013 production of potash from federal lands was 24,500 tons and salt was almost 14,700 tons. Total potash production in Utah in CY2013 was more than 455,000 tons; total statewide salt production was over 3.2 million tons (Boden et al. 2014). Manure salts (potassium chloride) are a form of potash and, as such, are included in the statewide potash production figure. Their production from federal land has been small and declining, with no production in FY2013.

Table 7.50
Mineral Production on Federal Lands in Utah,
FY2003–2013
(tons)

Fiscal Year	Gilsonite	Potash	Magnesium Chloride Brine	Manure Salts	Salt	Clay
2003	17,215	10,073	60,626	4,611	3,906	41,636
2004	18,668	18,990	67,782	5,386	6,115	17,183
2005	18,261	17,479	40,470	7,322	9,037	15,924
2006	22,095	15,673	37,389	7,084	9,408	20,157
2007	23,047	22,779	40,596	6,683	5,771	29,171
2008	23,841	29,744	54,727	4,156	9,356	26,147
2009	21,906	12,689	51,891	563	16,913	15,078
2010	21,509	21,026	66,972	541	17,764	12,805
2011	24,864	24,921	70,682	669	16,327	15,489
2012	31,891	22,647	72,198	605	18,339	33,319
2013	24,507	24,537	62,640		14,671	20,717

Note: Years are federal fiscal years, October 1 through September 30.
Source: Department of the Interior, Office of Natural Resources Revenue, statistics.onrr.gov/ReportTool.aspx.

7.5.2 Value of Mineral Production

The estimated value of Utah's metalliferous and industrial mineral production more than doubled from 2002 to 2013 after adjusting for inflation. Total value was $1.7 billion in 2002 (measured in 2013 dollars); it then reached $4.7 billion in 2006 and remained above $4.0 billion through 2011. In 2012 and 2013 total mineral production value was just under $3.9 billion (Table 7.51).

Base metals (copper, iron, molybdenum, magnesium and beryllium) accounted for the largest share of mineral production value in 2013 at $2.2 billion. Industrial minerals contributed $1.3 billion, while precious metals (gold and silver) were valued at $365 million (Table 7.51 and Figure 7.17). More than half of the value of base metal production in 2013 was due to copper, which was worth an estimated $1.6 billion, including $51.5 million from production on federal lands. Magnesium metal production was valued at $298.2 million, molybdenum at $129.9 million, and iron at $125.0 million. The state's 2013 gold production was valued at approximately $290.4 million, while silver production was worth $74.3 million. The largest contributors to the value of industrial minerals in 2013 were potash ($236.0 million), sand and gravel ($182.0 million) and salt ($172.0 million) (Boden et al. 2014).

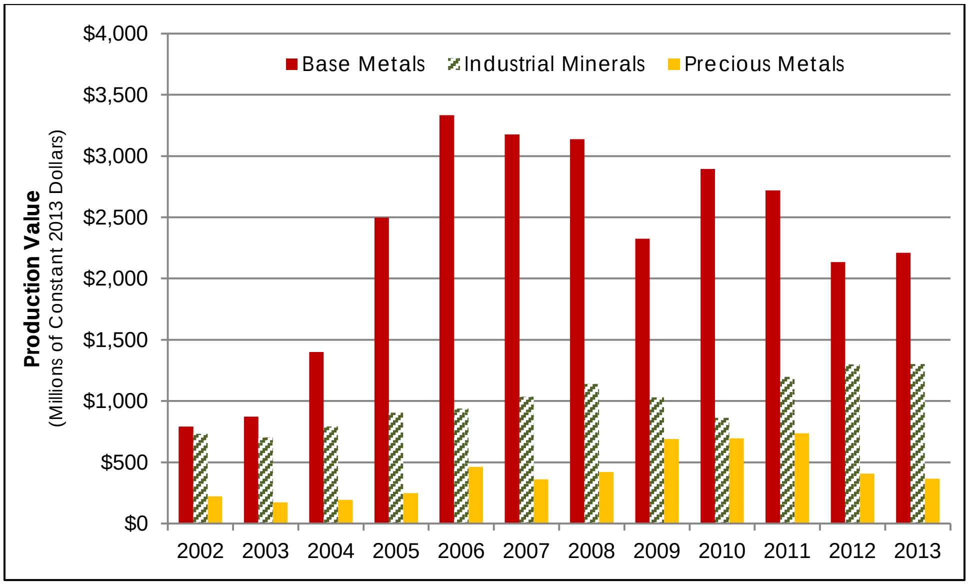
Table 7.51
Utah Estimated Metalliferous and Industrial Mineral Production Values, 2002–2013
(Millions of Constant 2013 Dollars)

Year	Base Metals	Industrial Minerals	Precious Metals	Uranium	Total Value
2002	$792	$732	$223		$1,747
2003	$874	$703	$172		$1,748
2004	$1,401	$793	$195		$2,389
2005	$2,497	$905	$249		$3,651
2006	$3,334	$937	$462		$4,733
2007	$3,177	$1,035	$362	$22.3	$4,596
2008	$3,138	$1,139	$422	$42.8	$4,742
2009	$2,326	$1,030	$690	$28.9	$4,075
2010	$2,895	$863	$695	$31.6	$4,485
2011	$2,719	$1,197	$736	$29.8	$4,682
2012	$2,135	$1,299	$409	$30.6	$3,874
2013	$2,210	$1,300	$365		$3,875

Note: Sulfuric acid has been included in industrial minerals since 2011.

Source: Adapted from Utah Geological Survey, Utah's Extractive Resource Industries 2013*, Circular 118.*

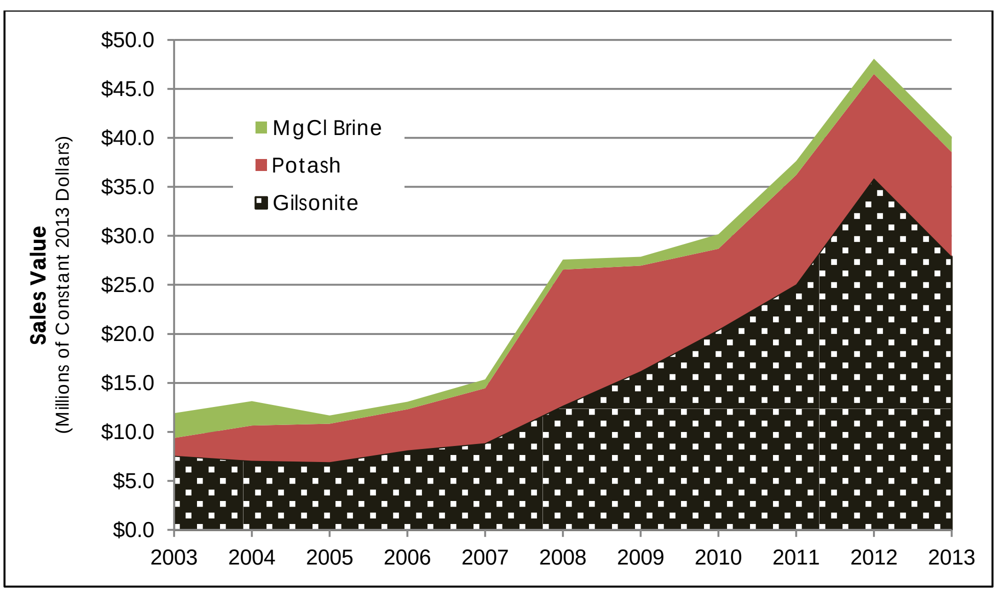
Figure 7.17
Estimated Mineral Production Values, 2002–2013



Source: Adapted from Utah Geological Survey, Utah's Extractive Resource Industries 2013*, Circular 118.*

According to data reported by the Office of Natural Resources Revenue, industrial minerals produced on federal lands in FY2013 had a total sales value of almost $40.3 million. While this was down from 2012's high of $48.4 million (in inflation-adjusted 2013 dollars), it was more than three times the value of production in 2003, $12.4 million (Figure 7.18 and Table 7.52). The largest contributors were gilsonite, worth $27.9 million, and potash at almost $1.6 million.

Figure 7.18
Sales Value of Selected Minerals Produced from Federal Lands, FY2003–2013



Source: Department of the Interior, Office of Natural Resources Revenue, statistics.onrr.gov/ReportTool.aspx.

Gilsonite, potash and salt all saw rapid increases in inflation-adjusted production values between 2003 and 2013, particularly since 2007. The value of gilsonite mined from federal lands increased almost 270 percent over the period, from $7.6 million in 2003. Potash and salt values both grew more than fivefold; potash from $1.8 million to $10.6 million and salt from almost $17,800 to $102,700. Production values for magnesium chloride brine, manure salts, and clay were all lower in 2013 than in 2003.

Overall, production from federal lands accounted for about 4 percent of the total value of nonfuel mineral production in Utah in 2013.

Table 7.52
Sales Value of Mineral Production on Federal Lands in Utah, FY2003–2013
(Constant 2013 Dollars)

Fiscal Year	Gilsonite	Potash	Magnesium Chloride Brine	Manure Salts	Salt	Clay	Total
2003	$7,567,695	$1,816,851	$2,529,438	$367,409	$17,757	$139,294	$12,438,444
2004	$7,056,691	$3,591,941	$2,493,674	$361,767	$33,155	$55,668	$13,592,896
2005	$6,915,168	$3,918,157	$842,988	$520,785	$68,601	$54,455	$12,320,154
2006	$8,117,481	$4,190,990	$768,948	$529,943	$65,453	$84,149	$13,756,965
2007	$8,851,894	$5,602,614	$905,601	$495,043	$36,978	$112,150	$16,004,280
2008	$12,678,865	$13,879,646	$1,023,008	$458,303	$53,033	$88,281	$28,181,137
2009	$16,195,482	$10,765,989	$908,522	$129,706	$126,652	$48,395	$28,174,746
2010	$20,427,598	$8,255,443	$1,485,554	$73,451	$135,557	$41,887	$30,419,490
2011	$25,048,504	$11,161,271	$1,424,750	$87,297	$120,094	$67,795	$37,909,710
2012	$35,878,980	$10,644,882	$1,550,086	$76,110	$129,807	$100,251	$48,380,117
2013	$27,897,400	$10,646,287	$1,573,838		$102,697	$62,152	$40,282,373

Note: Years are federal fiscal years, October 1 through September 30.
Source: Department of the Interior, Office of Natural Resources Revenue, statistics.onrr.gov/ReportTool.aspx.

7.5.3 Economic Contributions

We analyzed the economic contribution of not only the nonfuel mineral mining sectors combined but also of support activities for metal and nonmetallic mineral mining. We used direct employment and earnings (Table 7.53) to estimate output or "final demand." The available data were for full- and part-time jobs and their payroll that are covered by the unemployment insurance program; they do not include the self-employed. An estimate of employer contributions for health insurance was added to the payroll figures to derive earnings. To the extent that there are sole proprietors operating in this industry, our estimates of the economic contributions are conservative. We report employment, earnings and gross state product contributions by industry, to reflect the cross-sector linkages in the economy.

In 2012, the combined nonfuel mining sectors in Utah provided almost 4,200 full- and part-time jobs earning $332.2 million (Table 7.53)—an average of over $79,000 per job. The largest component sector was copper, nickel, lead and zinc mining, with over 1,600 jobs earning $140.6 million. Most of this is Rio Tinto's operation at the Bingham Canyon mine. The next largest sector was sand, gravel and clay, which provided 892 jobs with $33.3 million in earnings. The combined support activities sectors supplied 789 jobs earning $97.5 million. We assigned employment and earnings to activity on federal lands based on production values. This yielded a total of 109 direct jobs with nearly $10.0 million in earnings due to mineral production on federal lands and its related support activities.

Table 7.53
Direct Employment and Earnings in Utah's Nonfuel Mining Sectors, 2013

Sector	Total		Federal Portion[1]	
	Employment	Earnings	Employment	Earnings
Gold, Silver and Other Metal Ore Mining	187	$13,051,172		
Copper, Nickel, Lead, Zinc Mining	1,614	$140,628,942	50	$4,389,407
Stone Mining and Quarrying	143	$5,891,147		
Sand, Gravel, Clay and Ceramic & Refractory Minerals	892	$33,345,835	0.3	$11,355
Other Nonmetallic Minerals	557	$41,735,647	33	$2,435,864
Support activities for metal mining	703	$90,016,426	22	$2,809,654
Support activities for nonmetallic minerals	86	$7,504,450	4	$346,815
Total	4,182	$332,173,619	109	$9,993,094

1 Federal portions estimated based on federal share of production value.

Source: Bureau of Labor Statistics, Quarterly Census of Employment and Wages, and BEBR analysis of data from Utah Geological Survey, Utah's Extractive Resource Industries 2013*, Circular 118.*

The overall nonfuel minerals mining sector, comprising metal and nonmetallic mineral mining and affiliated support activities, supported an estimated total of 13,442 jobs, $855.8 million in earnings, and $1.7 billion in gross state product (GSP) in Utah in 2013 (Table 7.54). This includes the direct jobs and their earnings mentioned above and which are part of the mining sector contributions below. Nonfuel mineral mining from federal leases and its associated support activities contributed an estimated 413 jobs, 109 of which were direct; $26.7 million in earnings, $10.0 million of which was direct; and $53.8 million in GSP. Outside of the mining sector, the largest employment contributions from the mineral mining industry were in professional, scientific and technical services; finance and insurance; and retail trade. The largest earnings contributions were in professional, scientific and technical services; health care and social assistance; and management of companies and enterprises. The largest GSP contributions were in real estate and rental and leasing; professional, scientific and technical services; and finance and insurance.

Table 7.54
Total Estimated Economic Contributions of Utah's Nonfuel Mining Sectors, 2013
(Millions of Dollars)

Sector	Jobs	Total Earnings	GSP	Impacts from Production on Federal Land Jobs	Impacts from Production on Federal Land Earnings	Impacts from Production on Federal Land GSP
Agriculture, forestry, fishing, and hunting	63	$2.5	$5.7	2	$0.08	$0.18
Mining	4,526	$382.4	$787.2	138	$11.84	$24.31
Utilities*	146	$19.6	$57.9	4	$0.60	$1.78
Construction	80	$5.2	$6.8	2	$0.16	$0.21
Manufacturing	528	$39.0	$66.4	16	$1.22	$2.07
Wholesale trade	338	$27.1	$57.2	10	$0.84	$1.78
Retail trade	868	$33.5	$62.8	27	$1.04	$1.95
Transportation and warehousing*	473	$31.4	$51.3	14	$0.97	$1.58
Information	192	$14.2	$31.2	6	$0.44	$0.97
Finance and insurance	1,057	$43.8	$94.3	32	$1.36	$2.93
Real estate and rental and leasing	845	$19.7	$159.9	26	$0.61	$4.97
Professional, scientific, and technical services	1,116	$82.2	$115.7	35	$2.57	$3.62
Management of companies and enterprises	488	$45.6	$68.5	15	$1.41	$2.12
Administrative and waste management services	616	$21.2	$34.1	19	$0.66	$1.06
Educational services	165	$5.6	$8.0	5	$0.17	$0.25
Health care and social assistance	773	$47.7	$61.2	24	$1.48	$1.90
Arts, entertainment, and recreation	174	$4.5	$7.7	5	$0.14	$0.24
Accommodation	132	$4.6	$9.9	4	$0.14	$0.31
Food services and drinking places	551	$12.8	$20.7	17	$0.40	$0.64
Other services	240	$12.0	$18.6	10	$0.55	$0.86
Households	72	$1.1	$1.1	2	$0.03	$0.03
Total	13,442	$855.8	$1,726.4	413	$26.7	$53.8

Source: BEBR analysis of data from Bureau of Labor Statistics, Quarterly Census of Employment and Wages, and Utah Geological Survey, Utah's Extractive Resource Industries 2013*, Circular 118 using the Bureau of Economic Analysis' RIMS II multipliers.*

The economic contribution of mineral mining itself to Utah's economy consisted of 10,195 jobs, 3,393 of which were direct; $595.0 million in earnings, of which $234.6 million was direct; and $1.2 billion in GSP. Mineral mining from federal leases supported 304 jobs (83 direct), $18.1 million in earnings ($6.8 million direct), and $37.8 million in GSP (Table 7.55). Aside from the mining sector, the largest employment contributions from mineral mining were in finance and insurance; professional, scientific and technical services; and retail trade. The largest earnings contributions were in professional, scientific and technical services; health care and social assistance; and management of companies and enterprises. The largest GSP contributions were in real estate and rental and leasing; professional, scientific and technical services; and finance and insurance.

Table 7.55
Estimated Economic Contributions of Mineral Mining in Utah, 2013
(Millions of Dollars)

Sector	Jobs	Total Earnings	GSP	Impacts from Production on Federal Land Jobs	Earnings	GSP
Agriculture, forestry, fishing, and hunting	45	$1.6	$3.6	1	$0.05	$0.11
Mining	3,539	$276.7	$605.9	106	$8.42	$18.44
Utilities*	131	$16.7	$49.6	4	$0.51	$1.51
Construction	63	$3.7	$4.8	2	$0.11	$0.15
Manufacturing	362	$23.2	$39.4	11	$0.71	$1.20
Wholesale trade	249	$17.9	$37.8	7	$0.54	$1.15
Retail trade	663	$23.2	$43.4	20	$0.71	$1.32
Transportation and warehousing*	390	$24.3	$40.6	12	$0.74	$1.23
Information	146	$9.8	$21.4	4	$0.30	$0.65
Finance and insurance	795	$29.5	$63.2	24	$0.90	$1.92
Real estate and rental and leasing	633	$13.4	$107.9	19	$0.41	$3.28
Professional, scientific, and technical services	710	$45.1	$63.4	21	$1.37	$1.93
Management of companies and enterprises	380	$32.3	$48.6	11	$0.98	$1.48
Administrative and waste management services	440	$13.4	$21.4	13	$0.41	$0.65
Educational services	127	$3.9	$5.6	4	$0.12	$0.17
Health care and social assistance	590	$33.0	$42.3	18	$1.00	$1.29
Arts, entertainment, and recreation	131	$3.1	$5.2	4	$0.09	$0.16
Accommodation	96	$2.9	$6.4	3	$0.09	$0.20
Food services and drinking places	412	$8.6	$13.9	12	$0.26	$0.42
Other services	240	$12.0	$18.6	7	$0.37	$0.57
Households	55	$0.7	$0.7	2	$0.02	$0.02
Total	10,195	$595.0	$1,243.7	304	$18.1	$37.8

Source: BEBR analysis of data from Bureau of Labor Statistics, Quarterly Census of Employment and Wages, and Utah Geological Survey, Utah's Extractive Resource Industries 2013*, Circular 118 using the Bureau of Economic Analysis' RIMS II multipliers.*

Support activities for metals and nonmetallic minerals mining contributed a total of 3,247 jobs, 789 of which were direct; $260.8 million in earnings, $97.5 million of which was direct; and $482.7 million in GSP (Table 7.56). Support activities associated with mineral mining on federal leases supported 109 jobs, including 26 direct; $8.6 million in earnings ($3.1 million direct), and $15.9 million in GSP. Aside from the mining sector, the largest employment contributions were in professional, scientific and technical services; finance and insurance; and real estate and rental and leasing. The largest earnings contributions were in professional, scientific and technical services; manufacturing; and health care and social assistance. The largest GSP contributions were in professional, scientific and technical services; real estate and rental and leasing; and finance and insurance.

Table 7.56
Estimated Economic Contributions of Support Activities for Metal and Nonmetallic Mineral Mining in Utah, 2013
(Millions of Dollars)

Sector	Jobs	Total Earnings	GSP	Impacts from Production on Federal Land Jobs	Earnings	GSP
Agriculture, forestry, fishing, and hunting	18	$1.0	$2.1	1	$0.03	$0.07
Mining	987	$105.7	$181.3	32	$3.42	$5.87
Utilities*	15	$2.8	$8.3	0	$0.09	$0.27
Construction	17	$1.5	$1.9	1	$0.05	$0.06
Manufacturing	166	$15.8	$27.0	5	$0.51	$0.87
Wholesale trade	89	$9.2	$19.4	3	$0.30	$0.63
Retail trade	206	$10.4	$19.4	7	$0.34	$0.63
Transportation and warehousing*	83	$7.1	$10.8	3	$0.23	$0.35
Information	46	$4.4	$9.8	2	$0.14	$0.32
Finance and insurance	262	$14.3	$31.1	9	$0.46	$1.01
Real estate and rental and leasing	213	$6.3	$52.1	7	$0.21	$1.69
Professional, scientific, and technical services	406	$37.1	$52.3	13	$1.20	$1.69
Management of companies and enterprises	108	$13.3	$20.0	4	$0.43	$0.65
Administrative and waste management services	176	$7.9	$12.7	6	$0.25	$0.41
Educational services	38	$1.7	$2.4	1	$0.06	$0.08
Health care and social assistance	182	$14.7	$18.9	6	$0.48	$0.61
Arts, entertainment, and recreation	44	$1.5	$2.5	1	$0.05	$0.08
Accommodation	36	$1.6	$3.5	1	$0.05	$0.11
Food services and drinking places	139	$4.2	$6.8	5	$0.13	$0.22
Other services	0	$0.0	$0.0	3	$0.18	$0.29
Households	17	$0.4	$0.4	1	$0.01	$0.01
Total	3,247	$260.8	$482.7	109	$8.6	$15.9

Source: BEBR analysis of data from Bureau of Labor Statistics, Quarterly Census of Employment and Wages, and Utah Geological Survey, Utah's Extractive Resource Industries 2013*, Circular 118 using the Bureau of Economic Analysis' RIMS II multipliers.*

We also calculated the fiscal impacts due to nonfuel mineral mining and its support activities in 2013. Earnings contributions generate income and sales tax revenues for the state and counties. Mineral production generates federal royalty payments (49 percent of which is returned to the state and a portion of that is then distributed to some of the counties), local property taxes, and state and local taxable sales. (For a detailed discussion of these and other revenue impacts, see Chapters 5 and 6.) Total estimated fiscal impacts of nonfuel mineral mining in 2013 amounted to approximately $146.2 million, with $6.0 million of this attributable to production from federal leases (Table 7.57). The largest sources of revenue were income and sales taxes from earnings ($64.3 million total, $2.0 million from production on federal leases) and property taxes ($60.3 million total, an estimated $2.1 million from mines on federal land). Note that the fiscal impacts from earnings shown here do not include income tax revenues from corporate income[183] or from production royalties paid to private landowners, nor do they include county and municipal sales tax revenues from taxable business investments in the nonfuel mining sector.

Table 7.57
Estimated Fiscal Impacts of Nonfuel Mineral Mining, 2013

Source	Total	Federal
Earnings	$64,321,958	$2,009,300
Royalties[1]	$1,422,263	$1,422,263
Property Taxes	$60,283,395	$2,079,447
Taxable Sales[2]	$20,171,277	$509,750
Total Fiscal Impact	$146,198,893	$6,020,760

1 State share (49%) of estimated federal royalties.
2 These are state sales tax revenues from taxable business investments in the mining (except oil and gas) sector less those from coal mining.
Source: BEBR analysis, Office of Natural Resources Revenue, Utah State Tax Commission.

183 In 2012 mining firms paid $24.0 million in corporate income taxes to the state of Utah.

7.6 GRAZING[184]

Agriculture in Utah is dominated by livestock and livestock products, which consistently make up about 70 percent of the state's value of agricultural production (Utah Agricultural Statistics 2013). Much of the meat produced in Utah uses public lands for grazing, which has a long, well-documented history. Godfrey (2008) provides an excellent overview of how public lands grazing has evolved in Utah, noting that in the decade prior to the 1934 Taylor Grazing Act some 2.5 million sheep and lambs were grazing in Utah with only 475,000 beef cows (see Godfrey's Figures 1 and 2).

In the decades following World War II many ranches shifted production from sheep to cattle and, with the exception of a few counties, cattle have been the dominant form of livestock production in Utah ever since. In the last 10 years sheep and lamb production has averaged roughly 2–3 percent of the total value of livestock production, whereas cattle and calves have accounted for 20–35 percent, depending on the condition of agricultural markets.

Given the dominance of cattle production in Utah's livestock economy, and the relatively small contribution by sheep and lamb production to the value of agricultural production, the economic contribution analysis will focus on cattle and calves as the primary use of public lands for grazing in Utah. However, the *overview* of grazing on public lands presented here includes all livestock classes (cattle, horses and sheep).

In response to H.B. 142, the scope of this analysis is limited to measuring the economic activity of grazing lands managed by the Bureau of Land Management and U.S. Forest Service (referred to hereafter as federal lands). As such, it includes only the grazing activities associated with ranchers holding a permit to graze on federal public lands.

7.6.1 Grazing on Federal Lands

The key federal agencies operating grazing programs in Utah are the Bureau of Land Management (BLM) and the U.S. Forest Service. Combined, these agencies manage nearly 31 million acres of land in Utah, and allow livestock grazing on roughly 26.2 million acres.

Photo Credit: Bureau of Land Management, used with permission.

Grazing is allowed on BLM rangelands and national forests through the Federal Land Policy and Management Act of 1976, the Taylor Grazing Act of 1934, and the Granger-Thye Act of 1950. Under these Acts, permits issued by the BLM and Forest Service generally cover a 10-year period and are renewable without competition if the issuing agency determines that the terms and conditions of the permit are being met. Grazing permits issued by both agencies give the permittee the right to use lands, but do not give title to, or provide for exclusive access to the lands (GAO 2005).

[184] The authors thank Kim Chapman, Troy Cooper, Dillon Feuz and Bruce Godfrey of USU Agricultural Extension Service, and Troy Forrest and Bill Hopkin of the Utah Department of Agriculture and Food for discussion of livestock production practices in Utah. Any errors remain with the authors.

To provide grazing access, the BLM and Forest Service have divided their lands into allotments, which vary in size from a few acres to hundreds of acres. The BLM permits grazing in allotments within its eight grazing districts. BLM allotments are generally used for grazing in fall, winter or spring. The Forest Service, which does not have grazing districts, uses permits to authorize grazing in its allotments. Forest Service grazing allotments are generally used in the summer (Banner 2008). Figure 7.19 shows the grazing allotments for both the BLM and Forest Service.

As shown in Figure 7.19, the number of allotments available for livestock grazing has changed slightly over the years with the closure of some allotments. Closed allotments have been removed from grazing as part of a land-use planning decision due to drought or conflicts with other resource uses.

Grazing on BLM Lands

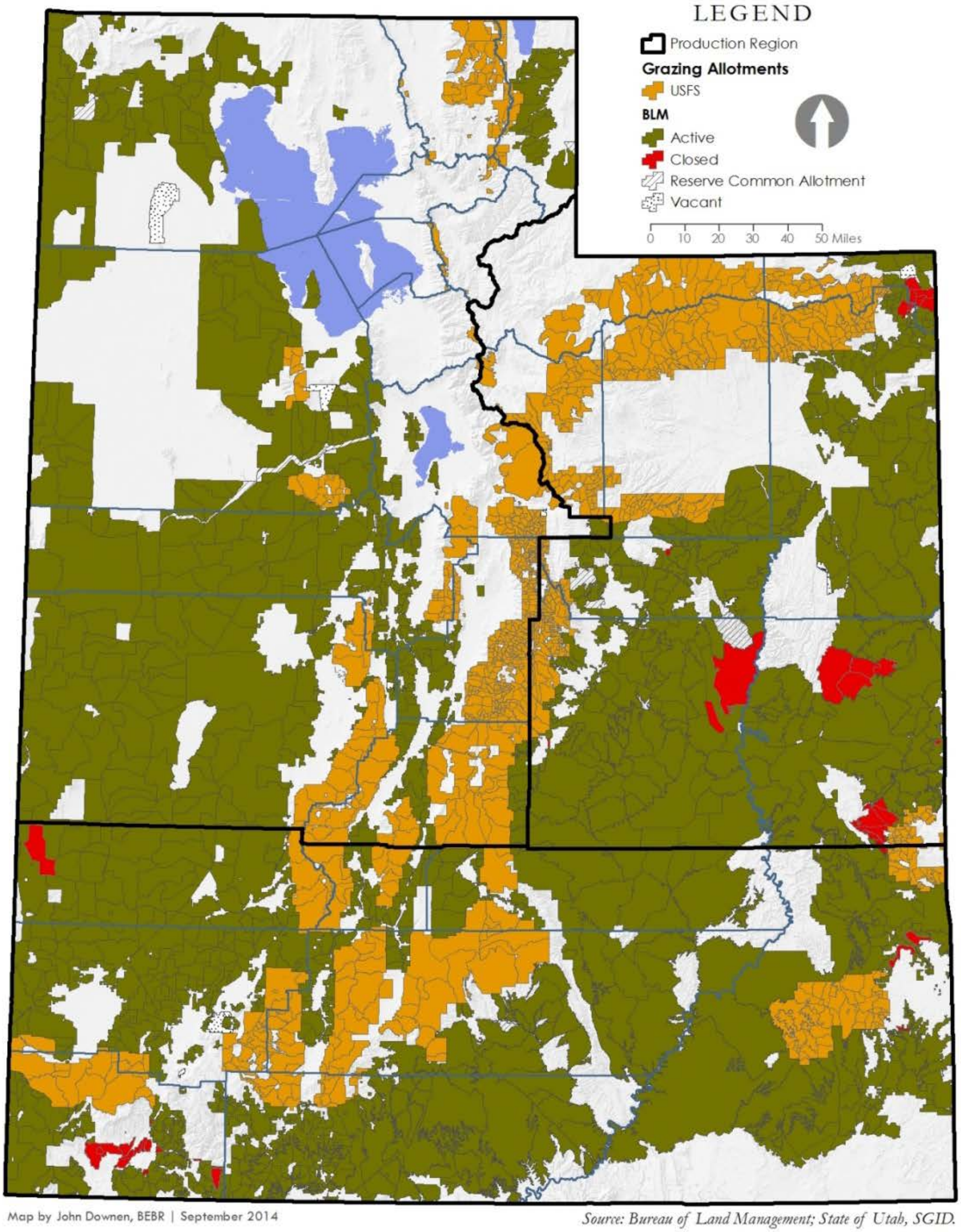
The BLM manages 1,468 grazing permits on approximately 19.4 million acres of rangeland (GAO 2005). Grazing on BLM rangeland is measured in animal unit months, or AUMs. An AUM is the amount of forage needed to feed a cow and calf, a horse or five sheep for one month. Permits issued by the BLM include the total number of active AUMs allowed under the permit (termed "active preference"), the acreage covered by the permit, as well as the percentage of the allotment within a given county. Each permit specifies the grazing season and the maximum amount of active permitted grazing on an allotment. BLM performs a full Environmental Assessment–backed range permit process for about 105 permits each year. Depending on the outcome of that process, the number of active AUMs specified on the permit may be modified (Smith 2014).

The number of active preference AUMs on BLM lands has trended slightly downward since 2000, declining from 1.2 million to 1.1 million in 2012—a reduction of 4.5 percent over a 13-year period. Factors affecting the number of active AUMs include open range closures, allotment closure for resource protection, conflicts with other resource uses such as recreation, rise in invasive plant species, and special area designations (Banner 2009, Smith 2014).

While the downward trend in recent years has slowed, livestock grazing on lands managed by the BLM declined significantly following passage of the Taylor Grazing Act of 1934. From 1940 to 1980, the number of AUMs dropped sharply and steadily, going from 2.7 million to less than 1.0 million. These permit reductions were largely a response to rangeland degradation caused by overgrazing on public lands (Banner 2009, GAO 2005).

Suspended use is a formal reduction in permit AUMs that remain with the permit under the assumption that if forage production increases, the AUMs could be restored. From 2000 to 2012, the number of active suspended AUMs averaged 326,219, ranging from a high of 347,876 in 2001 to a low of 311,604 in 2012. In general, the number of suspended AUMs on BLM lands has also been declining; albeit at a much slower rate.

Figure 7.19
BLM and Forest Service Grazing Allotments in Utah

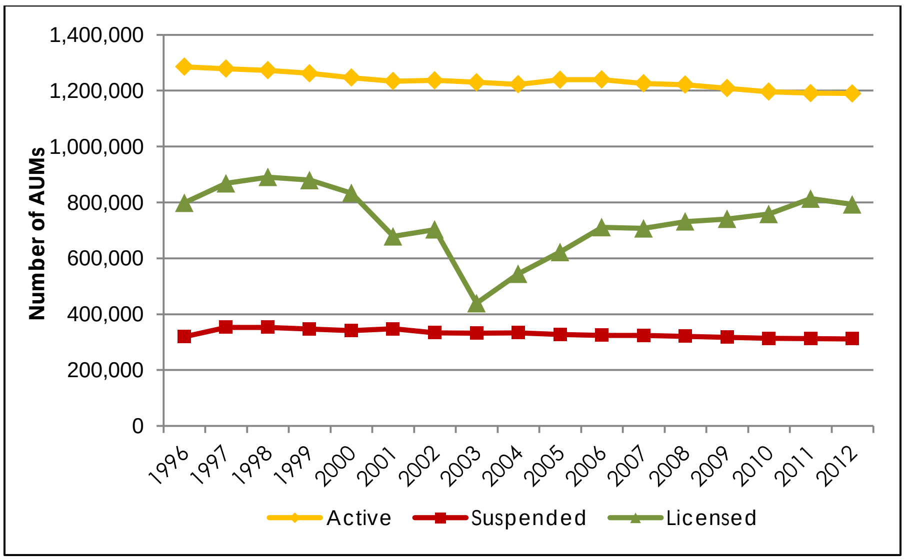


The actual number of AUMs allowed in a given year is defined as "authorized" use. For grazing permits issued by the BLM, the authorized count is typically much lower than the active count. From 2000 through 2012, BLM authorized, on average, 57 percent of its active preference

AUMs. This means that rather than having 1.2 million AUMs on the range each year, BLM authorized slightly less than 700,000. Range conditions and forage availability play an important role in determining the AUMs authorized by the BLM in a given year (DOI 2012). Drought is a major factor in determining the number of AUMs allowed each year, as it directly affects both rangeland conditions and forage availability.

Figure 7.20 shows grazing trends on BLM rangelands from 1996 to 2012. As presented there, the number of authorized AUMs (shown as licensed) declined significantly beginning in 2000 and continuing through 2005. Persistent and severe drought conditions in Utah during 2002 and 2004 contributed to this sharp decline in 2002 and 2003.

Figure 7.20
Bureau of Land Management Grazing Trends, 1996–2012



Source: Source data: U.S. Department of the Interior, Bureau of Land Management, "Public Land Statistics," various years. Available at www.blm.gov/public_land_statistics/.

Grazing on Forest Service Lands

The Forest Service permits grazing on 6.8 million acres of national forests in Utah (GAO 2005). Grazing on Forest Service land is measured in head-months (HMs). Permits issued by the Forest Service specify the maximum number of HMs allowed on the land (permitted) and the number of HMs authorized (or billed). No other federal agency uses HM relative to grazing authorizations (Forest Service 2014). While permitted use represents the *potential* grazing in the national forests, authorized use specifies *actual* grazing allowed in a given year.

The Forest Service calculations for HMs are equivalent to the BLM's AUMs as defined specifically for fee purposes, but the agency also calculates AUMs using HM data. In this discussion of grazing, we have used the AUM numbers provided by the Forest Service.[185] The Forest Service also has suspended AUMs, but does not report them separately in its annual grazing reports.

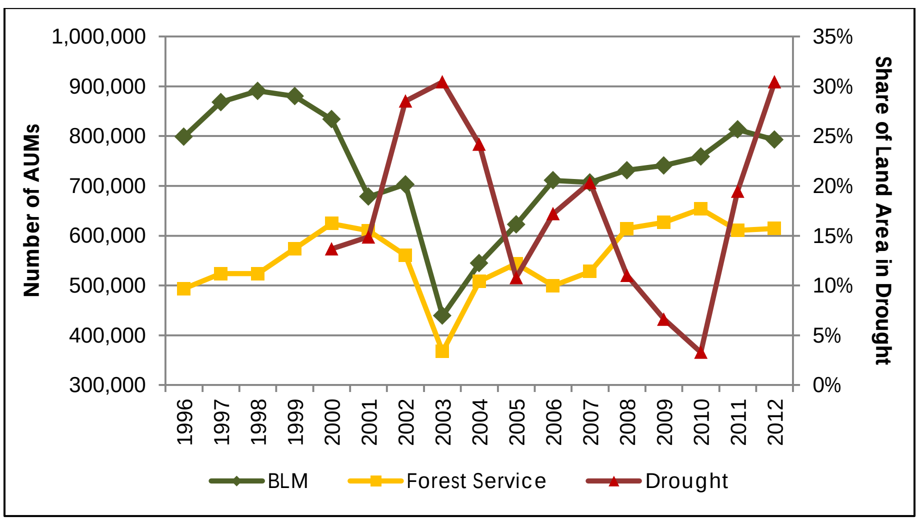
[185] The Forest Service calculates AUMs using its head-months data. The conversion rate is 1.30 x head-months = AUMs (Forrest 2014).

The number of AUMs permitted in the national forests has trended downward in recent years. From 2000 through 2012, the number of permitted AUMs declined by 10 percent. However, authorized use as a share of permitted use is very high on Forest Service lands. From 2000 through 2012, the Forest Service authorized an average of 566,219 AUMs annually, or 89 percent of the permitted number. In contrast to livestock grazing on BLM lands, AUMs authorized in the national forests can exceed the number of AUMs permitted, and did so in 2009, 2010 and 2012.

Like the BLM, permitted grazing in Utah's national forests has also declined significantly since 1940. According to Forest Service data, permitted use dropped from a high of 1.0 million AUMs in 1940 to slightly more than 614,000 in 2012 (Godfrey 2008). Reasons for this decline include land erosion and flooding in communities along the mountains (Banner 2009).

In 2003, the number of AUMs authorized to graze on Forest Service lands dropped to its lowest point in 13 years, a response to severe drought conditions in Utah between 2002 and 2005. The effect of drought on AUM authorizations for both the BLM and Forest Service is highlighted in Figure 7.21. As shown there, from 2002 through 2004, 25 to 30 percent of Utah's land area was experiencing severe or extreme drought.

Figure 7.21
Trends in Authorized AUMs, 1996–2012



Note: The drought trend line shows the percent of Utah's land area experiencing "severe" or "extreme" drought conditions.

Source data: BLM: U.S. Department of the Interior, Bureau of Land Management, Public Land Statistics*, various years, available at www.blm.gov/public_land_statistics/; Forest Service: U.S. Forest Service,* Grazing Statistical Summary*, various years, available at www.fd.fed.us/rangelands/reports; Drought trends: United States Drought Monitor.*

Table 7.58 summarizes livestock grazing trends for both BLM and the Forest Service from 2000 to 2012.

Table 7.58
Bureau of Land Management and U.S. Forest Service Grazing Trends, 2000–2012

	Bureau of Land Management				U.S. Forest Service		
Year	**Active AUMs**	**Suspended AUMs**	**Authorized Count**	**Authorized Share of Active**	**Permitted AUMs**	**Authorized AUMs**	**Authorized Share of Permitted**
2000	1,246,639	340,715	833,715	66.9%	682,331	624,136	91.5%
2001	1,234,136	347,876	678,393	55.0%	676,993	609,758	90.1%
2002	1,236,840	333,749	703,067	56.8%	666,367	560,370	84.1%
2003	1,230,244	332,308	439,185	35.7%	616,363	366,989	59.5%
2004	1,222,517	333,659	544,458	44.5%	614,731	508,441	82.7%
2005	1,238,877	327,782	622,486	50.2%	603,266	543,670	90.1%
2006	1,239,786	324,140	711,160	57.4%	632,518	499,260	78.9%
2007	1,225,890	323,783	706,869	57.7%	635,375	527,972	83.1%
2008	1,221,159	320,886	731,462	59.9%	636,785	614,267	96.4%
2009	1,208,575	317,466	740,845	61.3%	625,493	626,846	100.0%
2010	1,195,958	313,782	758,798	63.4%	624,032	653,897	104.8%
2011	1,190,920	313,099	813,264	68.3%	616,075	610,563	99.1%
2012	1,190,008	311,604	792,721	66.6%	613,002	614,682	100.3%
Mean	1,221,658	326,219	698,189	57.2%	634,102	566,219	89.3%

Source: Bureau of Land Management: U.S. Department of the Interior, Bureau of Land Management, Public Land Statistics*, various years. Table 3-7c and 3-9c, available at www.blm.gov/public_land_statistics/index.htm; U.S. Forest Service: U.S. Department of Agriculture –Forest Service,* Grazing Statistical Summary*, various years, available at: www.fs.fed.us/rangelands/reports.*

The grazing authorizations presented above do not take into account authorized non-use. Holders of both BLM and Forest Service permits commonly graze fewer animals than authorized or reduce the period of use on the range so actual use is less than what is permitted. Non-use is generally the result of drought conditions, but may also be affected by the presence of other wildlife or animals on the range. Most non-use is voluntary (Godfrey 2008). Statewide, the estimated non-use averages 20 percent (Smith 2014), but is much lower for the Forest Service (5 percent) (Godfrey 2008).

As shown in Table 7.58, the national forests provide a disproportionate amount of livestock grazing on federal lands. Since 2000, the Forest Service authorized, on average, 566,219 AUMs on a total of 6.8 million acres of forests, or roughly 12 acres per AUM. This is in stark contrast to livestock grazing on BLM lands, which averages 27 acres per AUM—a difference that reflects land productivity between the national forests and the BLM rangelands (Banner 2009).

7.6.2 Economic Contributions of Federal Grazing

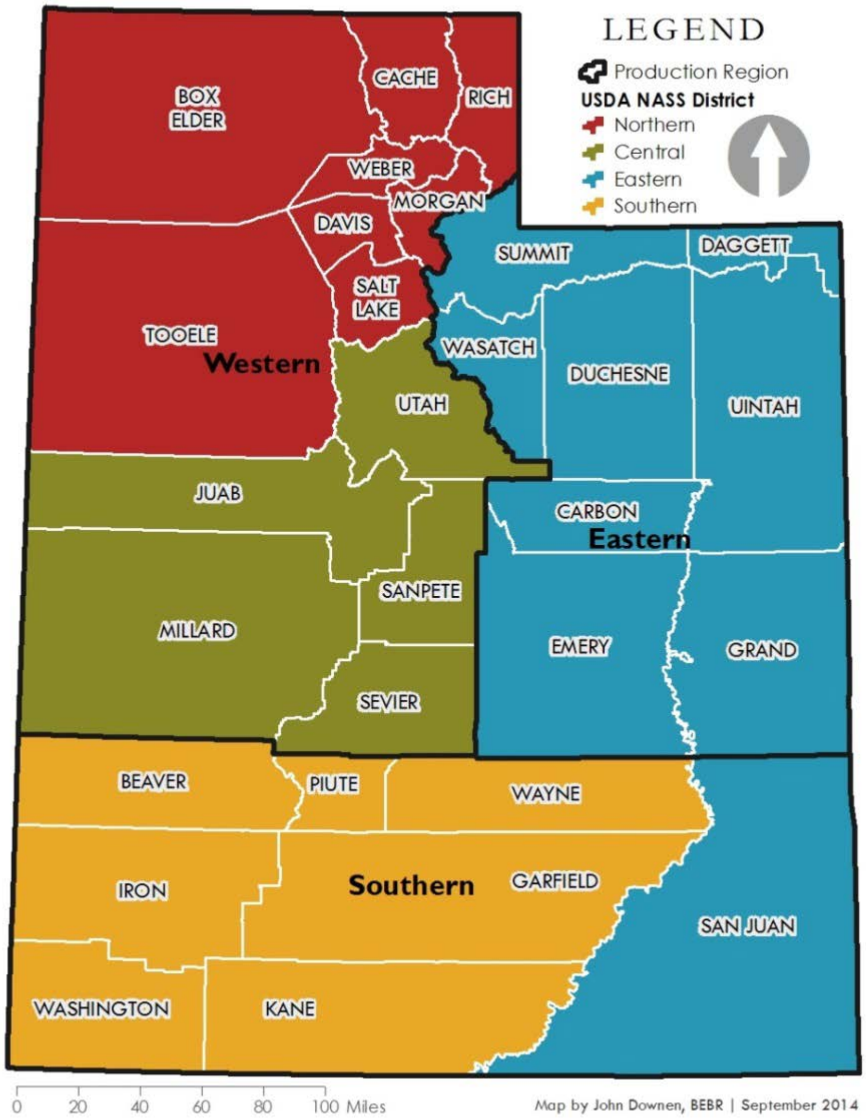
This analysis is an economic study of spending by livestock producers with permits to graze cattle on federal lands in 2013. It does not include the contributions of spending by livestock producers who graze exclusively on private lands nor does it include livestock operators with permits to graze other types of livestock on federal lands.

Methodology

The economic contributions of cattle grazing on federal lands have been estimated for three production regions in the state, aligned primarily with reporting districts identified by the USDA's National Agricultural Statistics Service.

While Utah has four agricultural reporting districts (Figure 7.22), communication with livestock experts indicated that production practices in two districts (Northern and Central) could be combined into a single region based on the predominance and similarity of cattle production in Box Elder, Tooele, Juab, and Millard counties. We term the three production regions Western, Eastern and Southern, where Western is composed of the Northern and Central districts. Also, San Juan County was moved from the Eastern district to the Southern region on the advice of livestock experts.

Figure 7.22
Grazing Production Regions and NASS Reporting Districts



Source: Utah Department of Agriculture and Food, 2013 Utah Agricultural Statistics*, and BEBR.*

The number of BLM authorized AUMs for each district was estimated using permit data available from BLM's Rangeland Administration System (RAS) website. Active AUMs for each allotment were pulled from the RAS site in summer 2013, and allocated to each county according to the percentage of the allotment located in that county. Active AUMs were then summed for each county and multiplied by 0.57 to reflect "authorized" AUMs over the 2000–2012 time period. Data from the BLM's *Public Land Statistics* were used to adjust the total authorized AUMs to cattle AUMs. The total number of authorized cattle AUMs was then reduced by 20 percent to account for authorized non-use (Smith 2014). Finally, the adjusted AUMs in each county were allocated to production regions.

No county-level or permit-level information is publicly available for Forest Service permits. As a means of approximation, AUMs on allotments managed by the Forest Service were allocated according to the amount of Forest Service land in each production region. That is, the Forest Service administers 2.5 million acres in the Eastern production region, which is 30.7 percent of the agency's 8.15 million acres in Utah. Similar allocations were made for the Western and Southern regions. The number of authorized AUMs in each production region was reduced by 5 percent to account for authorized non-use (Godfrey 2008).

Table 7.59 shows the estimated number of cattle AUMs, by agency and region, which were used to estimate the economic contributions of grazing on federal lands.

Table 7.59
Allocation of Cattle AUMs by Region and Agency

District	BLM	Forest Service	Total
Western	154,914	133,922	288,836
Eastern	113,414	130,844	244,258
Southern	182,338	163,300	345,638
Total	450,666	428,066	878,732

The economic contributions for each region were estimated with RIMS II and used AUM data converted to head counts and "enterprise budgets" for cattle production within each region. Enterprise budgets include all costs and returns associated with the production of a given crop or livestock product (in this case cattle production). The enterprise budgets used to estimate production costs were provided by Utah State University based on budgets developed by agriculture experts. The methodology used to develop these region-specific budgets is provided in Appendix F: Grazing Cattle Budgets.

The conversion of AUM to head count is a function of months on federal rangelands and forests and an animal mix factor (cow, calf and bull) for each region.

RIMS II is an input-output (I-O) economic model developed by the Bureau of Economic Analysis in the U.S. Department of Commerce. RIMS II shows how an initial change in economic activity results in new rounds of spending. For example, building a new road will lead to increased production of asphalt and concrete. The increased production of asphalt and concrete will lead to more mining (indirect impacts). As workers benefitting from these increases spend their incomes, they create additional demand for goods and services (induced impacts). RIMS II measures the economic effects of these diminishing rounds of spending.

The impacts generated by RIMS II can be expressed in terms of value added (gross domestic or regional product), earnings (including proprietors' income, wages and salaries) and employment (full- and part-time jobs). While the regional multipliers in the RIMS II model provide a way to measure how an initial change in economic activity affects an economy, they cannot estimate how individuals and companies adjust their labor supply, savings or consumption decisions when income changes (BEA 2014). Detailed information about the RIMS II model is provided in Appendix E: Economic Impact Modeling.

The economic outputs shown for each production region are in 2013 dollars, using average authorized AUMs from 2000 to 2012.

Caveats to the Analysis

The livestock budgets described above were used to estimate producer spending in each region. The livestock budgets provide reliable information about how money is spent, but not where spending occurs. This analysis assumes that ranchers within a specific region make their purchases from suppliers within that same region.

The basis for this assumption is reasonable given that each region is economically diverse and has the supplier capacity to meet producers' needs. However, the economic contributions for a specific region will vary from those presented here if ranchers purchase from suppliers outside of their region. If ranchers purchase goods and services from suppliers located outside the state there would be no economic benefit to Utah derived from those purchases, and the economic contributions presented here would be lower.

This economic contribution analysis has focused on the effects of spending. No attempt has been made to estimate the effects of changes to rangeland and forest health that result from grazing. Further, the study does not address the costs borne by the BLM and Forest Service to manage their respective grazing programs. These costs are identified in Chapter 2, Sections 2.1.1 and 2.1.2.

Finally, the economic estimates produced here are conservative from the perspective that only spending tied to actual use of the range and forests has been considered, i.e., the number of authorized AUMs has been adjusted for authorized non-use.

The economic contributions presented here are the sum of contributions in the three production regions described above. They are from a federal grazing perspective only; however, the model used to make these estimates could be used to estimate the contributions of all cattle grazing. Contributions for individual regions follow the statewide summary.

Estimated Regional Production Costs

Federal lands supported an estimated 144,693 animals, or 878,732 cattle AUMs in 2013. This includes 450,666 AUMs from the BLM and 428,666 AUMs from the Forest Service. In all production regions, cattle graze on federal lands for at least 4.5 months of the year. Most of this time is spent on BLM rangelands. Ranchers with federal grazing permits also graze their animals on private pastures and private rangelands for some part of the year.[186]

[186] In this analysis, the terms "producers" and "ranchers" are used interchangeably.

Cash receipts for cattle production in 2013 were $134.1 million, with production costs estimated at $96.6 million. On a per-AUM basis, the cost of production statewide was $110. Ranchers' net income for all regions combined totaled $37.5 million, or about $43 per AUM.

Region-specific production cost estimates are presented in Table 7.60.

Table 7.60
State Summary
Estimated Operational Spending of Federal Grazing Permittees, 2013
(Dollar Amounts in Thousands)

Purchases and Expenses	Western Region	Eastern Region	Southern Region	Total
Hay and Alfalfa	$6,966.3	$14,517.2	$3,440.8	$24,924.3
Cattle ranching and farming	$5,552.3	$6,196.1	$10,902.8	$22,651.2
Agricultural services	$1,555.3	$1,677.0	$1,663.7	$4,896.1
Utilities	$15.9	–	–	$15.9
Construction	$1,008.1	$840.6	$1,258.9	$3,107.7
Wholesale trade	$384.9	$362.7	$416.7	$1,162.3
Retail trade	$5,455.7	$2,929.6	$4,390.4	$12,775.7
Transportation	$925.8	$256.0	$236.0	$1,417.8
Insurance	$829.5	$512.1	$472.0	$1,813.6
Veterinary services	$918.8	$601.7	$540.1	$2,060.6
Private pasture leasing	$3,682.7	$4,776.6	$3,258.9	$11,718.1
Hired labor	$3,031.9	$2,611.6	$1,699.1	$7,342.6
Property taxes, depreciation, misc.	$1,158.0	$299.3	$1,488.1	$2,945.4
Grazing fees	$347.1	$287.9	$414.4	$1,049.3
Totals	$31,484.3	$35,580.5	$29,519.7	$96,584.5
Rancher's Cash Receipts	$41,776.3	$48,281.5	$44,078.5	$134,136.3
Rancher's Net Income	$10,292.0	$12,700.0	$14,558.8	$37,551.8

Note: Purchases were calculated by BEBR using livestock budgets provided by Utah State University. Totals may not sum due to rounding.
Source: BEBR analysis.

The primary inputs of livestock production, in the aggregate, are hay and alfalfa, cattle and other farm products, retail trade, and private pasture leasing. In 2013, almost 26 percent of livestock production costs were for hay and alfalfa ($24.9 million). Rents for private pasture leasing totaled $11.7 million. When combined, these inputs account for 38 percent of total production costs; however, this varies considerably depending on the region. Purchases for hay and alfalfa and private pasture leases accounted for more than half the cost of production in the Eastern region, but only 23 percent in the Southern region.

Purchases of cattle and other farm products totaled $22.6 million, followed by wholesale and retail purchases of $13.8 million. These purchases include machinery and equipment, vehicles, fertilizer, fuel, etc.

Total Economic Contribution Estimates

The economic contributions of livestock producer purchases are presented in Table 7.61. Based on these purchases, grazing on federal lands supports 2,767 jobs, composed of 1,377 direct jobs (livestock producers and their employees) and 1,389 jobs created in other industries.[187] Earnings

[187] Direct jobs include hired labor and BEBR's estimates of livestock producers with federal grazing permits. The estimate of livestock producers uses livestock farms as a proxy for direct employment. Information on livestock farms is found in *Census of Agriculture: County Data, 2012*, U.S. Department of Agriculture, national Agricultural Sta-

totaled $87.2 million and include $7.3 million in wages paid to employees, $37.6 million in rancher's income and $42.3 million in wages for workers in other industry sectors. The total contribution to Utah's gross state product is the sum of gross regional product (GRP) estimates in each region. These estimates totaled $110 million.

Table 7.61
Estimated Economic Contributions of Federal Grazing in Utah, 2013
(Dollar Amounts in Millions)

	Direct			Indirect and Induced			Total		
Region	Earnings	Jobs	GRP	Earnings	Jobs	GRP	Earnings	Jobs	GRP
Western	$13.3	662	$7.1	$16.9	526	$33.6	$30.2	1,188	$40.8
Eastern	$15.3	439	$8.3	$12.6	439	$28.6	$27.9	878	$36.8
Southern	$16.3	277	$7.5	$12.8	424	$24.9	$29.0	701	$32.4
State Total	$44.9	1,377	$22.9	$42.3	1,389	$87.1	$87.2	2,767	$110.0

Source: BEBR analysis of livestock budgets from Utah State University Extension Economics using BEA's RIMS II multipliers.

Based on the economic contributions shown in Table 7.61, in 2013 about $99 in earnings were generated per AUM and .0031 jobs supported throughout the state. The .0031 jobs represent about one job for every 318 AUMs of cattle grazing. The average earnings per job are $31,516.

Total Fiscal Impacts

In addition to the economic contributions presented in Table 7.61 there are the fiscal impacts that accrue to state and local governments. The impact on state revenue is estimated to be $6.3 million, derived about equally from income and sales taxes. Local governments received an estimated $575,687. Table 7.62 shows the fiscal impacts generated in each region.

Table 7.62
Estimated Fiscal Impacts of Grazing in Utah, 2013

Region	State	Local	Total
Western	$2,048,650	$134,087	$2,182,737
Eastern	$2,314,153	$205,374	$2,519,527
Southern	$1,953,554	$236,226	$2,189,780
State Total	$6,316,357	$575,687	$6,892,044

Note: State fiscal impacts are income tax revenues and sales and gross receipts tax revenues. Local fiscal impacts are total general sales and use tax revenues and tourism restaurant tax revenues.
Source: BEBR analysis.

Economic Contributions of Grazing in the Western Production Region

The Western Production Region (Western region) includes the counties of Box Elder, Tooele, Cache, Rich, Weber, Morgan, Davis, Salt Lake, Utah, Juab, Millard, Sanpete and Sevier. Federal lands supported an estimated 46,288 animals (288,836 cattle AUMs) in the Western region during 2013. The estimated AUMs shown here have been adjusted for authorized non-use.

tistics Service. See table 44, entry "Beef cattle ranching and farming." BEBR assumed that 20 percent of all farm proprietors hold federal grazing permits (Godfrey 2008).

Cattle in this region graze on federal lands for a total of six months. Producers also graze their cattle on private pastures and rangelands for 4.5 months of the year, slightly longer than producers in the Eastern region and 1.5 months longer than producers in the Southern region.

Cash receipts for cattle production in the Western region are estimated to be $41.8 million, with spending of almost $31.5 million, which includes property taxes and depreciation on vehicles and machinery. On a per-AUM basis, the cost of production in the Western region was $109, the lowest of the three regions. Net operating income for ranchers was estimated to be $10.3 million, or almost $36 per AUM, also the lowest of the three regions.

Estimated Production Costs

The estimated production costs for the Western region are presented in Table 7.63. For this region, the primary production input is purchased feed. In 2013, producers paid $7.0 million for hay and alfalfa—22 percent of total spending. Private pasture leasing totaled almost $3.7 million. Combining hay and alfalfa purchases with private pasture leasing shows that ranchers in this region spend $10.5 million to provide feed for their cattle when they are not on the range. This translates to approximately $36 per AUM, or approximately one-third of the total cost per AUM.

Table 7.63
Western Production Region
Estimated Operational Spending, 2013
(Thousands of Dollars)

Purchases and Expenses	Amount	Share
Hay and alfalfa	$6,966.3	22.1%
Cattle ranching and farming	$5,552.3	17.6%
Agricultural services	$1,555.3	4.9%
Utilities	$15.9	.05%
Construction	$1,008.1	3.2%
Wholesale trade	$384.9	1.2%
Retail trade	$5,455.7	17.3%
Transportation	$925.8	2.9%
Insurance	$829.5	2.6%
Veterinary services	$918.8	2.9%
Private pasture leasing	$3,682.7	11.7%
Hired labor	$3,031.9	9.6%
Property taxes, depreciation, misc.	$1,158.0	2.6%
Grazing fees	$347.1	1.1%
Totals	$31,484.3	100%
Ranchers' Cash Receipts	$41,776.3	
Ranchers' Net Income	$10,292.0	

Notes: Purchases were calculated by BEBR using livestock budgets provided by Utah State University. Totals may not sum due to rounding.
Source: BEBR analysis.

Purchases of animals and other farm products totaled almost $5.6 million, followed by retail trade purchases ($5.5 million) and purchases of other agricultural services ($1.6 million). Non-fee costs for this region averaged $13 per AUM or $81 per animal.

Economic and Fiscal Contributions

The economic effects of livestock producer purchases in this region supported a total of 1,188 jobs in 2013—662 direct jobs and 526 in other industry sectors. The earnings contribution was

$30.2 million and included $3.0 million in wages paid to employees of livestock producers, $10.3 million in rancher's income and $16.9 million in earnings for workers in other industry sectors. The total contribution to GRP was $40.7 million. Fiscal revenues included $2.0 million in state taxes and $134,087 in taxes for local units of government. These results are summarized in Table 7.64.

Table 7.64
Western Production Region
Economic Contributions of Federal Grazing, 2013

Impact Type	Earnings	Jobs	GRP
Direct	$13,323,931	662	$7,101,978
Indirect and Induced	$16,889,727	526	$33,626,905
Total	$30,213,658	1,188	$40,728,883
	State	**Local**	**Total**
Fiscal Impacts	$2,048,650	$134,087	$2,182,737

Note: State fiscal impacts are income tax revenues and sales and gross receipts tax revenues. Local fiscal impacts are total general sales and use tax revenues and tourism restaurant tax revenues.
Source: BEBR analysis.

Based on these contribution estimates, almost $105 dollars in earnings are generated per cattle AUM and .0041 jobs supported throughout the region. This represents about 1 job for every 243 AUMs of cattle grazing on federal lands.

Economic Contributions of Grazing in the Eastern Production Region

The Eastern Production Region (Eastern region) includes the counties of Summit, Wasatch, Duchesne, Daggett, Uintah, Carbon, Emery, Grand, and San Juan. Federal lands supported an estimated 51,207 animals (244,258 cattle AUMs) in this region in 2013. The estimated AUMs have been adjusted for authorized non-use.

Producers in this region graze cattle on federal lands for a total of 4.5 months (2.25 months on BLM rangelands and 2.25 months in national forests). Producers in the East utilize federal lands for a shorter period of time than producers in any other region. Livestock producers in this region also graze their cattle on private pastures and rangelands for four months of the year.

Cash receipts for cattle production in the Eastern region are estimated to be $48.3 million, with spending of $35.6 million, which includes property taxes and depreciation on vehicles and machinery. On a per-AUM basis, the cost of production in the Eastern region was $146, the highest of the three regions. The net operating income was estimated to be $12.7 million, or $52 per AUM, also the highest of the three regions.

Estimated Production Costs

The estimated production costs for the Eastern region are presented in Table 7.65. Because cattle in this region spend such a short time on the range, hay and alfalfa and private pastures are significant costs for producers in this region. In 2013, spending for purchased feed and private pastures totaled $19.5 million, or 55 percent of the total livestock budget.

Table 7.65
Eastern Production Region
Estimated Operational Spending, 2013
(Thousands of Dollars)

Purchases and Expenses	Amount	Share
Hay and alfalfa	$14,517.2	40.8%
Cattle ranching and farming	$6,196.1	17.4%
Agricultural services	$1,677.0	4.7%
Utilities	–	–
Construction	$840.6	2.4%
Wholesale trade	$362.7	1.0%
Retail trade	$2,929.6	8.2%
Transportation	$256.0	0.7%
Insurance	$512.1	1.4%
Veterinary services	$601.7	1.7%
Private pasture leasing	$4,776.6	13.4%
Hired labor	$2,611.6	7.3%
Property taxes, depreciation, misc.	$11.4	.03%
Grazing fees	$287.9	0.8%
Totals	$35,580.5	100%
Ranchers' Cash Receipts	$48,281.5	
Ranchers' Net Income	$12,701.0	

Notes: Purchases were calculated by BEBR using livestock budgets provided by Utah State University. Totals may not sum due to rounding.
Source: BEBR analysis.

The amount spent by ranchers for hay and alfalfa and private pastures in 2013 translates to $79 per AUM—about double the amount spent by producers in the Western region and more than four times the amount spent by Southern region producers.

Purchases of cattle and other farm products were estimated to be $6.2 million, followed by purchases in the retail trade sector ($2.9 million) and agricultural services ($1.7 million). Non-fee costs for this region averaged $13.75 per AUM or $66 per animal.

Economic and Fiscal Contributions

The economic effects of livestock producer purchases in this region support 878 jobs, comprising 439 direct jobs and 439 jobs in other industry sectors. The earnings contribution was $27.9 million and included $2.6 million in wages paid to employees of livestock producers, $12.7 million in rancher's income, and $12.6 million in earnings for workers in other industry sectors. The total contribution to GRP was $36.8 million. Fiscal revenues included $2.3 million in state taxes and $205,374 in taxes for local units of government. The economic and fiscal contributions of production purchases are summarized in Table 7.66.

Based on these contribution estimates, about $114 dollars in earnings are generated per cattle AUM and .0036 jobs supported throughout the Eastern region. This represents about 1 job for every 278 AUMs of cattle grazing on federal lands.

Table 7.66
Eastern Production Region
Economic Contributions of Federal Grazing, 2013

Impact Type	Earnings	Jobs	GRP
Direct	$15,312,522	439	$8,207,851
Indirect and Induced	$12,635,523	439	$28,588,672
Total	$27,948,045	878	$36,796,523
	State	**Local**	**Total**
Fiscal Impacts	$2,314,153	$205,374	$2,519,527

Note: State fiscal impacts are income tax revenues and sales and gross receipts tax revenues. Local fiscal impacts are total general sales and use tax revenues and tourism restaurant tax revenues.
Source: BEBR analysis.

Economic Contributions of Grazing in the Southern Production Region

The Southern Production Region (Southern region) includes the counties of Beaver, Iron, Washington, Piute, Garfield, Kane, Wayne and San Juan. Federal lands supported an estimated 47,198 head of cattle (345,638 cattle AUMs) in this region. The estimated number of AUMs is adjusted for authorized non-use.

Ranchers in the Southern region graze on federal land for a total of 7 months (4 months on BLM rangelands and 3 months in national forests). Cattle in this region spend more months grazing on federal lands than in any other production region. Producers also graze their cattle on private pastures and rangelands for three months of the year, the fewest number of months in any region.

Cash receipts for cattle production in the Southern region are estimated to be $44.1 million, with spending of $29.5 million, including property taxes and depreciation on vehicles and machinery.

The singular importance of rangeland forage to ranchers in the Southern region is reflected in the region's production costs. On a per-AUM basis, the cost of production in the South is estimated to be $85; 22 percent lower than costs in the Western region and 42 percent lower than costs in the Eastern. Net operating income for livestock producers in this region was nearly $14.6 million, or $42 per AUM. This is slightly less than the amounts estimated in the Eastern region, but is $6 per AUM more than the amount estimated for Western region producers.

Non-fee costs for this region averaged $13.75 per AUM, or $101 per animal—the highest amount of all production regions.

Estimated Production Costs

The estimated production costs for the Southern region are shown in Table 7.67. In contrast to other regions, hay and alfalfa are not the largest inputs of livestock production costs in this region. Purchases of cattle and other farm products accounted for the largest share of spending (37 percent) and totaled almost $11 million, followed by retail trade purchases of $4.4 million. In comparison, purchases of hay and alfalfa and private pastures totaled about $6.7 million, or 23 percent of total spending in 2013. This translates to $19 per AUM, the lowest amount spent by producers in any region.

Table 7.67
Southern Production Region
Estimated Operational Spending, 2013
(Thousands of Dollars)

Purchases and Expenses	Amount	Share
Hay and alfalfa	$3,440.8	11.7%
Cattle ranching and farming	$10,902.8	36.9%
Agricultural services	$1,663.7	5.6%
Utilities	–	–
Construction	$1,258.9	4.3%
Wholesale trade	$416.9	1.4%
Retail trade	$4,390.4	14.9%
Transportation	$235.9	0.8%
Insurance	$472.0	1.6%
Veterinary services	$540.1	1.8%
Private pasture leasing	$3,258.9	11.0%
Hired labor	$1,699.1	5.8%
Property taxes, depreciation, misc.	$826.0	2.8%
Grazing fees	$414.3	1.4%
Totals	$29,519.7	100%
Ranchers' Cash Receipts	$44,078.5	
Ranchers' Net Income	$14,558.8	

Notes: Purchases were calculated by BEBR using livestock budgets provided by Utah State University. Totals may not sum due to rounding.
Source: BEBR analysis.

Economic and Fiscal Contributions

The economic effects of livestock producer purchases in this region support 701 jobs, consisting of 277 direct jobs and 424 jobs in other industry sectors. The total earnings contribution was $29 million and included about $1.7 million in wages paid to employees of livestock producers, $14.6 million in ranchers' income, and $12.8 million in earnings for workers in other industry sectors. The contribution to GRP was $32.4 million. Fiscal revenue impacts include almost $2.0 million in state taxes and $236,226 in taxes for local units of government. These results are summarized in Table 7.68.

Table 7.68
Southern Production Region
Economic Contributions of Federal Grazing, 2013

Impact Type	Earnings	Jobs	GRP
Direct	$16,257,922	277	$7,493,345
Indirect and Induced	$12,786,302	424	$24,863,508
Total	$29,044,225	701	$32,356,853
	State	Local	Total
Fiscal Impacts	$1,953,554	$236,226	$2,189,780

Note: State fiscal impacts are income tax revenues and sales and gross receipts tax revenues. Local fiscal impacts are total general sales and use tax revenues and tourism restaurant tax revenues.
Source: BEBR analysis.

Based on these contribution estimates, in 2013 about $84 dollars in earnings were generated per AUM and .0020 jobs supported throughout the Southern region. This represents about 1 job for every 493 AUMs of cattle grazing on federal lands.

7.7 GEOTHERMAL STEAM PRODUCTION

Net geothermal electrical generation in Utah has grown from 153,000 megawatt-hours in 2001 to 348,000 megawatt-hours in 2013, with particularly rapid growth since 2007. Although it is still quite small, geothermal's share of total electricity generation has also grown, from 0.43 percent in 2001 to 0.81 percent in 2013 (Table 7.69). As of January 2014 there were three geothermal power plants in Utah with a combined capacity of 77.1 Gigawatts (Utah Geological Survey nd). Two of these plants, PacifiCorp's Blundell plant at Roosevelt Hot Springs and Enel Green Power's Cove Fort plant, operate on federal leases. Therefore they pay a 10 percent royalty on their gross receipts to the Department of Interior's Office of Natural Resources Revenue. Until they begin commercial production, other geothermal leases on federal land pay annual rents ranging from $2 per acre in the first year of a competitive lease to $3 per acre in years three through ten to $5 per acre after ten years. ONRR also receives bonus payments on geothermal leases, which are the winning bids on competitively auctioned leases. One-quarter of all of these revenues is disbursed to the counties in which the leases reside and 49 percent is distributed to the state[188] (see Chapter 5). In federal fiscal year 2013, $302,379 in royalties was paid to ONRR, plus $371,509 in rents. Of these revenues, $159,275 was returned to Beaver, Iron, Juab and Millard counties and an estimated $330,205 was disbursed to the state (Table 7.70).

Table 7.69
Net Geothermal Electricity Generation in Utah, 2001–2013
(thousand megawatt-hours)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Generation	153	218	198	195	185	191	164	254	279	277	330	335	348
Share of Total Gen.	0.43%	0.60%	0.52%	0.51%	0.48%	0.46%	0.36%	0.55%	0.64%	0.66%	0.81%	0.85%	0.81%

Source: U.S. Energy Information Administration, Electricity Data Browser, www.eia.gov/electricity/data/browser/.

Table 7.70
Geothermal Revenues from Federal Leases,
FY2003–FY2013
(Constant 2013 Dollars)

Fiscal Year	Sales Value	Royalties	Rents, Bonus, Other	Disbursements to Counties	Disbursements to State*
2003	$8,495,910	$378,343	$77,472		$223,349
2004	$3,542,592	$354,259	$30,756		$188,658
2005	$3,242,590	$324,259	$20,813		$169,085
2006	$3,008,792	$300,879	$9,934	$82,036	$152,298
2007	$3,192,022	$319,202	$4,643,101	$79,904	$2,431,528
2008	$2,847,500	$284,750	$37,891	$78,492	$158,094
2009	$3,836,227	$383,623	$7,292,118	$3,084,459	$3,761,113
2010	$3,388,503	$338,850	$726,501	$328,620	$522,022
2011	$2,987,160	$298,716	$445,896	$172,184	$364,860
2012	$2,938,349	$293,835	$405,067	$194,150	$342,462
2013	$3,023,790	$302,379	$371,509	$159,275	$330,205

Note: Years are federal fiscal years, October 1 through September 30.
* Estimated by BEBR since state disbursements are not reported by source mineral.
Source: U.S. Department of the Interior, Office of Natural Resources Revenue, statistics.onrr.gov/ReportTool.aspx.

7.7.1 Economic Contributions

The sales value of geothermal steam generated from federal leases in 2013 was over $3.0 million (Table 7.70). Using RIMS II multipliers from the Bureau of Economic Analysis, we estimate that

188 Note that since fiscal year 2011, sequestration has led to the withholding of a portion of the disbursements, which is then delivered in the following fiscal year.

this provided 18 direct full- and part-time jobs with approximately $866,000 in earnings. The value added of the geothermal sector, or its direct contribution to gross state product, is estimated to be almost $2.0 million (Table 7.71). In addition to the direct jobs and earnings paid, geothermal steam production also generated indirect and induced jobs and earnings among its suppliers and when employees of both the producers and suppliers spent their wages. The estimated indirect and induced contributions totaled 23 additional jobs with almost $950,000 in earnings, and $1.8 million in value added or gross state product. Most industry-level contributions were quite small, with the largest in construction; retail trade; finance and insurance; real estate and rental and leasing; professional, scientific and technical services; administrative and waste management services; and health care and social assistance.

Table 7.71
Estimated Economic and Fiscal Contributions of Geothermal Steam Production on Federal Land in Utah, 2013
(Dollar amounts in thousands)

Contribution	Jobs	Earnings	Value Added
Direct	18	$866.3	$1,986.6
Indirect and Induced	23	$949.2	$1,843.0
Agriculture, forestry, fishing, and hunting	0.1	$3.0	$7.3
Mining	0.1	$7.0	$16.3
Utilities	0.1	$14.3	$43.5
Construction	2	$121.0	$156.6
Manufacturing	1	$55.0	$94.9
Wholesale trade	0.6	$40.2	$84.7
Retail trade	2	$74.7	$140.0
Transportation and warehousing	0.7	$39.9	$58.7
Information	0.4	$24.8	$59.3
Finance and insurance	2	$81.6	$189.3
Real estate and rental and leasing	2	$30.2	$308.4
Professional, scientific, and technical services	3	$191.1	$287.0
Management of companies and enterprises	0.3	$22.7	$33.9
Administrative and waste management services	2	$42.6	$66.2
Educational services	0.4	$11.8	$16.3
Health care and social assistance	2	$100.1	$128.2
Arts, entertainment, and recreation	0.4	$9.1	$14.8
Accommodation	0.3	$9.7	$20.6
Food services and drinking places	1	$26.6	$43.2
Other services	0.9	$41.4	$71.4
Households	0.2	$2.4	$2.4
Total	41	$1,815.5	$3,829.6
	State	**Local**	**Total**
Fiscal Impacts (dollars)	$455,269	$169,922	$625,191

Note: Fiscal impacts consist of income tax revenues, sales tax revenues, and federal geothermal lease revenue disbursements to the state and counties.

Source: BEBR analysis of data from Utah Department of Workforce Services, Bureau of Labor Statistics, and Office of Natural Resources Revenue using BEA's RIMS II multipliers.

Fiscal impacts associated with these economic impacts comprise state income and state and local sales tax revenues associated with the earnings contributions, plus federal geothermal lease revenues disbursed to the state and some of the counties. Table 7.71 provides estimates of these impacts. State revenues associated with geothermal production on federal land were an estimated $455,000, which includes approximately $148,000 of federal royalties and $182,000 of federal rents disbursed to the state. Local revenues were estimated at $170,000, which includes $159,000 of federal royalties and rents disbursed to Beaver, Iron, Juab and Millard counties. The total fiscal impacts of geothermal production on federal land in 2013 were an estimated $625,000.

7.8 TIMBER HARVESTS

During the period 2003 to 2012 average annual timber harvests on public lands in Utah were 30.6 million board feet (MMBF), which generated $1.7 million in annual revenue, given in FY2012 dollars (Table 7.73). By both measures, the Forest Service accounted for most of the timber harvest. Harvests on private and tribal lands were about 11.6 MMBF in 2007, the most recent year for which data were available. Timber harvest volumes are largely determined by forest health, timber offerings from public lands, and timber industry infrastructure.

Utah's timber industry in 2012 offered approximately 324 full- and part-time jobs and generated about $7.4 million in earnings (Table 7.80). Economic impacts of the industry that year (measured in inflation-adjusted 2013 dollars) consisted of $14.7 million in earnings, 537 jobs, and $21.0 million in value added or gross state product, with amounts given in 2013 dollars. Industry activity has decreased in most respects since the late 1990s for a variety of reasons.

7.8.1 Utah Timber Harvest

Utah's timber harvest statewide rose from 32.5 MMBF in 1974 to 64.7 MMBF in 1992, falling to 41.3 MMBF in 2002 and 30.3 MMBF in 2007, the most recent year for which data was available (Table 7.72).[189] Harvest volumes from private and public lands were not available annually for Utah.

In 2007, the leading Utah counties in terms of timber harvest were Wasatch (14.2 percent of the state total), Sanpete (12.5 percent), Garfield (10.4 percent), and Summit (8.9 percent). In 2002, the leading counties were Kane (13.4 percent), Summit (10.0 percent), Wasatch (9.1 percent), and Duchesne (8.4 percent). A handful of counties that extracted at least 100,000 board feet of timber in 2002 did not have any activity five years later: Daggett, Davis, Millard, Rich, and Wayne counties. Figure 7.23 shows average harvest levels for these two years, the most recent for which we have timber harvest information by county.

Unlike recent years, Uintah County accounted for about one-fourth of the state harvest in 1974 and 1992 (Table 7.72). Uintah County was followed by Garfield, Summit, and Kane counties, each with more than 10 percent of Utah's total. Compared to 1974 and 1992, timber activity was at least 3 MMBF lower in 2007 in Uintah, Kane, and Garfield counties, while the harvest was at least 1 MMBF higher in Wasatch, Washington, and Carbon counties.

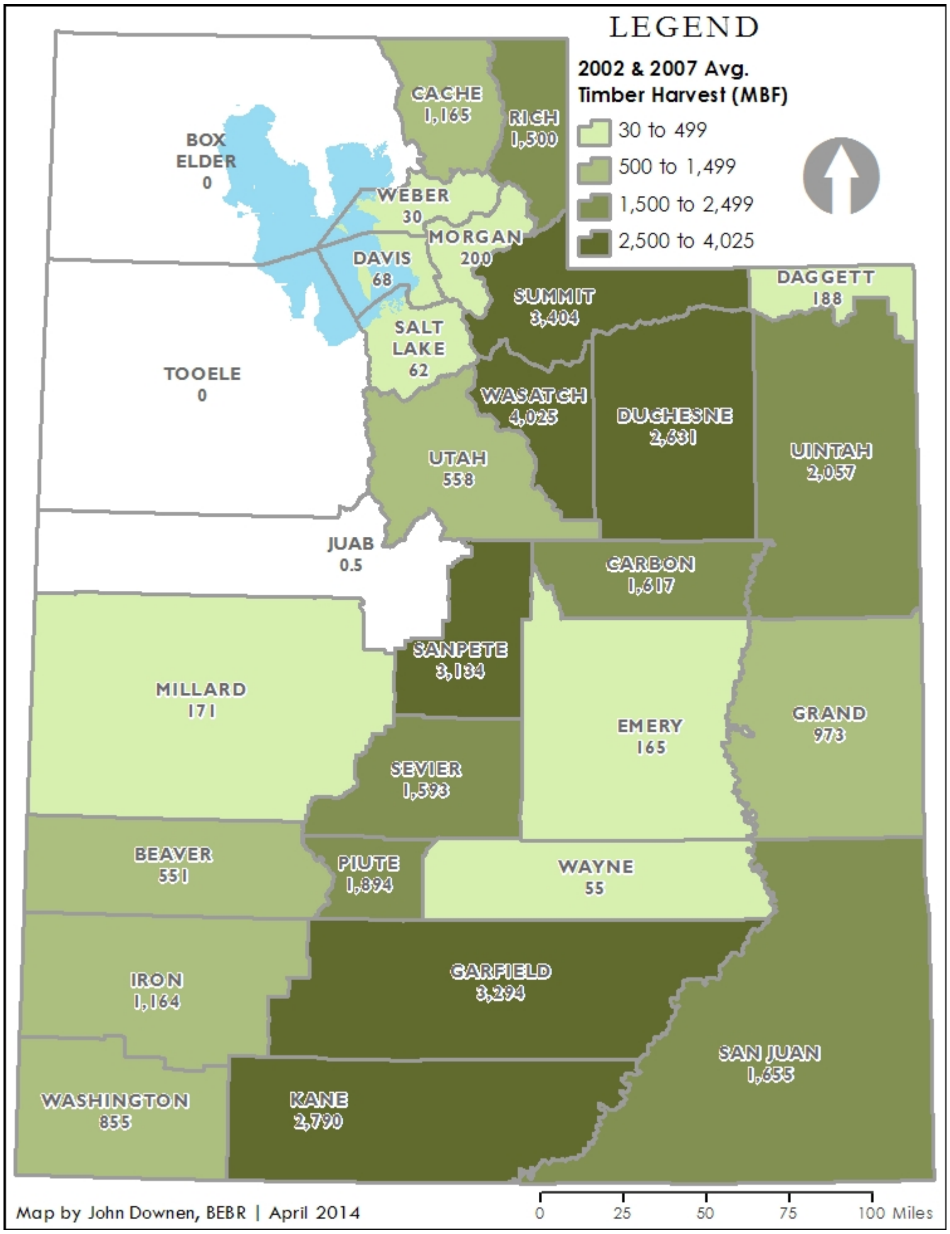
[189] Timber harvest volumes reported by public land owners suggest these numbers may understate the total harvest. For example, in 2007 the harvest reported from public lands alone was 38.9 MMBF (see Table 7.76, Table 7.77 and Table 7.78), 28.3 percent higher than the total for public and non-public lands given in Table 7.72 from Hayes et al. (2012), which is based on a mill survey with a response rate lower than 100 percent, still the best available source for Utah.

Table 7.72
Utah Timber Harvest by County for Selected Years, 1974–2007
(Thousand Board Feet, MBF)

	1974		1992		2002		2007	
County	Volume	Share	Volume	Share	Volume	Share	Volume	Share
Beaver	155	4.6%	2,952	4.6%	633	1.5%	468	1.5%
Box Elder	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Cache	1,389	0.3%	175	0.3%	1,180	2.9%	1,150	3.8%
Carbon	260	0.2%	100	0.2%	1,670	4.0%	1,564	5.2%
Daggett	3,193	4.4%	2,850	4.4%	375	0.9%	0	0.0%
Davis	0	0.0%	0	0.0%	135	0.3%	0	0.0%
Duchesne	2,539	2.7%	1,767	2.7%	3,469	8.4%	1,793	5.9%
Emery	250	0.0%	0	0.0%	45	0.1%	284	0.9%
Garfield	8,502	10.9%	7,047	10.9%	3,446	8.4%	3,141	10.4%
Grand	5,000	0.0%	0	0.0%	20	0.0%	1,925	6.3%
Iron	0	2.2%	1,435	2.2%	773	1.9%	1,554	5.1%
Juab	0	0.0%	0	0.0%	1	0.0%	0	0.0%
Kane	6,480	6.4%	4,117	6.4%	5,520	13.4%	60	0.2%
Millard	30	0.0%	0	0.0%	342	0.8%	0	0.0%
Morgan	11	0.0%	25	0.0%	250	0.6%	150	0.5%
Piute	440	1.0%	620	1.0%	3,288	8.0%	500	1.6%
Rich	2,159	0.0%	0	0.0%	3,000	7.3%	0	0.0%
Salt Lake	0	0.0%	0	0.0%	65	0.2%	59	0.2%
San Juan	5,000	7.0%	4,503	7.0%	1,444	3.5%	1,865	6.2%
Sanpete	520	5.8%	3,750	5.8%	2,468	6.0%	3,800	12.5%
Sevier	715	5.7%	3,663	5.7%	1,703	4.1%	1,483	4.9%
Summit	5,589	15.5%	10,000	15.5%	4,107	10.0%	2,700	8.9%
Tooele	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Uintah	14,652	25.7%	16,624	25.7%	2,715	6.6%	1,398	4.6%
Utah	20	0.0%	0	0.0%	323	0.8%	793	2.6%
Wasatch	1,606	4.5%	2,908	4.5%	3,750	9.1%	4,300	14.2%
Washington	0	0.0%	0	0.0%	375	0.9%	1,334	4.4%
Wayne	3,905	3.3%	2,110	3.3%	110	0.3%	0	0.0%
Weber	50	0.0%	20	0.0%	60	0.1%	0	0.0%
Statewide	32,465	100.0%	64,666	100.0%	41,267	100.0%	30,321	100.0%

Source: U.S. Forest Service, Hayes et al. (2012).

Figure 7.23
Average Timber Harvest during 2002 and 2007 by County in Utah



Source: U.S. Forest Service, Hayes et al. (2012)

Forest Products

In 2002, from all types of land, sawlogs (conventional lumber) accounted for 62 percent of the timber received by Utah sawmills, while house logs were 30 percent, and fiber logs, wood for furniture, posts, and poles amounted to 8 percent (DeBlander et al. 2010).

Wood products typically derived from Utah's state trust lands are aspen excelsior, pellets for fuel, and sawdust for oil and gas drilling (Christy et al. 2014). Trust land forests also provide material for small quantities of specialty wood, dimensional timber, logs for homes, low-grade mining timber, fence posts and poles, and tongue and groove paneling

Products removed from National Forests in central and southern Utah are mostly salvage wood from trees that are dead or dying due to disease, drought, insects, and fire (Cote 2014). About half of the wood harvested, at least in central and southern Utah, is for fuelwood, and the rest is used for log homes, rough cut wood, trim, shavings, and some dimensional timber.

Biomass

Renewable energy from biomass has not been a significant product of Utah's forest resources. The potential for biomass applications in Utah in the future is likely to depend on the feasibility of technology given energy prices and government funding.

Biomass from branches, leaves and bark, timber harvest byproducts, can generate renewable energy and heat (Blackham 2013). Salvage timber left behind from wildfire or beetle infestation can also be used as biomass. Between 2000 and 2005, Utah had an estimated 358 million tons of biomass (DeBlander et al. 2010, p. 20). The Utah juniper, a non-commercial species, comprised twice as much biomass in tons as any other tree species in Utah at that time. Other abundant species in terms of biomass are aspen, Doulas-fir, and pinyons. Although the resource is available, and the technology for utilizing biomass is proven, biomass has not become commercially viable. Here, as in other western states, "the cost of harvesting and transporting excess biomass is far greater than the value of the power or other end products" (Blackham 2013, p. 13).

Two installations in Arizona generate biomass from generate electricity. A $73 million, 24 megawatt biomass power plant has been operating in Snowflake, Arizona since 2008, funded partially by municipal bonding.[190] Three-fourths of its inputs are derived from thinning and salvage efforts on nearby Forest Service lands.[191] A five-kilowatt biomass power plant is located near Flagstaff. A 2002 assessment estimated the operation would be feasible with a 7- to 11-fold increase in wholesale electric prices or government subsidies to defray construction or ongoing transportation costs (TSS Consultants 2002). By helping fund the removal of hazardous fuels, biomass power plants can support fire prevention and contribute to improved rangeland for grazing.

State and Federal Lands

Average annual timber harvests on public lands in Utah amounted to 30.6 MMBF and generated $1.7 million in revenue during the period 2003 to 2012 (Table 7.73). They generated an estimated $1.7 million in annual revenue for the Forest Service, Bureau of Land Management (BLM), and Utah's School and Institutional Trust Lands Administration (SITLA), given in Fiscal Year (FY) 2012 dollars. The Forest Service accounted for 78.3 percent of the volume harvested and 86.6 percent of its value. SITLA accounted for a little more than 10 percent of the volume and value harvested on

Table 7.73
Timber Harvest on Public Lands in Utah, FY2003-2012

Land Owner	Volume (MMBF)	Share	Revenue (Thousands)	Share
Forest Service	23.9	78.3%	$1,504	86.6%
BLM	3.0	9.9%	$52	3.0%
SITLA	3.6	11.8%	$180	10.4%
Total	30.6	100.0%	$1,736	100.0%

Note: For information on these amounts, see Table 7.76 (Forest Service), Table 7.77 (BLM), and Table 7.78 (SITLA). Revenue is given in FY2012 dollars.
Sources: U.S. Forest Service, Bureau of Land Management, Utah School and Institutional Trust Lands Administration.

[190] "Snowflake White Mountain Power," Renegy Holdings, Inc., accessed June 11, 2014, www.renegy.com/project_snowflake.html.
[191] "Snowflake White Mountain Power Plant," Salt River Project, accessed June 11, 2014, www.srpnet.com/about/stations/snowflakebiomass.aspx.

public lands. By both measures, BLM had the smallest harvest of the three.

Timber revenue and harvest volume data for the Forest Service, BLM, and SITLA can be used to measure forest productivity (Table 7.74). While National Forests constitute most of Utah's timberland, BLM and SITLA harvest more per acre from the limited acreage they manage. During a five year period ending June 30, 2012, an average of 23.5 board feet were harvested per acre of timberland managed by SITLA, whereas BLM timberland produced 21.6 board feet per acre, and only 8.0 board feet were harvested per acre of Forest Service lands.

Table 7.74
Utah Timberland Productivity by Ownership, FY2003–2012

Owner	**Timberland** (Thousand Acres)	**Timber Harvest Volume** (Thousand Board Feet, Average)[1]	**Timberland Productivity** (Annual Board Feet per Acre)
Forest Service	2,995	23,933	8.0
BLM[2]	141	3,031	21.6
SITLA[3]	154	3,616	23.5

1. These are ten-year averages for fiscal years 2003-2012. Forest Service and BLM harvest volumes are for federal fiscal years ending September 30, while SITLA's harvest volumes corresponds to state fiscal years ending June 30.
2. The BLM harvest volume includes fuelwood and biomass with traditional timber and special forest products. Harvest volume for SITLA and the Forest Service include fuelwood but not biomass. The two were inseparable in the BLM source for FY2011 and 2012, but for the earlier three years where fuelwood was given separately, it was included, and biomass was omitted. Fuelwood and biomass were converted from green tons at 3.4 green tons per thousand board feet (MBF).
3. SITLA's harvest volume was converted from tons at 5 tons per MBF. SITLA's harvest volume, like that of the Forest Service, did not include Christmas trees, native seeds, or special forest products, which collectively were an insignificant share of SITLA's harvest volume.

Sources: U.S. Forest Service, DeBlander et al. (2010), Utah School and Institutional Trust Lands Administration.

Of the timber processed in Utah mills in 2007, 56.4 percent came from National Forests, down from 79.3 percent in 1992 (Table 7.75). The volume of timber harvested from private and tribal lands hardly increased since 1992, but as harvesting on Forest Service lands declined, sawmills' reliance on timber from non-public forests rose from 19.3 percent to 42.2 percent. Much of the timber harvested from public lands is not milled, for example firewood.

Table 7.75
Timber Products Received as Inputs at Utah Mills, Selected Years

Ownership	**1992**	**2002**	**2007**
Forest Service	79.3%	67.3%	56.4%
State	0.6%	4.1%	0.8%
Private and Tribal	19.3%	28.4%	42.2%
Other	0.8%	0.1%	0.6%
Total	100%	100%	100%
Volume (MMBF)	58.8	32.5	27.5

Note: Shares may not add to 100 percent due to rounding. Volume is measured in millions of board feet (MMBF). Timber received as inputs is somewhat lower than the total harvest for these years, 64.7, 41.3, and 30.3 MMBF, respectively, for 1992, 2002, and 2007.

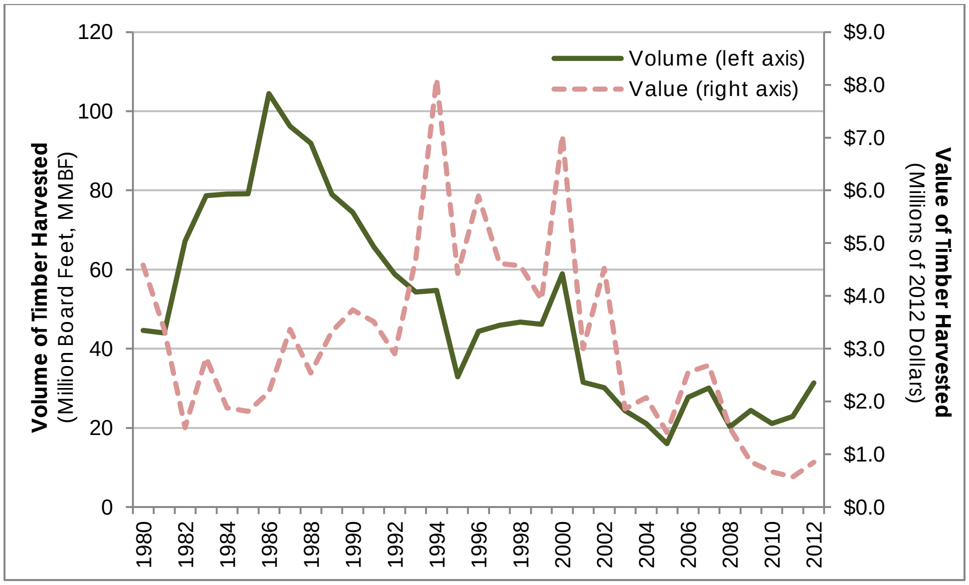
Source: U.S. Forest Service, Hayes et al. (2012).

Forest Service

Most of Utah's standing timber and harvested timber comes from federally managed forests. Figure 7.24 and Table 7.76 show the state's timber harvest volume from Forest Service lands since FY1980. The Forest Service's FY2012 timber harvest value was $853,580. In contrast, BLM forestry revenue was $63,906 that year, and SITLA received $179,738.

Many factors affect the amount of timber companies harvest from Forest Service lands each year. One is market conditions. Since the late 1990s, the market value of Utah timber from national forests has declined, along with the harvest in board feet (Figure 7.27). On the other hand, harvest volumes were unusually high during the mid-1980s when market values were historically low, at least partially due to Forest Service policy emphasizing revenue creation from national forests (Cote 2014). Beetle infestation and wildfire have intensified in Utah in recent decades, damaging timber resources on timberland in the state (McNaughton 2014).

Figure 7.24
Timber Harvested from U.S. Forest Service Land in Utah, FY1980–2012



Source: U.S. Forest Service, Cut and Sold Reports.

Over the past few decades, the Forest Service has offered fewer valuable timber stands for sale due to evolving conservation principles and ecological priorities, with diminished emphasis on commodity production, as well as the need to respond to lawsuits and otherwise comply with the National Environment Policy Act (NEPA), Endangered Species Act, and other regulations (Matson 2013, Hunter 2013).

The USFS timber harvest was valued at $4.6 million in FY1980 and reached as high as $8.1 million in 1994. The FY2012 value of $0.9 million was lower than every year since FY1980 except FY2010 and FY2011.

Bureau of Land Management

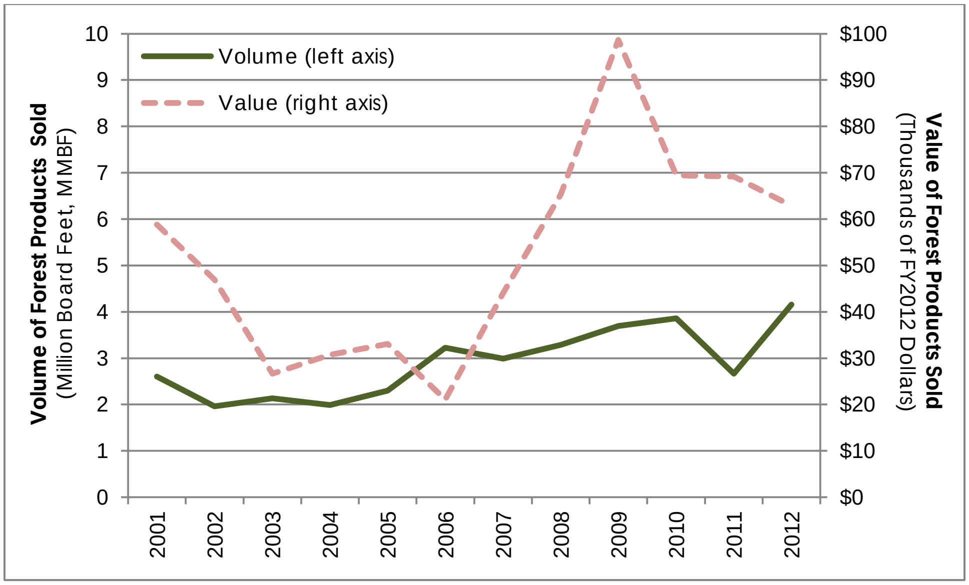
Forestry revenue peaked in FY2009 at $99,661 and averaged $52,241 per year from FY2001 to 2012 in FY2012 dollars (Figure 7.25 and Table 7.77). Timber harvest volumes generally rose during the period, averaging 2.9 MMBF and jumping to 4.1 MMBF in FY2012. During 2001-2012, an average of 53.1 percent of BLM forest product sales were conventional timber or wood products. A little less than half of sales were Christmas trees, seeds, and other non-wood forest products.

Table 7.76
U.S. Forest Service Timber Harvest in Utah, Selected Years, FY1980–2012

Fiscal Year	Volume (MBF)[1]	Value (Thousands)[2]
1980	44,663	$4,587
1985	79,183	$1,818
1990	74,475	$3,736
1995	32,939	$4,425
2000	58,939	$7,045
2003	24,346	$1,866
2004	21,122	$2,076
2005	16,017	$1,412
2006	27,721	$2,553
2007	30,115	$2,690
2008	20,295	$1,493
2009	24,402	$856
2010	21,103	$667
2011	22,865	$573
2012	31,347	$854
Average 2003–12	23,933	$1,504

1. Volume is given in thousand board feet (MBF). The volume of timber includes convertible forest products, including timber for lumber, logs for homes, posts, poles and others that can be measured in board feet. Volumes reported here do not include non-convertible forest products like Christmas trees, tree nuts, pine cones and wildflowers that are measured by count, bushel or weight.
2. These amounts are converted to FY2012 dollars.
Source: U.S. Forest Service, Cut and Sold Reports.

Figure 7.25
Forest Products Sold from BLM land in Utah, FY2001–2012



Source: Bureau of Land Management, Public Land Statistics.

Table 7.77
Forest Products Sold in Utah by BLM, FY2001–2012

Fiscal Year	Wood Product Volume (Thousand Board Feet, MBF)[1]	Forest Product Sales (Thousands of FY2012 Dollars)[2]
2001	2,602	$59
2002	1,960	$47
2003	2,133	$27
2004	1,991	$31
2005	2,303	$33
2006	3,224	$21
2007	2,993	$44
2008	3,288	$65
2009	3,696	$99
2010	3,859	$69
2011	2,667	$69
2012	4,154	$63
Average 2003–12	3,031	$52

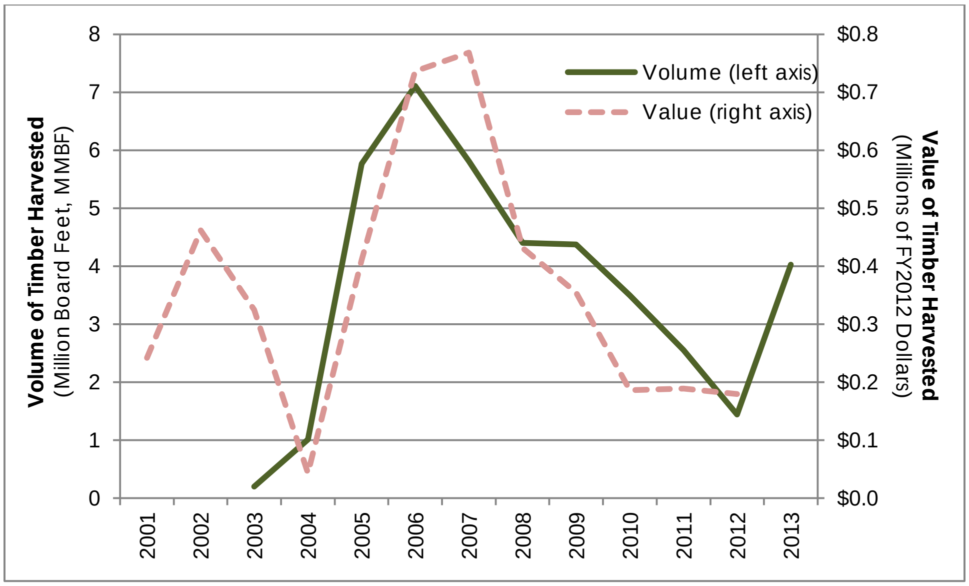
1. Wood products generally include sawtimber, fuelwood, posts, and poles that can be measured in board feet or cubic feet.
2. Besides wood products, BLM forest products also include other wood and non-wood products that are not measured in board feet or cubic feet.
Source: Bureau of Land Management, Public Land Statistics.

Utah School and Institutional Trust Lands Administration

School and Institutional Trust Lands Administration (SITLA) is the institution that conducts timber sales that allow harvesting in forests on Utah's trust lands. SITLA forestry revenue was $179,738 in FY2012, the lowest revenue amount in twelve years with the exception of the $43,190 anomaly in 2004, adjusted for inflation (Figure 7.26 and Table 7.78). For FY2001-2012 average forestry revenue at SITLA was $360,669, in real 2012 dollars, and the highest value was $768,061 in FY2007.

Timber harvest volumes on SITLA lands since 2004 have ranged from 1 to 7 MMBF. The volume harvested follows timber values in rising from low levels in FY2004, remaining high for three years, and then declining through 2012. SITLA timber sales come from Douglas fir, subalpine fir, lodgepole pine, Englemann spruce, and aspen (Wilcox 2014). As of 2014, aspen was the mainstay of SITLA's timber sale offerings (Christy et al. 2014). Four-fifths of the wood harvested is dead or dying, while the remaining fifth is green. From 2013 to 2017, it was expected SITLA sales would consist of 91 percent aspen and 9 percent Douglas-Fir.[192]

Figure 7.26
Timber Harvested from SITLA Trust Lands in Utah, FY2001–2013



Source: Utah School and Institutional Trust Lands Administration

For FY2001 through 2012, SITLA revenues (Table 7.78) from forestry ranged from 2.1 percent to 41.4 percent of the value of Forest Service timber sales (see Table 7.76), averaging 19.2 percent.

[192] "Utah Coordinated Resource Offering Protocol," Mater Ltd., accessed February 2014, www.crop-usa.com/utah/.

Table 7.78
SITLA Timber Harvest, FY2001–2013

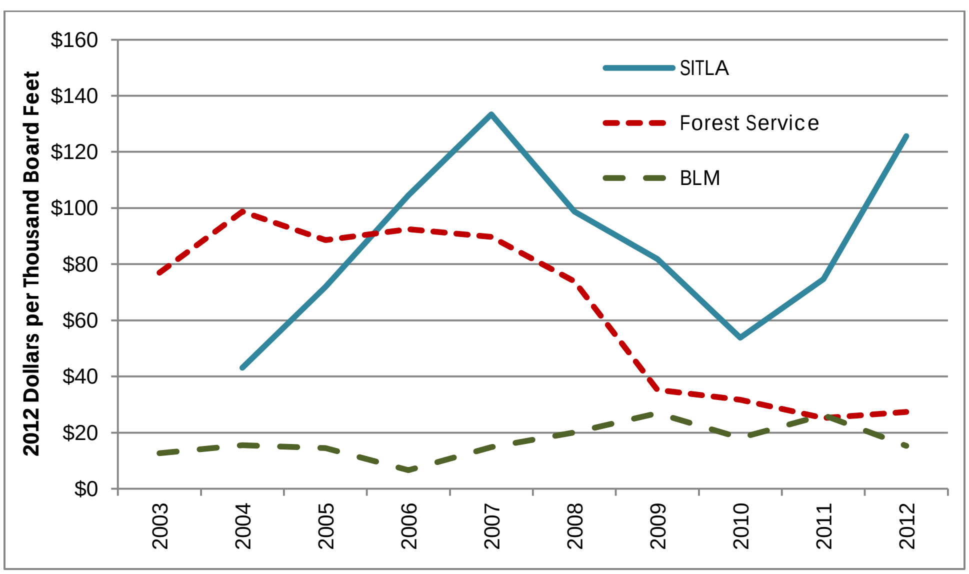
Fiscal Year	Timber Harvest Volume (Thousand Board Feet, MBF)	Forestry Revenue (Thousands of FY2012 Dollars)
2001	--	$242
2002	--	$462
2003	198	$325
2004	1,010	$43
2005	5,768	$411
2006	7,106	$736
2007	5,809	$768
2008	4,404	$431
2009	4,372	$355
2010	3,496	$186
2011	2,555	$189
2012	1,443	$180
2013	4,028	--
Average 2003-12	3,616	$362

Note: Timber harvest amounts per fiscal year were converted from tons to board feet at five tons per MBF.
Source: Utah School and Institutional Trust Lands Administration, Schneider (2013) and Wilcox (2014).

Timber Prices

This section presents implied prices of forest products sold from public lands in Utah. From FY2003 to 2012, timber from National Forests in Utah generally commanded a lower price than timber from SITLA lands, while BLM prices were the lowest of the three. Average prices during this period were $93 per thousand board feet (MBF) on SITLA lands, $63 per MBF on Forest Service lands, and $17 per MBF on BLM lands (Figure 7.27).[193]

Figure 7.27
Price of Timber Harvested from Public Lands in Utah, FY2003–2012



Sources: Utah School & Institutional Trust Lands Administration, Schneider (2013) and Wilcox (2014); U.S. Forest Service, Cut and Sold Reports; Bureau of Land Management, Public Land Statistics.

[193] Revenue and volume data used to calculate prices in Figure 7.27 are for state fiscal years for SITLA and federal fiscal years for the Forest Service and BLM.

SITLA timber prices were quite volatile from FY2004 to 2012, ranging from $43 to $133 per MBF. Forest Service timber prices fell by more than two-thirds from FY2006 to 2012, converging with BLM prices. BLM prices dipped in FY2010 and 2012 but generally were rising from FY2003 to 2012. SITLA and Forest Service prices were deeply affected by the recession starting in 2007. SITLA prices had nearly recovered by FY2012.

One convention SITLA used for pricing timber stands during this period was $50 per MBF for aspen and $60 per MBF for pine and spruce (Wilcox 2014). These prices arose during competitive offerings several years ago and are applied where there are too few interested companies to make competitive bidding plausible. Perhaps due to regulatory simplicity on state lands, SITLA has found its prices tend to be higher than prices for comparable trees elsewhere. These default prices are generally lower than the average annual prices given in Figure 7.27.

Imports and Exports

In 2007, Utah imported 2.3 MMBF in timber products and exported 5.2 MMBF for net exports of 2.9 MMBF, 9.4 percent of the state's harvest that year (Hayes et al. 2012). These exports imply Utah's economy attracted outside dollars paid by sawmills in other states to purchase wood products harvested in Utah. Utah exports in 2007 amounted to 17.1 percent of the total volume of timber harvested in the state, and imports were 8.5 percent of the wood inputs received by Utah lumber mills for processing. By comparison, net exports of timber products were 1.6 MMBF from Arizona and 1.9 MMBF from New Mexico, while Colorado was a net importer at 7.3 MMBF.

Most Utah timber exports are house logs, furniture logs, poles, posts, industrial fuelwood, or fiber logs for erosion control. The state is a net importer of lumber-grade sawlogs suitable for making boards. Specifically, net imports for sawlogs were 1.2 MMBF that year, while net exports were 0.8 MMBF for house logs and 3.2 MMBF for other timber products (Hayes et al. 2012).

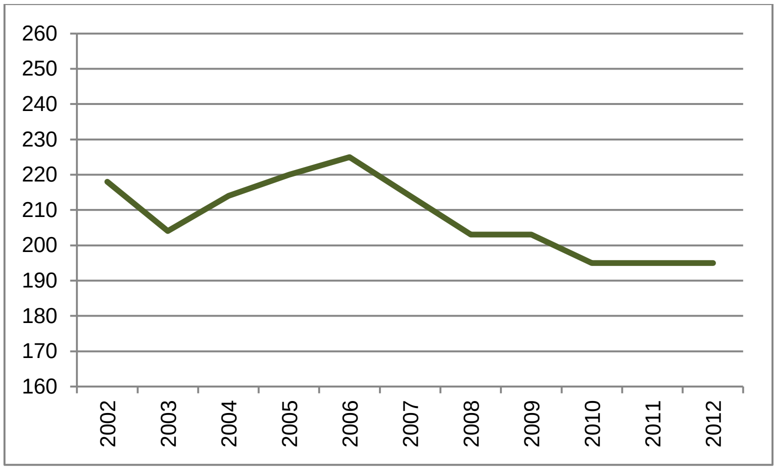
As an example of exports, 6 of 29 operators registered to harvest timber in Utah as of March 2014 had a primary location or sawmill in another state (Zanotti 2014). Individuals and companies required to register also include those involved in reforestation and road construction associated with logging.

One situation that creates timber imports is when Forest Service timber sales in other states are bought and harvested by Utah establishments. This occurs near the state's southern border, for example the northern portion of Kaibab National Forest in Arizona (McNaughton 2014).

7.8.2 Utah's Timber Industry

In 2012, an estimated 195 companies were involved with harvesting or milling timber in Utah, the lowest number in at least 15 years (Figure 7.28). The industry included 21 companies with covered employees in 2012, whereas there had been 29 such companies in 2007, 45 in 2002 and 47 in 1998 (Figure 7.29). Covered employees include virtually all paid employees based on Utah's unemployment insurance requirements. The number of timber companies without employees, e.g. partnerships and sole proprietorships, declined from 192 in 1998 to 174 in 2012 and ranged during the intervening years from a low of 166 in 2003 to a high of 204 in 1999 (Table 7.82).

Figure 7.28
Businesses in Utah's Timber Industry, 2002–2012



Source: U.S. Census, County Business Patterns and Nonemployer Statistics

In recent years, employment in Utah's timber industry probably exceeds 365 people. From 2008 to 2012, employment from timber companies with paid employees averaged 189 people (Table 7.81). For the same five-year period, the state's timber industry included an average of 176 small businesses without employees, which implies at least 176 jobs from nonemployer establishments and at least 365 jobs including companies with employees (Table 7.82).

In the western United States, economists have documented a decline in employment in the industry accompanied by an increase in labor productivity over the past several decades (Haggerty 2014, Kaetzel 2014). In particular, the number of sawmills in the west declined from about 1,000 in the 1970s to about 150 in 2013, while output per sawmill and per worker increased during that period (Andrews 2014, Lehner 2014).

Industry Definition

The timber industry in Utah is here defined to comprise subsectors 113, Forestry and Logging; 1153, Support Activities for Forestry; and 321113, Sawmills, as identified by the North American Industry Classification System (NAICS). With 195 companies, these three sectors are inclusive of most businesses that harvest or mill timber, those involved with the initial extraction of forest products and preliminary processing. These sectors exclude wood product manufactures that make flooring, furniture, and many other finished products from wood. Such manufacturers purchase their wood inputs from many sources in the U.S. and abroad. They do not primarily work in Utah's forests or derive most of their revenue directly from forest resources here. Wholesalers and retailers are also excluded because only a small fraction of their sales are traceable to wood products harvested from Utah forests.

Companies that harvest or mill timber are sometimes classified under NAICS subsectors other than 113, 1153, or 321113 if logging, forestry support, milling, etc. is not their primary business activity. For example, a company that is primarily a retail establishment or wholesaler, such as a hardware store or lumber yard, may mill or log some of its own lumber. Unfortunately, the logging and milling part of its operation would be missed in our analysis since the company is not *primarily* engaged in those activities. Data disclosure limits do not provide access to revenue or employment information on individual companies or for particular products or functions within a company. On the other hand, activity in the three NAICS sectors identified will be overstated by the amount of ancillary business activity outside of forestry, logging, forestry support and sawmills. For example, a logging company belonging to NAICS 113 may provide certain landscaping or construction services under the same business name.

A few timber harvesting and milling companies with employees were found in NAICS subsectors outside of the three included in our industry definition: 444130, hardware stores; 444190, other building material dealers; 481212, nonscheduled chartered freight air transportation; 484110, general freight trucking, local; 484230, specialized freight (except used goods) trucking, long-distance; and 561730, landscaping services.[194] These six subsectors primarily describe business activities not related to harvesting and milling timber, and no more than one company with employees appeared in each subsector.

Business Counts by County

During 2012, at least one timber company with covered employees was found in fourteen counties in Utah (Table 7.79). There were 12 sawmills in 8 counties, 9 forestry support businesses in 6 counties, and 6 forestry and logging businesses in 5 counties.

Table 7.79
Utah Timber Companies with Employees, 2012[1]

County	Forestry and Logging	Support Activities for Forestry	Sawmills	*Total*
Box Elder		1		1
Duchesne			2	2
Garfield			1	1
Grand		1		1
Iron	2		1	3
Morgan	1			1
Salt Lake		3		3
Sanpete	1		1	2
Summit	1		2	3
Uintah	1	1	2	4
Wasatch			1	1
Washington		1		1
Wayne			2	2
Weber		2		2
Total[2]	6	10	12	28

1. This table includes counties with any businesses with covered employees in three NAICS industries: 113, Forestry and Logging; 1153, Support Activities for Forestry; and 321113, Sawmills. Virtually all paid workers except the self-employed and proprietors are covered employees under Utah unemployment insurance laws.
2. The county of one Utah forestry company in Support Activities was not indicated. The total of 28 here is higher than the parallel estimate of 21 businesses by the U.S. Census Bureau (Figure 7.29).
Source: Bureau of Labor Statistics, Quarterly Census of Employment and Wages.

In 2011, the leading counties in Utah for timber-related businesses without employees, nonemployer establishments like proprietorships, were Salt Lake, Utah, and Washington counties, with

[194] Comparable information is not available for Utah companies without employees, nonemployer establishments, that harvest and mill timber but are classified outside of NAICS 113, 1153, and 321113. *Source:* "FirmFind," Utah Department of Workforce Services, accessed March 2014, jobs.utah.gov/jsp/firmfind/welcome.do.

10 or more such businesses each, and Sanpete, Sevier, Uintah, and Davis counties, with more than 5 such businesses each (Table 7.80). Fully 23 of 29 counties have at least one nonemployer company involved in forestry and logging or support activities.

Table 7.80
Utah Timber Nonemployer Establishments, 2011

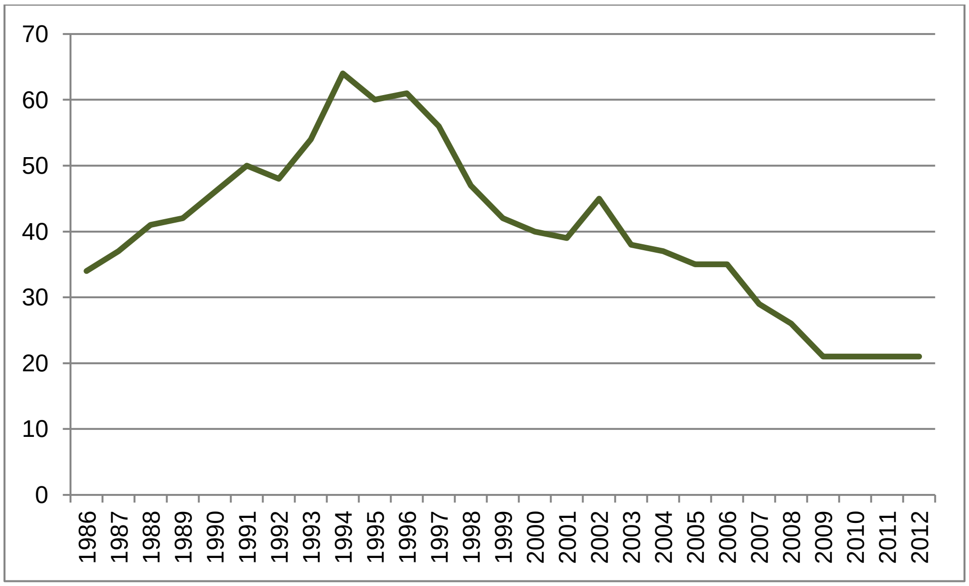
County	Forestry and Logging	Support Activities for Forestry
Beaver	D[2]	4
Box Elder	0	D
Cache	D	D
Carbon	5	D
Daggett	0	0
Davis	D	6
Duchesne	D	0
Emery	0	0
Garfield	D	0
Grand	0	D
Iron	5	D
Juab	0	0
Kane	5	D
Millard	D	0
Morgan	3	D
Piute	0	0
Rich	0	0
Salt Lake	17	14
San Juan	D	D
Sanpete	6	3
Sevier	4	5
Summit	3	D
Tooele	0	D
Uintah	7	D
Utah	9	10
Wasatch	0	0
Washington	4	6
Wayne	4	D
Weber	D	D
Not disclosed (D)[2]	28	26
Statewide	100	74

1. Nonemployer establishments do not include businesses with paid employees, only proprietorships, corporations, and partnerships without employees. The industries covered here are NAICS 113, Forestry and Logging and NAICS 1153, Support Activities for Forestry. No establishments were reported for NAICS 321113, Sawmills.
2. "D" indicates that the number of businesses was low and withheld by the Census Bureau to avoid disclosure. In the Forestry and Logging industry, a "D" represents an average of 3.5 establishments; in the Support Activities industry, a "D" represents an average of 2.0 establishments.
Source: U.S. Census Bureau, Nonemployer Statistics.

Timber Companies with Employees

Of all Utah timber companies with employees, during the period 1986 to 1997, 57.3 percent were sawmills, 34.4 percent were logging companies, and the remaining 8.3 percent were involved with timber tracts, forest nurseries, or forestry services, based on the Standard Industrial Classification (SIC) system (Figure 7.29). For the period 1998 to 2012, 44.1 percent of the businesses with employees were sawmills, 42.1 percent were in Forestry and Logging, and 13.9 percent provided support activities for forestry, based on the North American Industry Classification System (NAICS) that replaced the SIC system.[195]

Figure 7.29
Number of Timber Companies with Employees, Utah 1986–2012



Source: U.S. Census Bureau, County Business Patterns

Clearly, the number of timber-related businesses with covered employees has decreased markedly in Utah since its peak of 64 in 1994 (Figure 7.29). The rate of decline was sharp from 2007 to 2009 but stabilized since albeit with no uptick, even as the economy recovered. Timber prices and timber production in western states also declined since about 2007 and only rebounded weakly during the subsequent economic recovery (Headwaters 2014).

Employment and earnings data are available from the Bureau of Labor Statistics for Utah's timber industry for a few recent years. Table 7.81 represents businesses with paid employees, but not proprietors. In 2012, these businesses were responsible for 136 jobs and $4.2 million in wages, an average of about $30,589 per employee, which is 73.1 percent of Utah's mean wage that

[195] For the years 1986-1997, the number of businesses with employees includes SIC industries 0811, Timber Tracts; 0831, Forest Nurseries and Gathering of Forest Products; 0851, Forestry Services; 2410, Logging; and 2421, Sawmills and Planning Mills, General. For the years 1998-2011, the number of businesses with employees includes NAICS industries 113, Forestry and Logging; 1153, Support Activities for Forestry; and 321113, Sawmills. The number of businesses with paid employees in U.S. Census County Business Patterns (CBP) data is 12 percent to 30 percent lower than corresponding numbers from the Quarterly Census of Employment and Wages (QCEW), Bureau of Labor Statistics, during the years 2004-2011. CBP data is preferred here because it consistently gives Utah business counts for the relevant six-digit NAICS and four-digit SIC industries related to timber for many years before 2004, unlike QCEW data. See Table 7.82 for businesses without employees.

year.[196] This represents a dramatic decline in the number of jobs since 2008 and even since 2011, when employment was 169 and wages were $5.2 million.

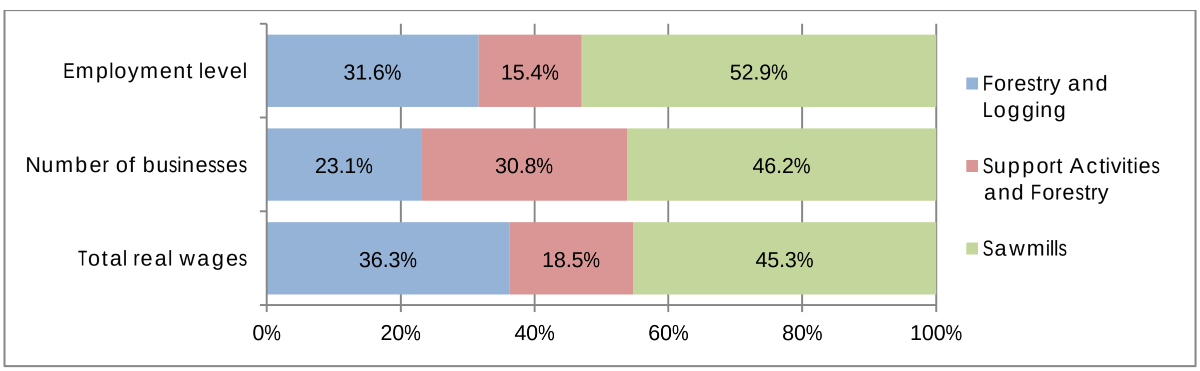
Table 7.81
Utah Timber Companies with Employees, 2008–2012

Year	Employment	Wages (Millions of 2012 Dollars)
2008	269	$7.9
2009	198	$5.5
2010	174	$5.4
2011	169	$5.2
2012	136	$4.2
Average	189	$5.6

This table includes businesses with covered employees in three NAICS industries: 113, Forestry and Logging; 1153, Support Activities for Forestry; and 321113, Sawmills. Virtually all paid workers except the self-employed and proprietors are covered employees under Utah unemployment insurance laws.
Sources: Bureau of Labor Statistics, Quarterly Census of Employment and Wages; Utah Department of Workforce Service, Knold (2014).

Of the three sectors within Utah's primary timber industry, sawmills contribute the most employment and wage earnings, with 52.9 percent of timber industry employment and 45.3 percent of its wage earnings in 2012 (see Figure 7.30).

Figure 7.30
Utah Timber Industry Composition: Businesses with Covered Employees in 2012



Source: Bureau of Labor Statistics, Quarterly Census of Employment & Wages; Utah Dep. of Workforce Services, Knold (2014).

The most common employment level for the three Utah industries shown in Figure 7.30 is fewer than five employees. In Forestry and Logging, the largest company, Thompson Logging from Summit County, has fewer than 50 employees. The largest company in the Support Activities for Forestry industry, Utah Fire Company in Ogden, operates with fewer than 20 employees. Locat-

196 "May 2012 State Occupational Employment and Wages: Utah," Bureau of Labor Statistics, accessed November 3, 2014, www.bls.gov/oes/2012/may/oes_ut.htm.

ed in Garfield, Summit, Duchesne, and Salt Lake counties, the largest sawmills also have fewer than 20 employees.[197]

Timber Companies Without Employees

From 2008 to 2012, businesses without employees produced an average of $6.6 million in sales in the Forestry and Logging industry or in the related forestry support industry, adjusted for inflation to 2012 dollars (Table 7.82). Sales declined 16.4 percent from an average of $7.9 million from 1998 to 2002. The Census reported no sawmill businesses without employees in Utah since 1998.

Table 7.82
Utah Timber Companies without Employees, 1998–2012[1]

Year	Companies	Sales (Millions of 2012 Dollars)
1998	192	$10.6
1999	204	$14.5
2000	200	$12.2
2001	181	$8.8
2002	173	$7.3
2003	166	$5.6
2004	177	$5.6
2005	185	$7.4
2006	190	$8.6
2007	185	$8.2
2008	177	$8.8
2009	182	$6.6
2010	174	$5.9
2011	174	$6.0
2012	174	$7.3

1. This table represents NAICS industries 113, Forestry and Logging, and 1153, Support Activities for Forestry. Companies without paid employees include proprietors, partnerships and corporations.
2. Inflation-adjusted value of sales, shipments, receipts, revenue, or business done in millions of 2012 dollars
Source: U.S. Census Bureau, Nonemployer Statistics

Table 7.82 provides some information about the Utah employment level in timber companies without employees. From 2008 to 2012, the industry included an average of 176 such companies, 88.9 percent of all businesses in the industry. Companies without employees collected $1,000 to $1 million in receipts. The range of receipts suggests different sizes of businesses, each of which may have had more than one worker. For example, a business owner may have harvested lumber from a private forest for firewood on an occasional weekend, while another may have been occupied with a co-owner or unpaid family member year-round harvesting on public lands and milling timber. Thus, these nonemployer establishments represented at least 176 jobs. With 189 jobs in timber companies with employees in Utah, the number of jobs in companies without covered employees may have been more than half of total employment in Utah's timber industry.

[197] Employment ranges of 0, 1-4, 5-9, 10-19 and 20-49 are disclosed. *Source:* "FirmFind," Utah Department of Workforce Services, accessed January 2014, jobs.utah.gov/jsp/firmfind/welcome.do.

Forestry and Logging Sector

For the Forestry and Logging sector alone, NAICS 113—leaving aside Sawmills and Support Activities for Forestry—Utah's average employment from 2008 to 2012 was 43 in 6 businesses with paid employees, not counting jobs supplied by 102 establishments without employees, such as proprietorships. Businesses without employees comprised 94.4 percent of the Forestry and Logging sector. Forestry and Logging includes logging, timber tract operations, forest nurseries, and gathering of forest products. The Sawmills sector will be discussed in the next section. Historical data on the Support Activities for Forestry sector in Utah is sparse.

As shown in Table 7.83, total wages and business counts more than doubled from 1990 to their peak in 2000, when 28 forestry and logging companies paid $3.0 million in wages to 115 employees. There followed a quick decline in all three measures, leading to a plateau that has persisted several years. 2012 wages for Forestry and Logging were $1.5 million, half of peak earnings, distributed among 43 employees, somewhat fewer than the 50 employees in 1990.

Table 7.83
Utah Forestry and Logging Companies with Employees, 1990–2012

Year	Businesses	Employment	Wages (Millions of 2012 Dollars)
1990	12	50	$1.2
1991	13	36	$0.9
1992	12	30	$0.8
1993	12	39	$1.3
1994	18	72	$1.9
1995	24	71	$1.4
1996	27	84	$1.8
1997	25	109	$2.8
1998	24	90	$2.4
1999	26	101	$2.7
2000	28	115	$3.0
2001	22	90	$2.3
2002	18	73	$1.9
2003	15	55	$1.3
2004	13	44	$1.0
2005	12	46	$1.0
2006	12	42	$1.2
2007	11	46	$1.6
2008	6	49	$1.7
2009	6	38	$1.2
2010	6	42	$1.4
2011	6	43	$1.5
2012	6	43	$1.5

This table represents NAICS industry 113, Forestry and Logging. The self-employed, proprietors, and companies without employees are not included among companies with covered employees.

Source: Bureau of Labor Statistics, Quarterly Census of Employment and Wages.

In Utah's Forestry and Logging sector, the average number of employees per company, counting those with any employees, rose from 3.5 in the 1990s to 4.5 the following decade. During the period 2010 to 2012, each company employed an average of 7.1 people, reflecting continued concentration in an industry that remained mostly small-business. In the broader timber industry, including support activities and sawmills, there were 5.6 employees per company from 2010 to 2012, up from 3.5 in the 1990s.

Sawmills

Due largely to the variability and decrease in timber harvest offerings on public lands, the Sawmill sector in Utah declined over the past several decades (DeBlander et al. 2010, p. 83). This transition involved downsizing, closures, and operation well below capacity. In many areas in Utah, the timber industry disappeared, reducing options for forest managers (Blackham 2013). In 2002, the timber-processing capacity of Utah sawmills was an estimated 78.5 MMBF, and capacity utilization was 42 percent or 32.6 MMBF (DeBlander et al. 2010). The state's second largest mill moved outside the state the next year, and by 2007, timber-processing capacity was only 60.1 MMBF with capacity utilization of 44 percent or 26.4 MMBF, accounting for changes in the level of mill inventories (Hayes et al. 2012). Utah's 2007 utilization percentage was low compared to those of New Mexico, Arizona, and Colorado.

Representatives of state agencies with expertise in forestry—Utah's School and Institutional Trust Lands Administration (SITLA) and Division of Forestry, Fire and State Lands (FFSL)—describe the lack of sawmills as a key factor limiting federal, state, and private landowners' ability to manage their forests. For example, selective removals to improve forest health in the face of beetle infestation and commercial harvesting to reduce hazardous fuel loads in overgrown forests can be cost-prohibitive without sawmills operating at an efficient scale in the vicinity of forests with treatment needs (McNaughton 2014). The state has often had difficulty finding enough Utah companies to harvest timber stands its foresters recommend for removal (Christy et al. 2014). The inconsistency of timber sales, particularly from federally-managed forests, is the reason for the scarcity of modest-sized sawmills and the absence of large sawmills in Utah (Cottam 2014).

Table 7.84 identifies the number of sawmills in 2002 that processed trees into intermediate or final goods in Utah. The counties with more than two of these facilities were Uintah (6), Cache (4), Duchesne (4), Salt Lake (4), Summit (4), Wasatch (4), Garfield (3), and Wayne (3) counties.

Table 7.84
Primary Wood Products Facilities, Utah 2002
(Number of Sawmills by Principal Product)

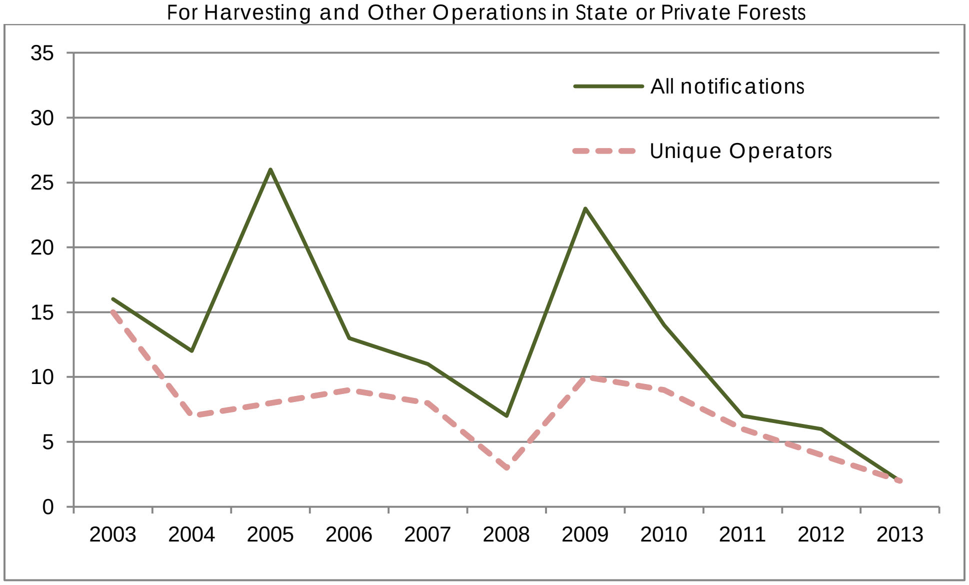
Year	Lumber	Logs[1]	Other[2]	Total
1992	34	13	4	51
2002	23	14	12	49

1. Logs include house logs as well as log homes.
2. Other includes log furniture, posts, poles, and bark products.
Sources: U.S. Forest Service, DeBlander et al. (2010).

State and Private Lands

The number of intended timber harvesting operations on state and private lands in Utah generally declined from 2003 to 2013 (Figure 7.31). From 2003 to 2008, an average of 14.2 operations were reported by individuals or companies, compared to 10.4 operations per year for the following five years. The number of unique operators also declined during this period, from an average of 8.3 for the first period to 6.2 for 2009 to 2013. These measures are for timber industry activity outside of federal lands and are particularly valuable for documenting activity in private forests, for which annual data like that presented in Section 7.8.1, State and Federal Lands, is lacking.

Figure 7.31
Notifications from Forest Operators in Utah, 2003–2013
For Harvesting and Other Operations in State or Private Forests



Source: Utah Division of Forestry, Fire and State Lands, Zanotti (2014)

Utah's Forest Practices Act of 2001 requires that FFSL be sent notification at least 30 days before "forest practices" are carried out on state or private lands in Utah.[198] Forest practices include timber harvesting and several related activities, including reforestation, disposal of logging slash, and road construction to access trees.[199] Notifications include precise locations, but the acreage affected and the volume of timber to be harvested are not reported by operators. Harvesting operations may not occur in the same year as notifications are submitted.

Table 7.85 provides counts for notifications of intent to conduct forest practices received by FFSL since Utah began tracking timber harvesting in this way, with more data points than Figure 7.31. The number of notifications received the first year was 3.6 times the annual average for the following ten years. Presumably, notifications were submitted in 2002 for ongoing timber harvesting operations that may have begun previously, in addition to notifications for new projects initiated during 2002.

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198 Utah Code 65A-8a-101

199 Individuals or companies are exempt from the notification requirement in several circumstances: when cutting Christmas trees or tree species not among fifteen named "commercial species"; when clearing land in the wild-urban interface for fire hazard reduction; when harvesting from less than five contiguous acres on another's property or less than ten contiguous acres on one's own property; and when operating solely on federal lands.

Table 7.85
Notifications from Forest Operators by Type, 2002–2013[1]

Year	Private	State	Total	Unique Operators
2002	42	3	45	17
2003	14	2	16	15
2004	6	6	12	7
2005	19	7	26	8
2006	9	4	13	9
2007	9	2	11	8
2008	5	2	7	3
2009	19	4	23	10
2010	10	4	14	9
2011	5	2	7	6
2012	5	1	6	4
2013	2	0	2	2
Total	145	37	182	61

1. Notification is required at least 30 days before harvesting timber on five or more contiguous acres of forest in Utah and before carrying out associated activities, such as site preparation.
2. "State" refers to notifications for lands administered by the Utah School and Institutional Trust Lands Administration (SITLA).
3. "Unique operators" are the number of individuals or companies submitting at least one notification.
Source: Utah Div. of Forestry, Fire & State Lands, Zanotti (2014)

FFSL notification records indicate the county and precise location where forest operators intended to harvest or perform other services. These are aggregated into multi-county regions in Table 7.86. Measured by the number of forest practices notifications for private and state lands, the most active region is the Southeast area, which includes Carbon, Emery, Grand, and San Juan counties, collectively accounting for 43 percent of all notifications from 2003 to 2013. The least active region is Bear River, which encompasses Utah's four northernmost counties.

Table 7.86
Notifications from forest operators by region, 2003–2013

Area	Number	Percent
Bear River	12	9%
Wasatch Front	5	4%
Northeast	23	17%
Central	22	16%
Southeast	59	43%
Southwest	16	12%
Total	137	100%

Note: The Bear River area includes Box Elder, Cache, Rich, and Weber counties; the Wasatch Front includes Davis, Morgan, Salt Lake, Tooele, and Utah counties; the Northeast area includes Daggett, Duchesne, Summit, Uintah, and Wasatch counties; the Central area includes Juab, Millard, Piute, Sanpete, Sevier, and Wayne counties; the Southeast area includes Carbon, Emery, Grand, and San Juan counties; the Southwest area includes Beaver, Garfield, Iron, Kane, and Washington counties.
Source: Utah Division of Forestry, Fire and State Lands, Zanotti (2014)

7.8.3 Timber and Land Transfer

In the event of land transfer under H.B. 148, state agencies in Utah would have more responsibility for timber harvesting and forest management. At least initially, transfer of National Forests in Utah to the state would most likely result in the state losing money (Cottam 2014). With targeted investments over time—e.g. inventory, treatments, and rehabilitation—these forests can become a financial resource instead of a liability without compromising the ecosystem, rather by supporting it. A viable forest program and resilient forests can certainly be developed in the long run, though neither would be available at first. Many forested areas in Utah are in need of active forest management and extensive restoration to achieve significant increases over current harvests.

Currently, there are only a few relatively small sawmills in Utah and fewer than 30 businesses with employees in the timber industry. Industry recovery would be aided if timber sales from public lands were consistently announced five to ten years in advance to facilitate business planning and investment. Along with on-the-ground action to improve forest health, business development efforts would help expand Utah's timber industry from its current toehold.

A sustainable harvest assessment is needed to analyze potential timber activity under new management of Forest Service lands. Resource management plans the Forest Service prepared in the 1980s reflect harvest levels that are unrealistically high given current forest conditions and poor markets. These have been updated for only 27.9 percent of National Forest acres in Utah (U.S. Forest Service 2012).[200]

Land transfer effects on forests and timber resources in Utah are also discussed in Chapter 9 on wildfire and in Chapter 2 sections addressing BLM, the Forest Service, and Utah's FFSL.

7.8.4 Timber Industry Economic Impacts

The timber industry is here defined to comprise logging (NAICS 113300), support activities for forestry (NAICS 115300), and sawmills (NAICS 321113). In 2012 there were a total of 136 full- and part-time timber industry jobs that received almost $4.2 million in wages (Table 7.87). There were also an additional 174 "nonemployer" establishments with nearly $7.3 million in sales (Table 7.88). These are sole proprietorships, partnerships and corporations with no employees. Assuming that partnerships consist of two people, these establishments accounted for an estimated 188 full- and part-time jobs. Using data from the industry input-output accounts maintained by the Bureau of Economic Analysis, we estimated the earnings[201] received by these jobs in 2012 to be $2.9 million (Table 7.89). All told, Utah's timber industry in 2012 consisted of approximately 324 full- and part-time jobs with about $7.4 million in earnings[202] (Table 7.90).

[200] Of 8.2 million acres of National Forests in Utah, 2.3 million acres or 27.9% have forest plans revised since 1986.

[201] The I-O accounts provide data on compensation paid to employees by industry. This differs slightly from wages, which are reported by the Bureau of Labor Statistics. Compensation consists of wages and salaries plus employer contributions for employee pension and insurance funds and employer contributions for government social insurance. We assumed that compensation paid to employees, as a share of total output (sales), is what the sole proprietors and partners of nonemployer establishments paid themselves as "earnings."

[202] The covered wages reported in Table 7.90 were increased by 7 to 8 percent to account for employer contributions for health insurance, which are part of the definition of earnings used by the RIMS II economic impact model.

Table 7.87
Utah Timber Industry Businesses with Covered Employees, 2012 Wages and Employment

Sector	Wages	Employment
Logging (NAICS 1133)	$1,508,265	43
Support Activities for Forestry (NAICS 1153)	$767,903	21
Sawmills (NAICS 321113)	$1,883,948	72
Total	$4,160,116	136

Note: Virtually all paid workers except the self-employed and proprietors are covered employees under Utah unemployment insurance laws.

Source: Bureau of Labor Statistics, Quarterly Census of Employment and Wages; Utah Department of Workforce Services, Knold (2014).

Table 7.88
Utah Timber Industry Nonemployer Establishments, 2012 Sales

Sector	Sales	Establishments
Logging (NAICS 1133)	$4,086,000	106
Support Activities for Forestry (NAICS 1153)	$3,176,000	68
Total	$7,262,000	174

Note: Nonemployer establishments include sole proprietorships, partnerships and corporations. There is no Utah data for NAICS 321113 (Sawmills).

Source: U.S. Census Bureau, Nonemployer Statistics.

Table 7.89
Utah Timber Industry Nonemployer Establishments, 2012 Estimated Earnings and Employment

Sector	Earnings	Employment
Logging (NAICS 1133)	$1,085,516	111
Support Activities for Forestry (NAICS 1153)	$1,813,888	77
Total	$2,899,404	188

Source: BEBR analysis of data from the U.S. Census Bureau, Nonemployer Statistics.

The total economic impacts of the timber industry in Utah in 2012 (measured in inflation-adjusted 2013 dollars) consisted of $14.7 million in earnings, 537 jobs, and $21.0 million in value added or gross state product (GSP) (Table 7.90). This was composed of direct earnings and employment of $7.4 million and 324 jobs, respectively, and $11.1 million in direct value added, plus an additional $7.3 million in earnings, 213 jobs and $10.0 million in GSP that were supported by the timber industry. Estimated state and county fiscal impacts, in the form of income and sales tax revenues, amounted to almost $1.1 million: $989,138 for the state and $84,972 for the counties. These were calculated from both direct earnings and indirect and induced earnings.

Table 7.90
Economic Impacts of the Timber Industry in Utah, 2012
(2013 Dollars)

Total Timber Industry Impacts

Type	Earnings	Jobs	Value Added
Direct	$7,418,033	324	$11,073,653
Indirect & Induced	$7,305,336	213	$9,985,963
Total	$14,723,368	537	$21,059,616
	State	**Local**	**Total**
Fiscal Impacts	$989,138	$84,972	$1,074,110

Logging Impacts

Type	Earnings	Jobs	Value Added
Direct	$2,711,236	154	$4,634,329
Indirect & Induced	$2,452,042	92	$1,776,114
Total	$5,163,278	246	$6,410,444
	State	**Local**	**Total**
Fiscal Impacts	$346,877	$29,798	$376,675

Support Activities for Forestry Impacts

Type	Earnings	Jobs	Value Added
Direct	$2,641,590	98	$2,904,105
Indirect & Induced	$1,943,418	34	$2,082,582
Total	$4,585,008	132	$4,986,687
	State	**Local**	**Total**
Fiscal Impacts	$308,028	$26,461	$334,489

Sawmills Impacts

Type	Earnings	Jobs	Value Added
Direct	$2,065,207	72	$3,535,218
Indirect & Induced	$2,909,876	87	$6,127,267
Total	$4,975,083	159	$9,662,485
	State	**Local**	**Total**
Fiscal Impacts	$334,234	$28,712	$362,946

Source: BEBR analysis of data from the Utah Department of Workforce Services and U.S. Census Bureau, using 2002/2010 RIMS II multipliers.

Of the timber industry's component sectors, sawmills provided the largest indirect and induced earnings and gross state product impacts, $2.9 million and $6.1 million, respectively, while the logging sector supported the most indirect and induced jobs with 92. The logging sector also produced the largest fiscal impacts, at an estimated $346,877 in state revenue and $29,798 in county revenues.

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8 Utah's Natural Resources[203]

The state of Utah is endowed with an abundance of natural resources. It contains significant supplies of oil, natural gas, coal, uranium, and oil shale and oil sands; base metals such as copper, beryllium, magnesium and molybdenum; and industrial minerals such as potash, salt, magnesium chloride and gilsonite. Renewable resources in Utah include geothermal, wind and solar energy and timber.

As of 2012 proved reserves of oil and natural gas in Utah stood at 613 million barrels of crude oil, 7.8 trillion cubic feet of natural gas, and 268 million barrels of natural gas liquids. As of 2013 there were an estimated 14.9 billion tons of recoverable coal remaining in the state. In addition, Utah hosts an estimated 1.3 trillion barrels of oil contained in the oil shale of the Green River Formation in the Uinta Basin (Johnson et al. 2010). Of this, approximately 77 billion barrels could be considered as a potential economic resource (Vanden Berg 2008).

Total energy production in 2013 was valued at $5.2 billion, including almost $3.0 billion from crude oil production, $1.7 billion from natural gas production, and nearly $0.6 billion from coal production. In addition, $423.6 million of natural gas liquids were produced.

Nonfuel mineral production was valued at $3.7 billion in 2012, including $2.1 billion from base metal production, $1.2 billion from industrial mineral production, and $0.4 billion from precious metal production. In 2012, copper was the largest contributor to the value of nonfuel minerals in Utah, having an estimated value of $1.4 billion, mostly produced from Rio Tinto's Bingham Canyon mine. The largest overall contributors to the value of industrial mineral production in Utah during 2012 were the brine-derived products potash, salt and magnesium chloride, having a combined estimated value of $421 million. Utah remains the only state in the nation to produce magnesium metal, beryllium concentrate and gilsonite.

The Utah Renewable Energy Zones Task Force has identified an estimated 24.0 Gigawatts of potential electricity generation from geothermal, solar and wind sources. These are located in 27 zones defined to provide a sufficient concentration of generation potential to justify the construction of the necessary transmission lines.

Utah has approximately 3.8 million acres of timberland, though it will take a major change in forest management, significant infrastructure investments, and several years of remediation to get the state's forests to the point where they could be profitably harvested on a commercial scale. In fiscal year 2012 there were a reported 39.5 million board feet of timber harvested from federal and state lands in Utah. In 2007, the most recent year for which data are available, Utah sawmills received 11.6 million board feet in harvested timber from private and tribal lands, which represented 42.2 percent of the total received by mills that year.

[203] The sections on oil and gas, coal, uranium, base and precious metals, and industrial minerals are reproduced from the Utah Geological Survey's *Utah's Extractive Resource Industries 2012* (Boden et al. 2013). Data were updated with 2013 values where they were available. As we were wrapping up this study, UGS released *Utah's Extractive Resource Industries 2013*; it is available online at geology.utah.gov/online/c/c-118.pdf.

8.1 NONRENEWABLE RESOURCES

8.1.1 Crude Oil and Natural Gas

Reserves

As of 2012 proved reserves[204] of oil and natural gas in Utah stood at 613 million barrels (bbls) of crude oil, 7.8 trillion cubic feet (TCF) of natural gas, and 268 million bbls of natural gas liquids[205] (Figure 8.1 and Table 8.1). Between 1960 and 2005 crude oil reserves in Utah were relatively stable, fluctuating between 166 million and 284 million bbls. However, in 2006 reserves began to increase rapidly, with only a brief dip from 2007 to 2008, to reach over 600 million bbls in 2012, with no signs of slowing. Natural gas reserves[206] declined from 2.0 TCF in 1961 to 675 billion cubic feet in 1979. They then rose back to almost 2.1 TCF in 1981 and remained at about this level through 1998. Since 1999 natural gas reserves have grown rapidly, albeit with a 24 percent stumble between 2001 and 2003, peaking at 8.1 TCF in 2011. Natural gas liquids are hydrocarbons such as propane, ethane and butane that are extracted from the natural gas production stream in natural gas processing plants.[207] Proved reserves of natural gas liquids hovered around 50 million bbls between 1960 and 1979. They began to rise rapidly in 1980, peaking at 335 million bbls in 1988. Reserves then declined to 89 million bbls in 2006. Since then, proved reserves of natural liquids have grown to 268 million bbls. Proved reserves of all three resources more than doubled between 2003 and 2012, with crude oil reserves growing by 177 percent, natural gas reserves increasing by 115 percent, and natural gas liquids growing by 113 percent (Table 8.1).

Table 8.1
Crude Oil and Natural Gas Proved
Reserves in Utah, 2003–2012

Year	Crude Oil (000 bbls)	Natural Gas (MMCF)	Natural Gas Liquids (000 bbls)
2003	221,000	3,621,694	125,720
2004	215,000	3,947,730	111,240
2005	256,000	4,358,894	96,690
2006	334,000	5,208,392	88,700
2007	355,000	6,460,995	108,000
2008	286,000	6,712,995	116,000
2009	398,000	7,410,707	206,000
2010	449,000	7,147,769	201,000
2011	504,000	8,100,228	274,000
2012	613,000	7,779,530	268,000
Change	177.4%	114.8%	113.2%

204 Proved reserves are estimated quantities of energy sources that are demonstrated to exist with reasonable certainty on the basis of geologic and engineering data.

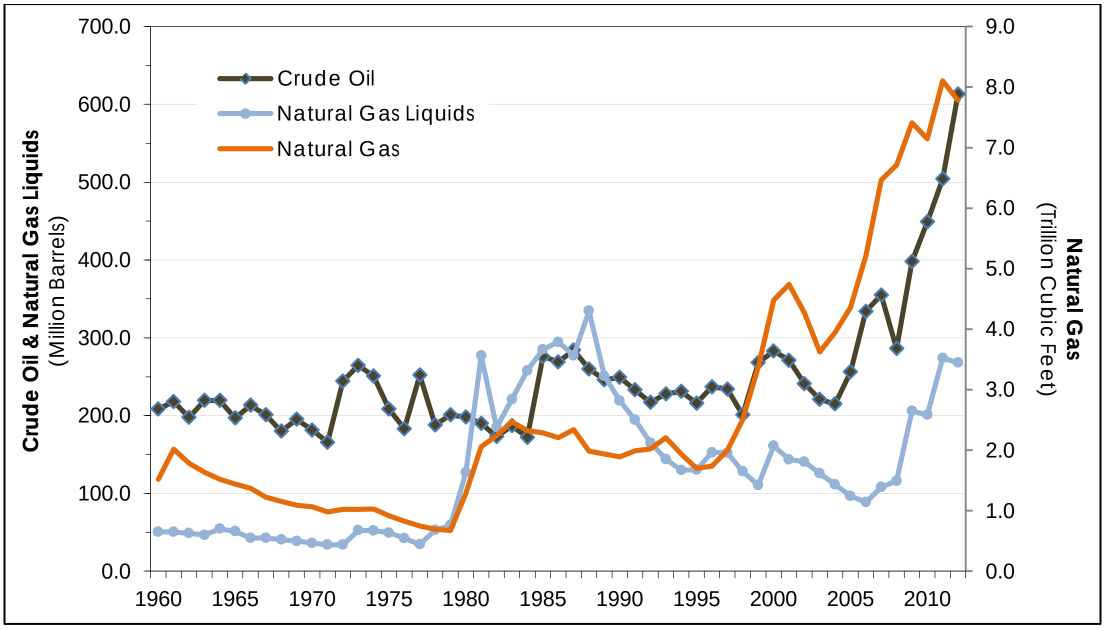
205 Natural gas liquids are those hydrocarbons in natural gas which are separated from the gas through the processes of absorption, condensation, adsorption, or other methods in gas processing or cycling plants. Generally such liquids consist of propane and heavier hydrocarbons and are commonly referred to as condensate, natural gasoline, or liquefied petroleum gases. (www.eia.gov/dnav/ng/TblDefs/ng_enr_ngl_tbldef2.asp)

206 Natural gas reserves comprise nonassociated and associated-dissolved reserves plus net withdrawals from storage.

207 U.S. Energy Information Administration, "What are natural gas liquids and how are they used?"; www.eia.gov/todayinenergy/detail.cfm?id=5930, accessed 6/20/2014.

Note: bbls = barrels, MMCF = million cubic feet
Source: Utah Geological Survey, Utah Energy and Mineral Statistics, geology.utah.gov/emp/energydata.

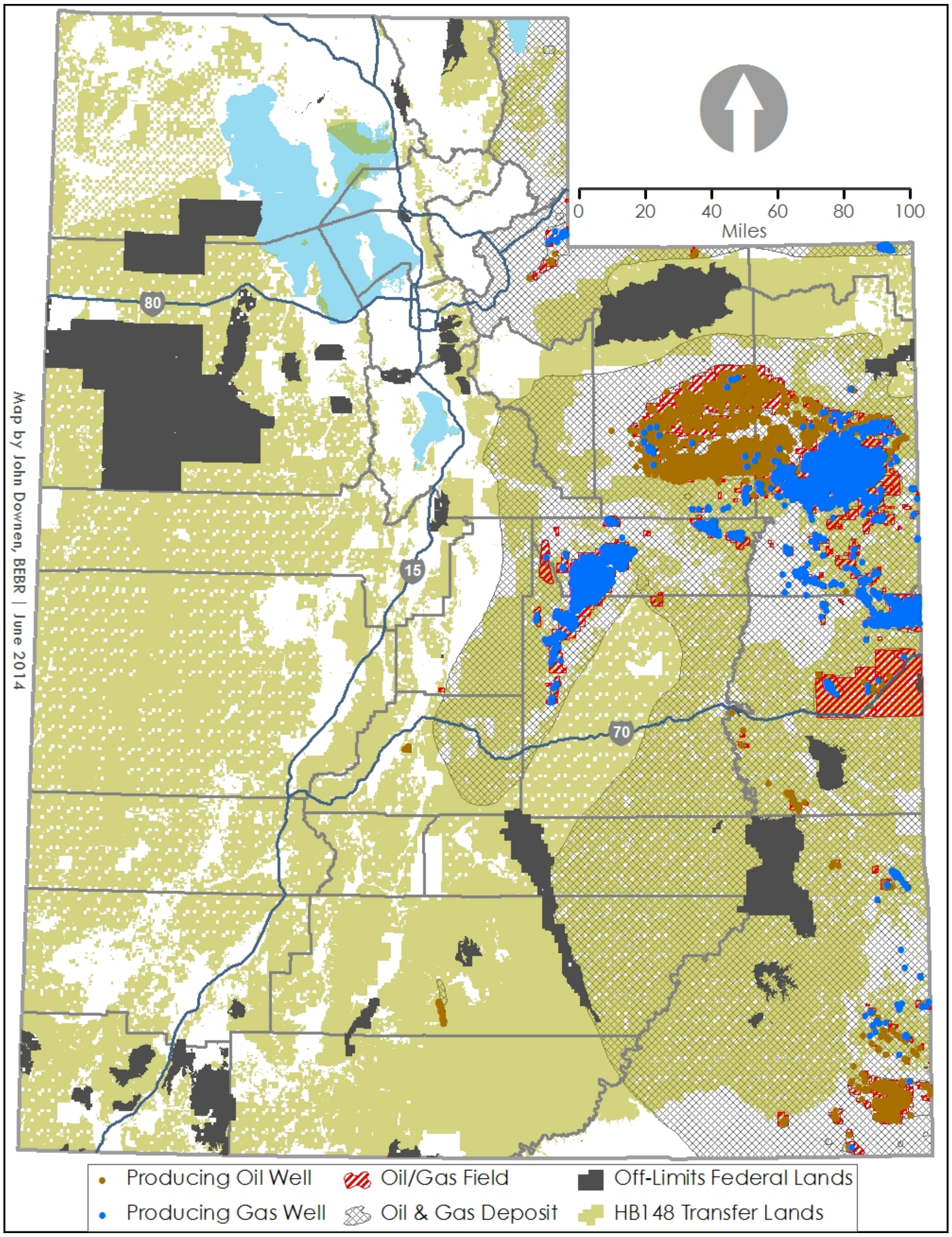
Figure 8.1
Proved Reserves of Crude Oil and Natural Gas in Utah, 1960–2012



Source: Utah Geological Survey, Utah Energy and Mineral Statistics, geology.utah.gov/emp/energydata.

Most of Utah's oil and gas resources are located in the eastern half of the state, with much of the current production concentrated in Duchesne and Uintah, Carbon and Emery, Grand and San Juan counties. As shown in Figure 8.2, federal lands overlay a significant portion of the state's oil and gas deposits. With the transfer of much of these lands to the state, additional areas may be opened to oil and gas exploration and development to which access is currently restricted by the BLM (see the Chapter 13 for more details).

Figure 8.2
Oil and Gas Resources and Federal Land in Utah



Note: "Off-Limits Federal Lands" comprise designated wilderness areas, national parks, Golden Spike National Historic Site, national monuments other than Grand Staircase–Escalante, and Department of Defense military lands.
Source: State of Utah, SGID.

Production and Values

The most current statistical data on oil and gas can be found on the Division of Oil and Gas website at oilgas.ogm.utah.gov/Statistics/Statistics.cfm. At an estimated value of almost $4.7 billion, oil and gas production was the largest contributor to the total value of fuel commodities produced in Utah during 2013, with 34.9 million bbls of oil and 470.6 billion cubic feet (BCF) of gas produced from Utah's oil and gas fields. Oil and gas constituted 89 percent of Utah's total fuel production value in 2013. Oil and gas values increased about $847 million (22 percent) in

2013 compared with 2012. Both the volume and value of oil were up, and the value of gas was up due solely to a 35 percent increase in the average annual price—gas production actually declined by 20.3 BCF (4 percent). Utah's nominal oil price rose 57 percent between 2005 and 2013, while production doubled; during that same period the nominal natural gas price decreased by 48 percent, while marketed gas production rose by 54 percent. Thus, gas and oil are following different market trends with oil production following price upward, but gas production increasing in spite of falling prices. Utah's 2013 oil and gas production came from 12,420 producing wells (5,059 oil wells and 7,361 gas wells), an increase from the 11,124 producing wells in 2012 (4,253 oil and 6,871 gas).

Oil's contributions were the largest to the total value of fuel production in Utah in 2013, with a value of almost $3.0 billion, about $463 million (19 percent) more than in 2012. Duchesne, Uintah, San Juan, and Sevier counties, in decreasing order of production, were the four largest oil-producing counties in Utah in 2013, and when combined, contributed about 96 percent of the total state production volume. The five largest producing oil fields in 2013, Monument Butte (Duchesne and Uintah), Altamont (Duchesne), Greater Aneth (San Juan), Bluebell (Duchesne and Uintah), and North Myton Bench (Duchesne), accounted for about 54 percent of Utah's total oil production. About 36 percent of the oil produced in Utah in 2013 (12.4 million bbls) came from federal leases.

Gas contributed the second-largest share of the overall value of fuel commodities produced in Utah during 2013, with an estimated value of $1.7 billion, a $384 million (29 percent) increase from 2012. Uintah, Carbon, Duchesne, and Emery counties, in decreasing order of production, were the four largest gas-producing counties in Utah in 2013, and when combined, contributed 96 percent of the total state gas production volume. The five largest producing gas fields in 2013, Natural Buttes (Uintah), Drunkards Wash (Carbon), Peters Point (Carbon), Nine Mile Canyon (Carbon), and Red Wash (Uintah), accounted for 74 percent of the total gas production, but Natural Buttes alone accounted for about 58 percent of Utah's 2013 gas production. More than half (56 percent, 264 BCF) of the natural gas produced in 2013 came from federal leases.

Exploration and Development Activity

Utah experienced a decrease in oil and gas exploration and development activity in 2013, and, in comparison with 2012, the number of wells permitted declined 23 percent from 2,105 to 1,611, and the number of wells started (spudded) decreased 10 percent from 1,107 to 997. The county with the most oil and gas exploration and development activity was Uintah with 737 new well permits and 524 well spuds; the second most active was Duchesne with 794 new well permits and 443 well spuds; and the third most active was San Juan with 50 new well permits and 16 well spuds. These top three counties accounted for about 98 percent of the new well permits and well spuds in Utah in 2013. The 983 new oil and gas wells completed during 2013 were a decrease from the 1,076 completed in 2012. The new oil and gas wells completed in 2013 consist of 730 new wells within established field boundaries, 136 wells drilled outside of an existing field boundary with the intent of extending the field boundary, and 117 wildcat wells drilled in unproven areas. Of the 983 new wells, 673 (68 percent) were oil wells, 291 (30 percent) were gas wells, and 7 (1 percent) were service wells (injection or disposal wells). Not all of the 983 new wells drilled in 2013 were productive and 11 (1 percent) were plugged and abandoned. The ratio of new oil wells to new gas wells drilled has increased in the past few years in response to the high oil prices and depressed gas prices, and this trend will continue until gas prices recover to a more attractive level.

8.1.2 Coal

Reserves

As of 2013, the most recent year for which coal reserves data are available, there were an estimated 14.9 billion tons[208] of recoverable coal remaining in the state (Table 8.2). This does not take into account economic or land use constraints. In some fields this was limited to coal seams with a minimum height of four feet and not more than 3,000 feet of overburden. Overall, ownership of the surface land above this coal lies 73 percent with the federal government, 22 percent with private landowners, and 5 percent with the state government (Table 8.2 and Figure 8.3). Mineral ownership of the coal is 80 percent federal, 13 percent private and 6 percent state. These ownership shares vary by coal field. The highest federal ownership is the Kaiparowits field under the Grand Staircase–Escalante National Monument in Kane and Garfield counties; 99 percent of both the surface and minerals are owned by the federal government. In contrast, just 20 percent of the surface and 59 percent of the minerals are federally owned at the Kolob coal field, in Kane and Iron counties.

Table 8.2
Utah Coal Resources by Landownership, 2013
(Million Tons)

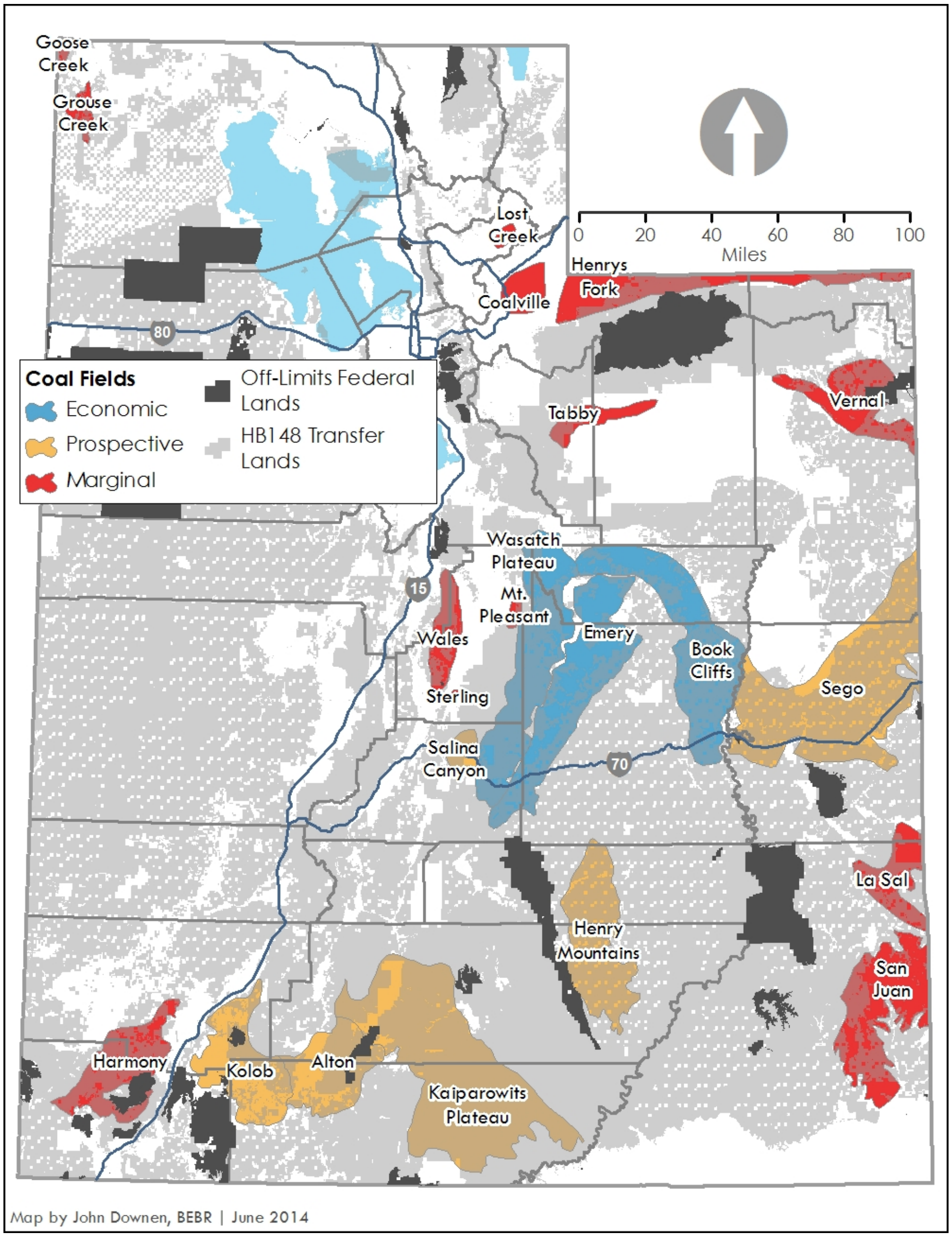
Coal Field	Original Principal Resource¹	Remaining Estimated Recoverable Resource²	Surface Ownership			Mineral Ownership		
			Federal	State	Private	Federal	State	Private
Kaiparowits	22,740.0	9,095.9	99%	1%	0%	99%	1%	0%
Wasatch Plateau	6,378.9	1,216.7	75%	1%	24%	78%	3%	19%
Alton	2,155.0	1,054.0	75%	2%	23%	81%	4%	15%
Kolob	2,014.3	805.0	20%	7%	73%	59%	13%	28%
Emery	2,336.0	801.0	68%	9%	23%	70%	11%	19%
Book Cliffs	3,527.3	657.3	61%	9%	30%	79%	11%	10%
Henry Mountains	925.5	484.7	88%	10%	2%	88%	11%	1%
Sego	1,144.0	340.5	85%	11%	4%	86%	11%	3%
Salina Canyon	692.7	207.3	68%	0%	32%	79%	0%	21%
Others	599.2	174.7	72%	6%	22%	80%	5%	15%
Mt. Pleasant	249.1	99.6	82%	1%	17%	87%	1%	12%
Wales	12.2	2.9	78%	4%	18%	79%	4%	17%
Total	42,774.2	14,939.6	73%	5%	22%	80%	6%	13%

1 Total coal resource with no economic, land use, or geologic constraints.
2 For Wasatch Plateau, Alton, Emery, Book Cliffs, and Henry Mountains; resources were constrained by a seam height minimum of four feet, with no more than 3000 feet of cover. For the remaining fields, resources were constrained by an estimated resource factor ranging from 30 percent to 40 percent of principal resources. Estimated recoverable resources do not take into account economic or land use constraints.

Source: Utah Geological Survey, Utah Energy and Mineral Statistics, Table 2.5; available at geology.utah.gov/emp/energydata/coaldata.htm.

208 The standard American 2,000-pound ton, also called the "short ton," is used throughout.

Figure 8.3
Coal Fields and Federal Transfer Lands

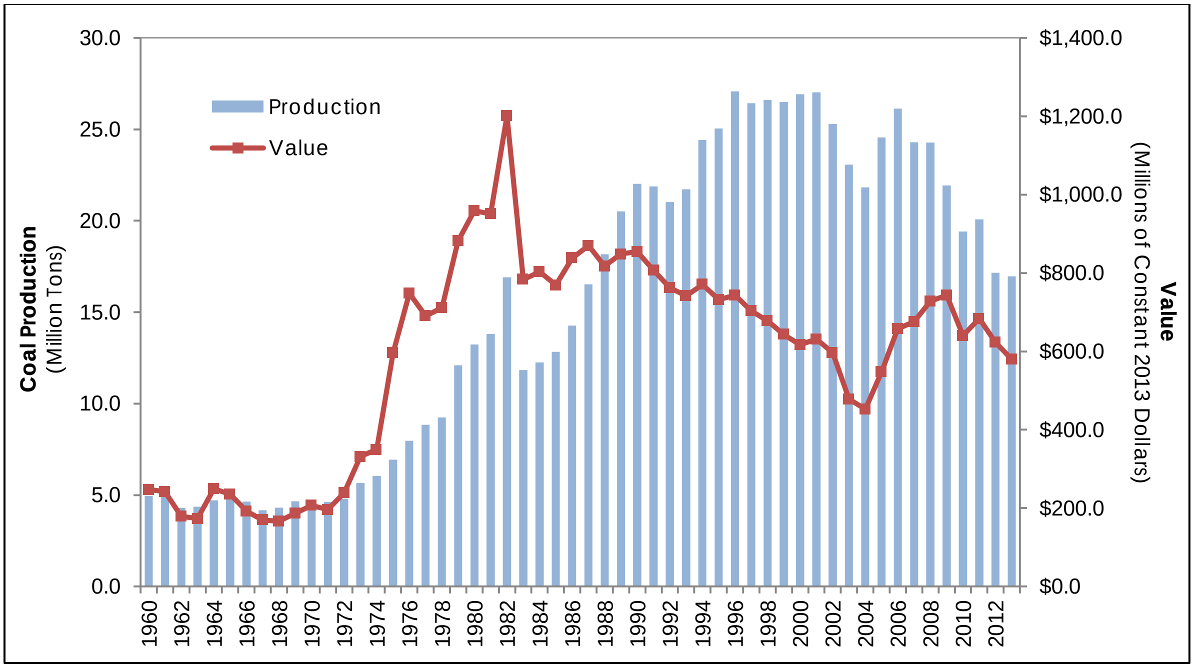


Note: "Off-Limits Federal Lands" comprise designated wilderness areas, national parks, Golden Spike National Historic Site, national monuments other than Grand Staircase–Escalante, and Department of Defense military lands.
Source: Utah Geological Survey and State of Utah, SGID.

Production and Value

Seven Utah coal operators produced 16.9 million tons of coal valued at $579 million from nine underground mines in 2013 (Figures 8.4 and 8.5). This production was 202,000 tons (1.2 percent) less than in 2012. The majority of this decrease was attributed to lower output from the Dugout Canyon mine as longwall production ceased in late 2012 and mining continued with only one continuous miner, reducing the mine's production to just 561,000 tons for the year. In addition, the Horizon mine was idled in mid-2012 and eventually shut down and production at the Deer Creek mine declined by 509,000 tons (Table 8.3). Demand for coal declined from a regulatory-induced drop in demand for coal-generated electricity.

Figure 8.4
Production and Value of Coal in Utah, 1960–2013



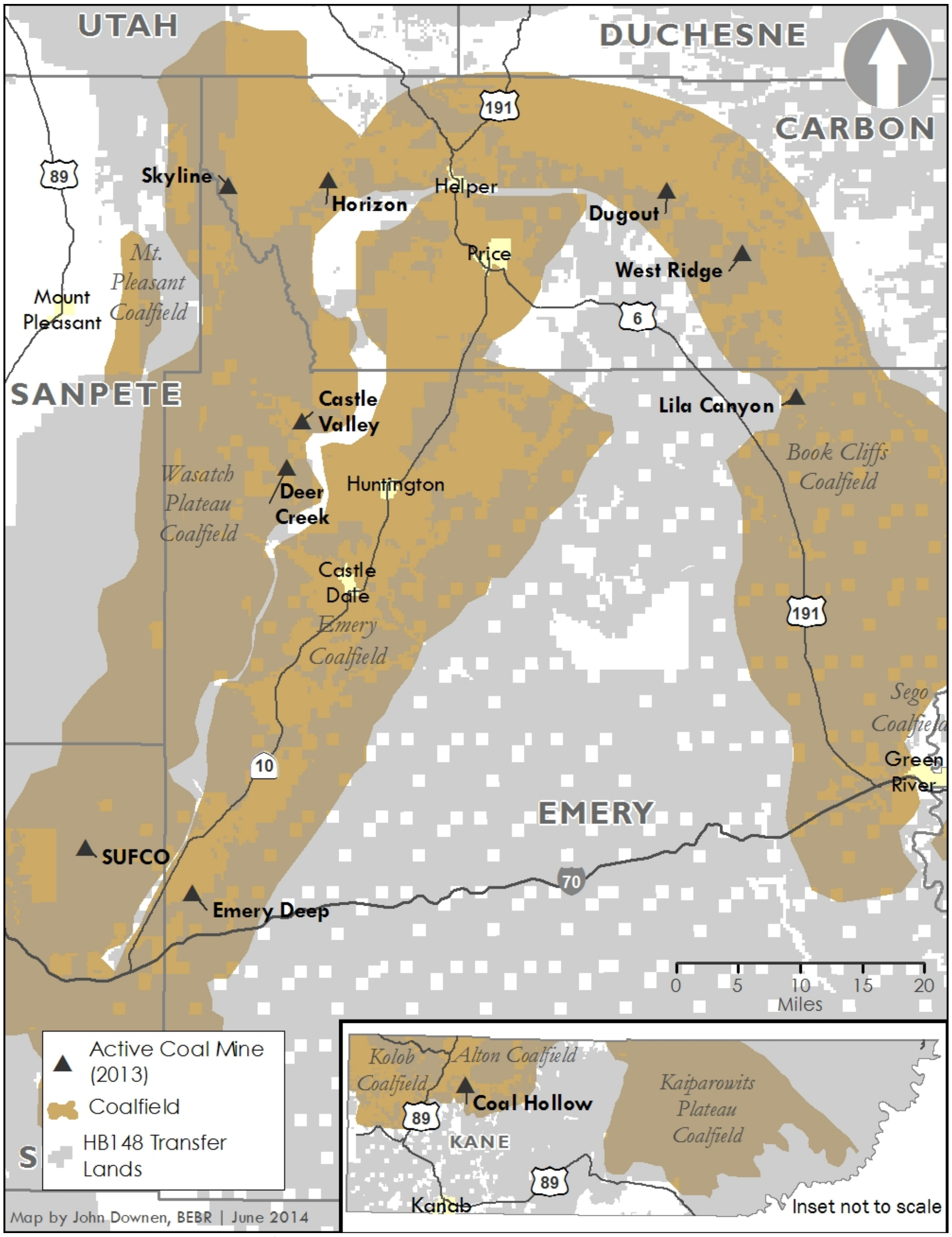
Source: Utah Geological Survey, Utah Energy and Mineral Statistics, geology.utah.gov/emp/energydata/coaldata.htm.

Table 8.3
Coal Production in Utah by Mine, 2008–2013
(Thousands of Tons)

Company	Mine	County	Coalfield	2008	2009	2010	2011	2012	2013
UtahAmerican Energy, Inc. / Murray Energy Corp.	Aberdeen	Carbon	Book Cliffs	242	–	–	–	–	–
	Lila Canyon	Emery	Book Cliffs	–	–	72	157	304	257
Canyon Fuel, LLC / Bowie Resources, Inc.[1]	Dugout Canyon	Carbon	Book Cliffs	4,135	3,291	2,307	2,395	1,588	561
	Skyline #3	Carbon	Wasatch Plateau	3,120	2,910	3,050	2,950	1,954	3,135
	SUFCO	Sevier	Wasatch Plateau	6,946	6,748	6,398	6,498	5,651	5,959
CONSOL Energy	Emery	Emery	Emery	1,050	1,238	999	–	–	4
Castle Valley Mining LLC[2] / Rhino Resources	Castle Valley #4	Emery	Wasatch Plateau	868	651	–	592	1,004	875
Energy West Mining Co.	Deer Creek	Emery	Wasatch Plateau	3,878	3,833	2,954	3,143	3,295	2,785
Hidden Splendor Resources, Inc. / America West Resources, Inc.	Horizon	Carbon	Wasatch Plateau	229	194	270	370	210	–
West Ridge Resources, Inc. / UtahAmerican Energy, Inc. / Murray Energy Corp.	West Ridge[2]	Carbon	Book Cliffs	3,807	3,063	3,355	3,566	2,579	2,629
Alton Coal Development	Coal Hollow	Kane	Alton	–	–	–	403	570	747
Total				24,275	21,927	19,406	20,073	17,155	16,953

1. Owned by Arch Coal until summer 2013.
2. Owned by C.W. Mining (Co-op) until summer 2010, mines formally called Bear Canyon.
Source: Utah Geological Survey, Utah Energy and Mineral Statistics, geology.utah.gov/emp/energydata/coaldata.htm.

Figure 8.5
Active Coal Mines, 2013



Source: State of Utah, SGID/Utah Geological Survey.

In 2013, the majority of Utah coal, 12.7 million tons, was produced from the Wasatch Plateau coalfield, with 3.4 million tons coming from mines in the Book Cliffs coalfield and 747,000 tons from the Coal Hollow mine in the Alton coalfield. The majority of Utah coal, 83.0 percent (14.1 million tons) was produced from federal land, while only 4.7 percent (801,000 tons) was from state-owned land. The remainder was produced from private (7.9 percent, 1.3 million tons) and county (4.4 percent, 742,000 tons) lands.

Existing Utah mines face steady reserve depletion and difficult mining conditions. In addition, the demand for Utah coal has sharply decreased over the past few years as power plants have switched to natural gas over coal-fired generation. In particular, several cogeneration plants in California, once a significant market for Utah coal, are converting to natural gas to comply with California's strict air quality standards. The California market is also starting to influence Utah's in-state demand since the IPP is mostly owned by the city of Los Angeles. The city has already stated that it will no longer purchase power from IPP after its current power purchase agreement expires in 2027, unless IPP converts to natural gas or implements carbon capture and storage technology. Thus, the average annual production total for Utah will likely be in the 15- to 20-million-ton range for the foreseeable future.

The total amount of Utah coal distributed to market in 2012 (the most recent year for which data are available) totaled 16.1 million tons, slightly less than the total coal produced for the year. The vast majority of Utah's coal, 79 percent, goes to the electric utility market. As a result of the slowed U.S. economy and new regulation limiting coal-fired generation, demand for coal to produce electricity decreased, resulting in a 41 percent drop in the demand for Utah coal at electric generating facilities, from 21.6 million tons in 2008 to 12.8 million tons in 2012. The economic recession and low natural gas prices also slowed demand for Utah coal in the industrial sector, with deliveries dropping to 2.2 million tons in 2012, the lowest level since 1987. Coal deliveries in 2013 are expected to have remained in the 17-million-ton range, correlating with lower overall production. However, the last few years have seen an uptick in the amount of Utah coal being exported to other countries, in particular the Asian coal market. Overseas exports of Utah coal doubled between 2008 and 2012 to 1.1 million tons. Demand for coal in Asia is strong, but Utah operators will need increased access to port facilities to allow this market to replace slowing domestic demand.

For detailed statistics on Utah's coal industry, please refer to the abundant data tables located on the UGS's Utah Energy and Mineral Statistics website: geology.utah.gov/emp/energydata.

Exploration and Development Activity

UtahAmerican Energy, Incorporated / Murray Energy Corporation – Lila Canyon mine: The Lila Canyon mine is located south of Horse Canyon in the Book Cliffs coalfield in Emery County. In spring of 2010, the company finished construction on 1,200-foot rock slopes and began development work in the Sunnyside coal bed, producing 72,000 tons of coal in 2010. Development work continued in 2011 and 2012, with total coal production reaching 157,000 tons and 304,000 tons, respectively. Coal production is expected to remain at the 300,000-ton level until longwall mining commences, possibly in 2015. At full capacity, the exact timing of which depends on the future coal market, the mine could employ up to 200 people and produce up to 4.5 million tons of coal per year. Coal will be mined from federal leases where the merged upper and lower Sunnyside bed is about 13 feet thick. Up to 46 million tons of recoverable coal is under lease. Approximately 32 million tons of additional reserves on 4,200 acres of federal land to the south has recently been nominated for leasing by UtahAmerican.

West Ridge Resources, Incorporated – West Ridge mine: The West Ridge mine began operation in 1999 in the Book Cliffs coalfield with production from the lower Sunnyside bed. The West Ridge mine produced 2.6 million tons of coal in 2012, down from 3.6 million tons produced in 2011, due mainly to difficult mining conditions and a weak coal market. Production in 2013 increased by only 50,000 tons. UtahAmerican estimates that the West Ridge mine has 3.4 million tons of recoverable coal under lease, which will accommodate longwall production only until 2015.

Canyon Fuel Company – Dugout Canyon mine: The Dugout Canyon mine, located in the Book Cliffs coalfield, produced 1.6 million tons of coal from the Gilson bed in 2012, down significantly from the 2.4 million tons produced in 2011. Dugout Canyon's longwall was shut down in December 2012 due to a weak coal market. Consequently, production in 2013 reach only 561,000 tons with one continuous miner. Canyon Fuel estimates that the Dugout Canyon mine has 12.8 million tons of recoverable coal remaining under lease.

Canyon Fuel Company – Skyline mine: Canyon Fuel Company's Skyline mine, located in the Wasatch Plateau coalfield, is currently mining in the Lower O'Connor "A" bed on their North lease (Winter Quarters lease) in Carbon County. Production from this bed decreased significantly in 2012 to 2.0 million tons as longwall equipment was moved to the North Lease, but rebounded to 3.1 million tons in 2013. Canyon Fuel estimates that 15.0 million tons of coal can be recovered from current leases. Future production at the Skyline mine could come from the unleased Flat Canyon tract, which is estimated to contain 25 to 30 million tons of reserves.

Canyon Fuel Company – SUFCO mine: SUFCO is Utah's largest coal producer and the eighth-largest producing underground coal mine in the United States (2011 data). It is also the only active coal mine in Sevier County. SUFCO produced 5.7 million tons of coal in 2012 from the upper Hiawatha bed, 15 percent less than in 2011 and 40 percent less than record high production of 7.9 million tons achieved during 2006. Demand for SUFCO coal diminished in 2012 due to a six-month outage at the coal-burning IPP. With IPP back online, production at SUFCO increased slightly to 5.9 million tons in 2013. Canyon Fuel estimates that roughly 32.1 million tons of reserves remain under lease in the upper and lower Hiawatha beds. On a separate note, the new Quitchupah road will significantly reduce coal haulage time for trucks heading for the Emery County power plants.

Canyon Fuel Company – Greens Hollow tract: Canyon Fuel has nominated the federal Greens Hollow tract for leasing, located northwest of the already acquired Quitchupah lease. A draft Environmental Impact Study (EIS) was issued in the spring of 2009 and the record of decision, favoring the lease of the tract, was made in December 2011. A National Environmental Protection Act (NEPA) plan is currently being formulated. The Greens Hollow tract is thought to contain approximately 73 million tons of reserves within the lower Hiawatha bed.

CONSOL Energy – Emery mine: CONSOL Energy's Emery mine, its only mine in the western United States, produced about 1 million tons annually from the Ferron Sandstone I bed from its opening in 2005 through 2010. CONSOL idled the mine in December 2010, citing lack of coal demand. The mine reopened in 2013 with fewer than 4,000 tons produced in the third quarter.

Rhino Energy – Castle Valley mines: Rhino Energy purchased the Bear Canyon mines, formerly owned by C.W. Mining (Co-Op), in 2010, and during bankruptcy proceedings renamed the mines Castle Valley. No coal was produced from the property in 2010, but Rhino produced 592,000 tons in 2011 using continuous miner machines in the Tank bed. Full-scale production with two continuous miners increased production in 2012 to 1.0 million tons. Production slowed in 2013 to 875,000 tons. Rhino estimates that 6.9 million tons of reserves still exist on leased land, but roughly 50.6 million tons of recoverable reserves could be available in the Tank, Blind Canyon, and Hiawatha beds in the surrounding area.

Energy West Mining Company / PacifiCorp – Deer Creek mine: Production at the Deer Creek mine increased to 3.3 million tons in 2012 but decreased in 2013 to 2.8 million tons. From the inception of mining on the Mill Fork lease to July 2011, this tract was state-owned; however, its reversion back to federal ownership will greatly decrease Utah's production of state-owned coal. Production in the Blind Canyon bed at Mill Fork was completed in mid-2010, and shifted back to the Hiawatha bed. There are roughly 14.4 million tons of coal remaining in the Hiawatha in this area.

Fossil Rock Fuels / PacifiCorp – Cottonwood tract: On December 31, 2007, SITLA held a sale of the Cottonwood Competitive Coal Leasing Unit. The tract was awarded to Ark Land Company, which is a subsidiary of Arch Coal, Inc., also the owner of Canyon Fuel Company. Two coal leases were issued, one for 8,204 acres covering lands within the 1998 land exchange Cottonwood Coal Tract and the other for 600 acres within an adjacent SITLA section. In mid-2011, the Cottonwood lease was transferred to Fossil Rock Fuels, a subsidiary of PacifiCorp and Rocky Mountain Power, as part of a settlement of litigation between the two companies. The Cottonwood tract is adjacent to PacifiCorp's existing, but inactive, Train Mountain federal lease. Total recoverable coal in the Hiawatha bed for the combined leases is estimated to equal 49 million tons. Fossil Rock Fuels is currently conducting a three-year exploration program on the newly acquired Cottonwood lease.

America West Resources, Incorporated / Hidden Splendor Resources, Incorporated – Horizon mine: The Horizon mine, located approximately 11 miles west of Helper in the Wasatch Plateau coalfield, was idled in July of 2012 after producing 210,000 tons of coal for the year. The mine was idled after MSHA required extensive changes to the mine plan and a portion of the operation sealed. In February 2013, the company filed for bankruptcy with a subsequent bankruptcy sale in April. The mine failed to sell, but Bowie Resources, who just recently acquired the Canyon Fuels Company, expressed interest in purchasing America West's coal supply contracts. In addition, a Rhino Resource Partners affiliate bought some of the mining equipment. Before the mine closed, America West estimated that 16 million tons of coal remained on leased land.

Alton Coal Development – Coal Hollow mine: In 2011, Alton Coal Development began production at a new coal mine in the Alton coalfield in southern Utah's Kane County. Surface-mining production on the company's private property totaled 403,000 tons for 2011 and increased to570,000 tons in 2012 and 747,000 tons in 2013. Full production at the Coal Hollow mine could total 2.0 million tons per year, but depends on the acquisition of surrounding federal lands. The BLM is currently preparing a draft EIS for the proposed federal leasing action. Alton's private lease, as well as two recently leased state sections, are estimated to contain about 20.0 million tons of recoverable coal, while reserves on the surrounding federal mining areas are estimated between 35 and 40 million tons. The Coal Hollow mine produces subbituminous Dakota Formation coal from the Smirl bed, which averages about 10,000 btu/lb, about 1 percent sulfur, and 9 percent ash. As overburden increases, the company eventually plans to switch to underground mining.

8.1.3 Uranium

Production and Value

Energy Fuels Resources was responsible for all uranium produced in Utah during 2012, having acquired Denison Mines Corporation during the year, including its producing Daneros, Beaver, and Pandora mines. Energy Fuels Resources produced approximately 553,000 pounds of uranium oxide (U_3O_8) having a value of about $30.9 million, at an average realized price of $55.83/lb (Energy Fuels, 2013). The uranium and byproduct vanadium ore was shipped to Energy Fuel's White Mesa mill (Figure 8.7), located about 6 miles south of Blanding in San Juan County, and processed into U_3O_8 and V_2O_5. The value of uranium produced in Utah in 2012 increased about 4.7 percent over the value in 2011, and was due to an approximate 8.9 percent increase in production over 2011, despite a slightly lower selling price. Uranium spot prices peaked at about $52/lb early in 2012, reached a low of around $41/lb late in the year, but recovered at year's end to about $45/lb (Energy Fuels, 2013).

Exploration and Development Activity

Historically, Utah is the third most productive uranium state, with the majority of its production from the Colorado Plateau. The spot price of U_3O_8 has been especially volatile over the past decade with spikes to $136/lb in June 2007 and lows of under $45/lb in 2009–2010. The spot price rebounded to $73/lb in early 2011, only to fall below $50/lb again following the Fukushima nuclear power plant disaster in March 2011. Uranium exploration and development in Utah has waxed and waned with these spot price fluctuations. Long-term contract U_3O_8 prices, in contrast, have remained relatively constant at approximately $60/lb. In the last few years of low prices, the uranium industry in Utah has undergone a period of property/company consolidation with Energy Fuels acquiring most of the promising uranium mines and prospects in Utah. Energy Fuels, Incorporated and Denison Mines Corporation announced on April 16, 2012, that they had signed a letter agreement for Energy Fuels to acquire the U.S. assets of Denison Mines in exchange for Energy Fuels shares.

The continuing low U_3O_8 prices (under $45/lb) resulted in a halt to all production from uranium mining operations in Utah in early 2013. The White Mesa mill is continuing operations on ore from higher grade uranium breccia pipe deposits across the state line in the Arizona Strip, north of the Grand Canyon.

The following paragraphs report the major uranium events in Utah in 2012.

Energy Fuels, Incorporated

Energy Fuels, Incorporated owns six permitted uranium mines in Utah as well as the 2000 ton-per-day, dual-circuit (uranium-vanadium) White Mesa mill near Blanding. The mill processes both uranium-vanadium ore and an alternate feed waste material. The mill began operating on stockpiled ore from Energy Fuels-owned mines in 2008, and began accepting ore from other companies for toll milling in 2009. The mill has the capacity to produce about 3 million pounds of U_3O_8 and 4.5 million pounds of V_2O_5 annually. Uranium recoveries typically average over 90 percent.

In late 2006, the Pandora mine, in the eastern La Sal mining district (Figure 8.8), San Juan County, became the first Utah uranium producer since 1991. Energy Fuels' Pandora mine shipped about 120 tons per day 70 miles south to the White Mesa mill, until it was put on standby in 2013. In 2012, the Pandora mine produced about 30,695 tons of ore.

In 2009, the Beaver mine, 2 miles west of the Pandora mine was reopened. The Beaver mine was also producing about 160 tons per day until its closure in October 2012. The La Sal district uranium ores are hosted in the Upper Jurassic Salt Wash Member of the Morrison Formation. In 2012, the Snowball and connected Beaver Shaft is credited with about 44,646 tons of ore.

The Daneros mine in the White Canyon mining district (Figure 8.8), San Juan County, was permitted in May 2009, development began in July, and production started in December 2009. Denison acquired the mine in June 2011, and it was sold to Energy Fuels in April 2012. The Daneros ore body had an estimated resource of 143,000 tons at 0.26 percent U_3O_8 hosted by the basal Shinarump Conglomerate Member of the Upper Triassic Chinle Formation and also contains about 1 percent copper (Peters, 2012). The mine is accessed by twin declines, developed by room and pillar methods, and had ramped up production to 140 tons day. Ore is shipped 62 miles to the White Mesa mill. In 2012, the Daneros produced 39,538 tons averaging about 0.22 percent U_3O_8.

Energy Fuels' Henry Mountains Complex (Tony M mine and Bullfrog properties) in the Shootaring Canyon district, Garfield County, and Rim mine in the Dry Valley (East Canyon) district of San Juan County, are both on standby awaiting higher uranium prices. Both the Shootaring and Dry Valley district ore bodies are hosted in the Upper Jurassic Salt Wash Member of the Morrison Formation.

In 2007, Energy Fuels acquired the Energy Queen mine in the La Sal district (Figure 8.8), San Juan County, and began rehabilitation. The mine has an estimated resource of 96,250 tons of ore averaging 0.32 percent U_3O_8 and 1.24 percent V_2O_5, with access via an existing 750-foot-deep lined shaft (Peters, 2011a). The Whirlwind mine on Beaver Mesa straddles the Utah-Colorado border about 28 miles northeast of Moab in Grand County. The property began limited production in 2009, but has been on standby since then. The Whirlwind mine has a measured resource of 147,798 tons of ore averaging 0.27 percent U_3O_8 and 0.88 percent V_2O_5 (Peters, 2011b). Both the Energy Queen and Whirlwind uranium ores are hosted in the Upper Jurassic Salt Wash Member of the Morrison Formation.

Energy Fuels acquired the Deep Gold and Down Yonder uranium resources in the San Rafael River mining district (Figure 8.8), Emery County, in 2011, through a merger with Titan Uranium, Incorporated. The San Rafael project has an estimated resource of about 3.49 million pounds of U_3O_8 (Gatten, 2011).

In 2012, Energy Fuels obtained a 100 percent interest in the Sage Plain project in the Ucolo uranium district (Figure 8.8), San Juan County. Sage Plain has calculated a measured and indicated resource of 642,971 tons at 0.22 percent U_3O_8 and 1.39 percent V_2O_5 (Peters, 2011c). This project encompasses the historic Calliham and Sage mines.

Uranium One, Incorporated

Uranium One, Incorporated acquired the uranium assets of the U.S. Energy Corporation in 2006 and Energy Metals in 2007. These assets in the Lisbon Valley district (Figure 8.8) included the Velvet mine with an indicated resource of about 70,850 tons averaging 0.41 percent U_3O_8 and 0.57 percent V_2O_5 (Beahm and Hutson, 2007). The Velvet has the highest grade uranium resource known in the state and is hosted in the Lower Permian Cutler Group sandstone. Other Uranium One assets include the large, albeit low-grade, Frank M underground uranium resource and nearby inactive 750-ton-per-day Shootaring Canyon (Ticaboo) uranium mill, both in the Henry Mountains, Garfield County.

Laramide Resources Limited
Laramide Resources is working to develop the La Sal deposit in the Lisbon Valley mining district (Figure 8.8), the largest uranium-producing district in Utah. The La Sal deposit was initially developed by Homestake Mining Company in the Permian Cutler Formation sandstone beneath the Triassic-hosted ores of the main Big Indian uranium belt. The estimated La Sal resource is approximately 800,000 tons of 0.17 percent U_3O_8.

8.1.4 Base and Precious Metals

Production and Values

Base and precious metals produced in Utah during 2012 have an estimated value of $2.53 billion, which accounts for 68 percent of the total value of all nonfuel minerals produced in Utah. Overall base and precious metal production values decreased 24 percent from 2011. Base metal production value in 2012 is estimated at $2.12 billion, which was the largest contributor to the total value of all nonfuel minerals produced in Utah, accounting for 57 percent (Table 8.4 and Figure 8.6). Utah's base metal production value decreased by 19 percent from 2011, because of decreases in the production of copper and molybdenum. Of the total base metal value, copper (65 percent), magnesium (13 percent), and molybdenum (13 percent) together constitute 91 percent, and iron, beryllium, and vanadium account for the remaining 9 percent.

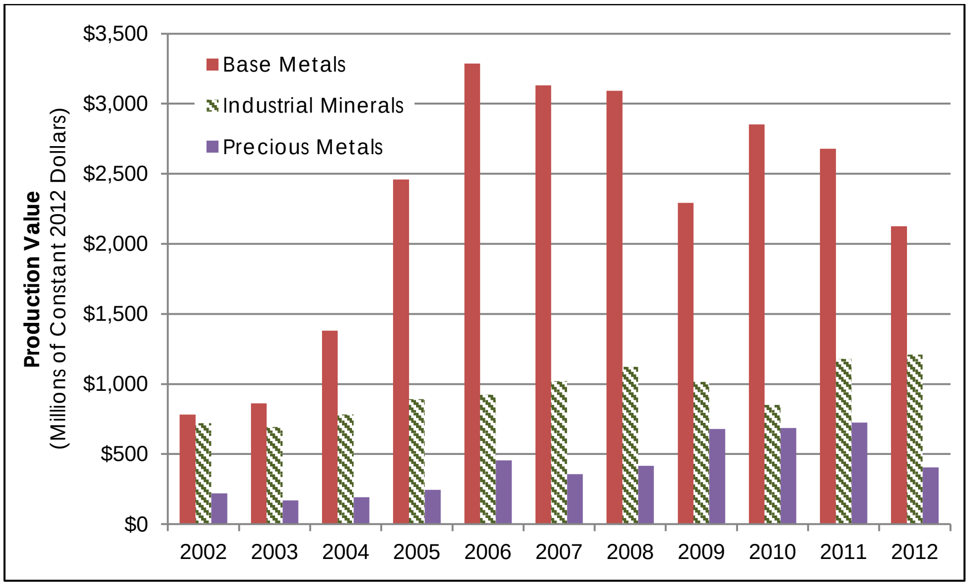
Table 8.4
Utah Estimated Energy and Mineral Production Values, 2002–2012
(Millions of Constant 2012 Dollars)

Year	Base Metals	Industrial Minerals	Precious Metals	Energy Minerals	Oil	Gas	Total Value
2002	$781	$721	$220	$587	$420	$698	$3,427
2003	$861	$693	$170	$470	$472	$1,375	$4,040
2004	$1,381	$782	$192	$446	$705	$1,771	$5,276
2005	$2,461	$892	$246	$540	$1,058	$2,536	$7,732
2006	$3,286	$924	$456	$648	$1,219	$2,177	$8,709
2007	$3,131	$1,020	$357	$688	$1,352	$1,609	$8,157
2008	$3,093	$1,123	$416	$759	$2,035	$2,843	$10,268
2009	$2,292	$1,016	$680	$761	$1,233	$1,606	$7,588
2010	$2,853	$851	$685	$662	$1,768	$1,925	$8,744
2011	$2,679	$1,180	$726	$703	$2,214	$1,814	$9,316
2012	$2,125	$1,209	$406	$644	$2,500	$1,330	$8,214

Note: Energy minerals consist of coal and uranium; sulfuric acid has been included in industrial minerals since 2011.
Source: Utah Geological Survey, Utah's Extractive Resource Industries 2012.

Precious metal production value for Utah in 2012 is estimated at $405.9 million, or 11 percent of the total value of all nonfuel minerals produced in Utah, and is distributed between gold (84 percent) and silver (16 percent) (Table 8.4 and Figure 8.6). Precious metal production value decreased by 43 percent from 2011 to 2012, due to significantly decreased production for both gold and silver.

Figure 8.6
Base Metals, Industrial Minerals and Precious Metals Production Values, 2002–2012



Source: Utah Geological Survey, Utah's Extractive Resource Industries 2012.

The vast majority of Utah's copper, gold, and silver, and all of the molybdenum, is produced from KUC's Bingham Canyon mine, located about 20 miles southwest of Salt Lake City in Salt Lake County (Figure 8.7). The combined value of metals produced by KUC in 2012 at average prices is estimated at $2.01 billion, about a 31 percent decrease from 2011, and was approximately 54 percent of the total value of all nonfuel minerals produced in Utah. KUC's Bingham Canyon mine was the second largest copper and molybdenum producer in the U.S. in 2012.

Copper

In 2012, copper was the largest contributor to the value of nonfuel minerals in Utah, having an estimated value over $1.38 billion, about a 23 percent decrease from 2011. KUC's Bingham Canyon mine produced the majority of copper in Utah in 2012 at approximately 180,000 tons, a significant decrease of about 35,000 tons from 2011 (Rio Tinto, 2013). The average copper price decreased about 9 percent from 2011 to $3.70/lb (USGS, 2013a), and KUC's production for 2012 has an estimated value of $1.33 billion, which is a decrease of about 24 percent from 2011.

Lisbon Valley Mining Company operates a copper mine and processing facility about 30 miles southeast of Moab in San Juan County (Figure 8.7). About 5,700 tons of copper was produced by the company in 2012, slightly less than in 2011, with an estimated value over $42 million at the 2012 average copper price (USGS, 2013a). C.S. Mining, LLC produced approximately another 565 tons of copper in 2012 from its Hidden Treasure mine in Beaver County. Copper is combined with a number of metals to create alloys for a wide variety of applications, and is used to produce a wide range of products including electrical wiring, electronic components, and pipe for plumbing, refrigerator, and heating systems.

Magnesium

The only facility producing magnesium from a primary source in the United States is located about 60 miles west of Salt Lake City at Rowley in Tooele County (Figure 8.7), and is operated by U.S. Magnesium, LLC. Magnesium chloride concentrate is produced from Great Salt Lake brines through evaporation and converted to magnesium metal by an electrolytic process. USGS (2013a) reports that annual magnesium production capacity at U.S. Magnesium's plant is 70,000 tons. The price for magnesium metal increased slightly from 2011, averaging $2.20/lb in 2012 (USGS, 2013a). Utah's 2012 magnesium production is valued around $308 million, assuming production at full capacity, ranking it second as a contributor to Utah's base metal values in 2012. Significant quantities of U.S. Magnesium's production are used by a nearby plant, operated by Allegheny Technologies Inc., to produce titanium sponge. Nationally, other markets for magnesium include use as a constituent of aluminum-based alloys (43 percent), structural use in castings and wrought products (40 percent), and for desulfurization of iron and steel (11 percent) (USGS, 2013a).

Molybdenum

Utah's molybdenum production in 2012 came solely from KUC's Bingham Canyon mine, where it was recovered as a byproduct from the copper operation. Approximately 10,362 tons of molybdenum was produced in 2012, a large decrease of about 31 percent from 2011 (Rio Tinto, 2013). Molybdenum's average price dropped about 14 percent from 2011 to $13.24/lb (USGS, 2013a). Utah's molybdenum production in 2012 is valued at approximately $274 million using the average 2012 price. Molybdenum production value was about 41 percent lower than in 2011, due to the decrease in production and price. Molybdenum ranked third as a contributor to Utah's base metal values in 2012. In 2012, molybdenum concentrate in the U.S. was produced by 12 mines, as either a primary product or byproduct, and was valued at about $1.7 billion. Molybdenum is primarily used in alloys with other metals by iron, steel, and other producers that account for about 76 percent of the molybdenum consumed (USGS, 2013a).

Iron Ore

Iron ore in Utah is produced solely by CML Metals, Incorporated from their Iron Mountain project, which is a redevelopment of the Comstock/Mountain Lion iron mine located about 19 miles west of Cedar City in Iron County (Figure 8.7). In 2012, CML produced approximately 1,583,400 tons of mostly run-of-mine iron ore up to 54 percent iron and lesser amounts of concentrate up to 67 percent iron (CML Metals, 2012). Iron ore production increased about 11 percent from 2011 to 2012. Estimated value of the iron ore at approximately $100/ton is around $158 million, which is an increase of about 32 percent from 2011. Iron ore production ranks fourth in contribution to Utah's 2012 base metal production values. Iron ore from the Iron Mountain project is transported by rail to a port in Southern California and shipped overseas.

Beryllium

Utah remains the United States' sole producer of beryllium ore from the mineral bertrandite ($Be_4Si_2O_7(OH)_2$). Materion Natural Resources, Inc. mines bertrandite from the Spor Mountain area about 42 miles northwest of Delta in Juab County (Figure 8.7). Materion operates a mill 11 miles north of Delta in Millard County, which is the nation's sole source of beryllium concentrate, where bertrandite ore and imported beryl are processed into beryllium hydroxide. Materion's parent company (Materion Corporation) operates a refinery and finishing plant in Ohio where the beryllium hydroxide concentrate is shipped and converted into beryllium-copper master alloy, metal, and oxide (USGS, 2013a). About 80,500 tons of bertrandite ore was mined in 2012 from the Topaz mine at Spor Mountain. Beryllium concentrate production from Utah in 2012 is estimated to be 228 tons, roughly the same as 2011, having a value of approximately $20 million. The average beryllium price for 2012 was slightly higher than in 2011 at $209/lb (USGS, 2013a), which resulted in an increase of about 3.5 percent in value over 2011. Beryllium ranked fifth as a contributor to Utah's 2012 base metal values. Beryllium is used in various telecommunications and consumer electronics products, defense-related applications, industrial components, commercial aerospace applications, appliances, automotive electronics, energy applications, medical devices, and other applications.

Vanadium

Vanadium, in the form of vanadium pentoxide (V_2O_5), is a byproduct of uranium mining and milling at Energy Fuel's White Mesa mill about 6 miles south of Blanding in San Juan County (Figure 8.7). In 2012, Energy Fuels produced approximately 1,811,200 pounds of V_2O_5 having a value of approximately $12 million, from the Beaver and Pandora mines uranium ore. The average vanadium price in 2012 was $6.52/lb (USGS, 2013a), remaining steady from 2011. Vanadium production value increased significantly in 2012 by about 43 percent over the value in 2011, and was due to an approximate 40 percent increase in production over 2011. Vanadium ranked sixth as a contributor to Utah's 2012 base metal values. Metallurgical use by the steel industry as an alloying agent is responsible for about 93 percent of domestic vanadium consumption (USGS, 2013a).

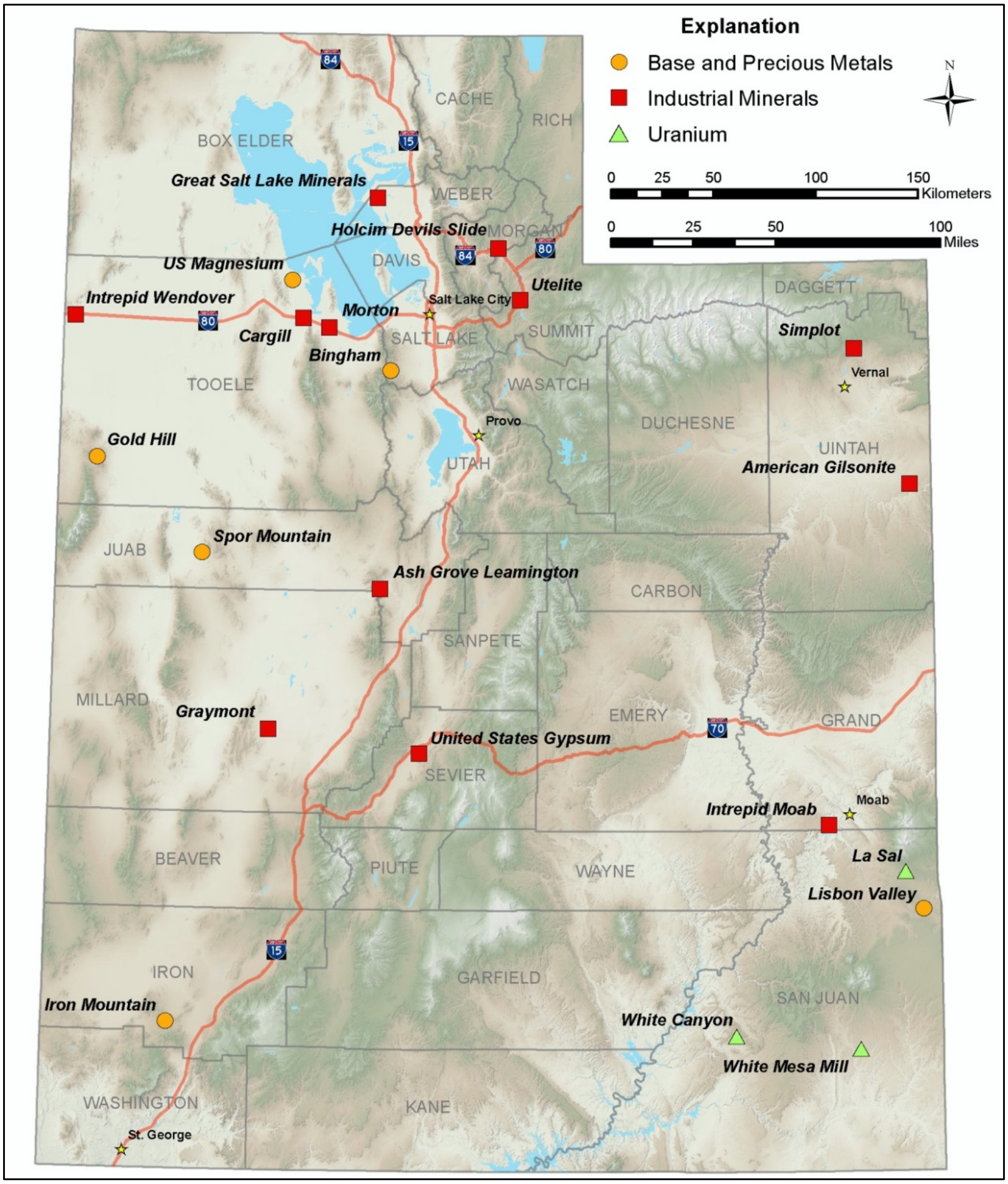
Gold

In 2012, approximately 201,000 troy ounces (oz) of gold was produced in Utah, which was about a 48 percent decrease (185,000 troy oz) from 2011 (Rio Tinto, 2013). KUC mines most of this gold at its Bingham Canyon mine, where it is recovered as a byproduct from the copper operation. About 1,000 troy oz of the total gold produced came from residual leaching of existing heaps at KUC's Barneys Canyon mine, which ceased active mining in 2001 after ore exhaustion, and is located 2.5 miles north of the Bingham Canyon operation. The average gold price in 2012 was $1,700/troy oz, an increase of about 8 percent from 2011 (USGS, 2013a). Utah's gold production at the 2012 average price has an estimated value of $342 million, about a 44 percent decrease in value from 2011. Small quantities of gold and silver may have been produced by other small Utah mines, but production may not be reported and would not make any significant impact on the total amount of gold and silver produced in Utah.

Silver

KUC produced most of Utah's silver in 2012 from the Bingham Canyon mine, where it is also recovered as a byproduct from the copper operation. Total silver production in 2012 amounted to approximately 2,126,680 troy oz, which was about a 28 percent decrease (849,320 troy oz) from 2011 (Rio Tinto, 2013). In 2012, C.S. Mining produced approximately 40,680 troy oz of silver from its Hidden Treasure mine in Beaver County. The average silver price in 2012 was $30/troy oz, a decrease of about 15 percent from 2011 (USGS, 2013a). Utah's silver production at the 2012 average price has an estimated value of $64 million, about a 40 percent decrease in value from 2011.

Figure 8.7
Base and Precious Metals, Selected Industrial Minerals, and Uranium Production Locations in Utah During 2012



Source: Utah Geological Survey, Utah's Extractive Resource Industries 2012.

Exploration and Development Activity

Metals had an off year in 2012 with copper, molybdenum, and silver prices slipping, compounded by significantly decreased Utah production. Base metal exploration in 2012 was dominated by major companies doing brownfield exploration in the Bingham, Tintic, and Drum (Detroit) mining districts.

The escalating gold price in 2012 prompted renewed exploration activity for that metal in Utah. Precious metal exploration was also driven by recent important sediment-hosted gold discoveries in the Basin and Range of eastern Nevada (e.g., Long Canyon and Kinsley Mountain, Elko County). Gold-silver exploration is being carried out by major gold-silver producers and junior exploration companies, as well as local prospectors.

Bingham Canyon
KUC's Bingham Canyon porphyry copper-gold-molybdenum-silver mine (Figure 8.7), Salt Lake County, produced its 3 billionth ton of porphyry ore in 2012, continuing a remarkable run of over 100 years of open pit copper mining. Bingham remained the second largest annual producer of both copper and molybdenum in the U.S. In June 2012, the $660 million Cornerstone push-back was approved to extend the Bingham Canyon mine life from 2018 to 2029. This project involves pushing back the south pit wall about 1,000 feet to access an additional 568 million tons of 0.79 percent copper equivalent ore.

Copper, molybdenum, gold, and silver production from Bingham were all down in 2012 from 2011 due to lower ore tonnages mined. Furthermore, copper, molybdenum, and silver prices were also down while only gold prices rose. Consequently gross sales revenue was down to $2.4 billion in 2012.

KUC began construction of a $340 million molybdenum autoclave process (MAP) facility in 2011. The new MAP facility will have the capacity to produce 30 million pounds of molybdenum products and an additional 9,000 pounds of rhenium per year. The MAP facility was due to come online in mid-2014 followed by a one-year shakedown period to reach full capacity. Ultimately the plant could produce 10 percent of the world's molybdenum.

Although KUC's Barneys Canyon gold mine ceased mining in 2001, the operation continues to recover minor amounts of gold from the old heap leach pads. In 2012, production was approximately 1,000 oz.

Kennecott Exploration Company (KEC) continued an aggressive brownfield, near-mine exploration drilling program in the Oquirrh Mountains in 2012. An additional 11 deep core holes (including deflections) totaling 40,335 feet were completed in the Bingham area (Russ Franklin, KEC, written communication, May 2013).

Lisbon Valley Copper
The Lisbon Valley Mining Company operates a sediment-hosted, open pit, heap leach, solvent extraction and electrowinning (SX-EW) copper operation situated in the Lisbon Valley mining district, San Juan County. The company began copper mine (Figure 8.7) development in 2005 with plant construction completed in 2006. Following some startup problems, Lisbon Valley Mining Company successfully restarted mining operations in 2009. Mine production in 2012 was similar to 2010 and 2011, holding steady at about 2.65 million tons averaging 0.46 percent copper delivered to the heap leach pads (Lantz Indergard, Lisbon Valley Mining Company, written communication, April 2013).

Iron Springs
The CML mine (formerly the Comstock-Mountain Lion) at Iron Mountain, Iron County (Figure 8.7), was acquired by Palladon Iron Corporation in 2005, and restructured into CML Metals Corporation in early 2010. The iron ore occurs as massive magnetite skarn/replacement deposits

adjacent to Miocene laccoliths. Open pit mining was initiated by Palladon in 2008, but ceased in 2009 due to instability in the iron ore market and logistical problems. In 2009, Palladon completed a Canadian NI 43-101 compliant resource estimate on the CML deposit showing a resource of 31.4 million tons averaging 48.6 percent iron (SRK Consulting, 2009). Mining was restarted by CML in July 2010 and run-of-mine ore was shipped out of the new rail load-out facility at the mine by the Union Pacific Railroad. The concentrator was completed in early 2012 and operated in break-in capacity throughout 2012, suffering through concentrate dewatering difficulties. CML mined approximately 1.6 million tons in 2012 and in 2013 was still optimizing the concentrator to produce a high-grade iron concentrate at a rate in excess of 2 million tons per year.

CML also completed nine drill holes in 2012, twinning old U.S. Steel holes in the Rex deposit to verify the historic resource of approximately 80.9 million tons of 39 percent iron. The completion of a feasibility study on the Rex deposit was planned for 2013.

Drum Mountains

The Drum Mountains (Detroit mining district) became the most competitive metal exploration area in the state in 2012. Freeport-McMoRan Exploration Corporation acquired about 1,020 acres of SITLA land, roughly 1,000 acres of patented mining claims, and staked an additional 395 lode claims in the copper-gold heart of the old mining district. The Steele family also has about 70 claims in this area.

Newmont Mining Corporation signed an earn-in agreement with Renaissance Gold, Incorporated on the Wildcat sedimentary rock-hosted gold property in the northern Drum Mountains, Juab County (Figure 8.8). The property consists of over 200 unpatented mining claims. The property was explored by Gold Fields Mining Corporation in the early 1990s. Gold Fields' drilling cut intervals of up to 75 feet of 1.27 ppm gold (hole DM-27). Newmont completed four reverse-circulation holes in 2011 and approximately 12 more in 2012 totaling 9,025 feet (Rendy Keaten, Newmont Mining Corporation, written communication, May 2013). Golden Dragon Capital also holds about 38 claims in this area.

Anglo Gold Ashanti USA (184 claims), C.S. Mining (226 claims), Golden Dragon (44 claims), and North Exploration (10 claims) have acquired land positions in the southern part of the Detroit district near the historic Drum distal disseminated silver-gold open pits in Millard County.

Rocky and Beaver Lake Districts

C.S. Mining controls a series of small copper deposits in the Rocky and Beaver Lake mining districts (Figure 8.8) in Beaver County. These properties host seven partially delineated prograde copper skarn and copper breccia pipe deposits. In 2009, a flotation mill was completed and open pit mining started on the Hidden Treasure copper skarn. The mill began production at 1,200 tons per day in May 2009 and produced a very limited amount of copper concentrate. A separate magnetite concentrate was also produced and sold to a coal wash plant in the fall of 2009. However, the mill experienced less than 20 percent copper recovery due to the mixed oxide-sulfide nature of the skarn ore and operations were halted near the end of 2009. The mine and mill were restarted in September 2012 and 206,527 tons of ore was mined from the Hidden Treasure copper skarn in 2012. C.S. Mining produced roughly 20 tons of concentrate per day for shipment in 2012 to the Bingham smelter. The concentrate is estimated to average about 25 percent copper, 600 ppm silver, and 3 ppm gold.

Tecoma District

In 2010, the TUG distal disseminated silver-gold deposit in the Tecoma district (Figure 8.8) of westernmost Box Elder County was optioned by West Kirkland Mining (USA) Limited from Newmont. The TUG deposit has a historic open-pitable resource of about 1.5 million tons averaging 1.71 ppm gold and 100 ppm silver, but recent drilling has increased the size to an inferred resource of approximately 30 million tons at 0.49 ppm gold and 15.9 ppm silver (Selway et al. 2012).

Goldstrike District

Cadillac Mining Corporation acquired 3,800 acres covering the historic mining area of the Goldstrike sedimentary rock-hosted gold-silver mining district, Washington County (Figure 8.8). Production from Goldstrike in the 1980s and 1990s totaled approximately 210,000 oz of gold and 198,000 oz of silver. Cadillac compiled and digitized the historic exploration/mining data on the district in 2011 and drilled three holes from a single pad on the Hamburg Extension target later that year. Two of these three initial reverse-circulation holes (GS11-02 and 03), totalling 1,860 feet, intersected 1.08 ppm gold over 240 feet and 1.25 g ppm gold over 270 feet. Several follow-up holes in 2012 also intersected mineralization including GS12-07, which cut 99 feet of 1.56 ppm gold and 3.8 ppm silver, and GS12-08, which intersected 101 feet of 2.05 ppm gold and 4.3 ppm silver.

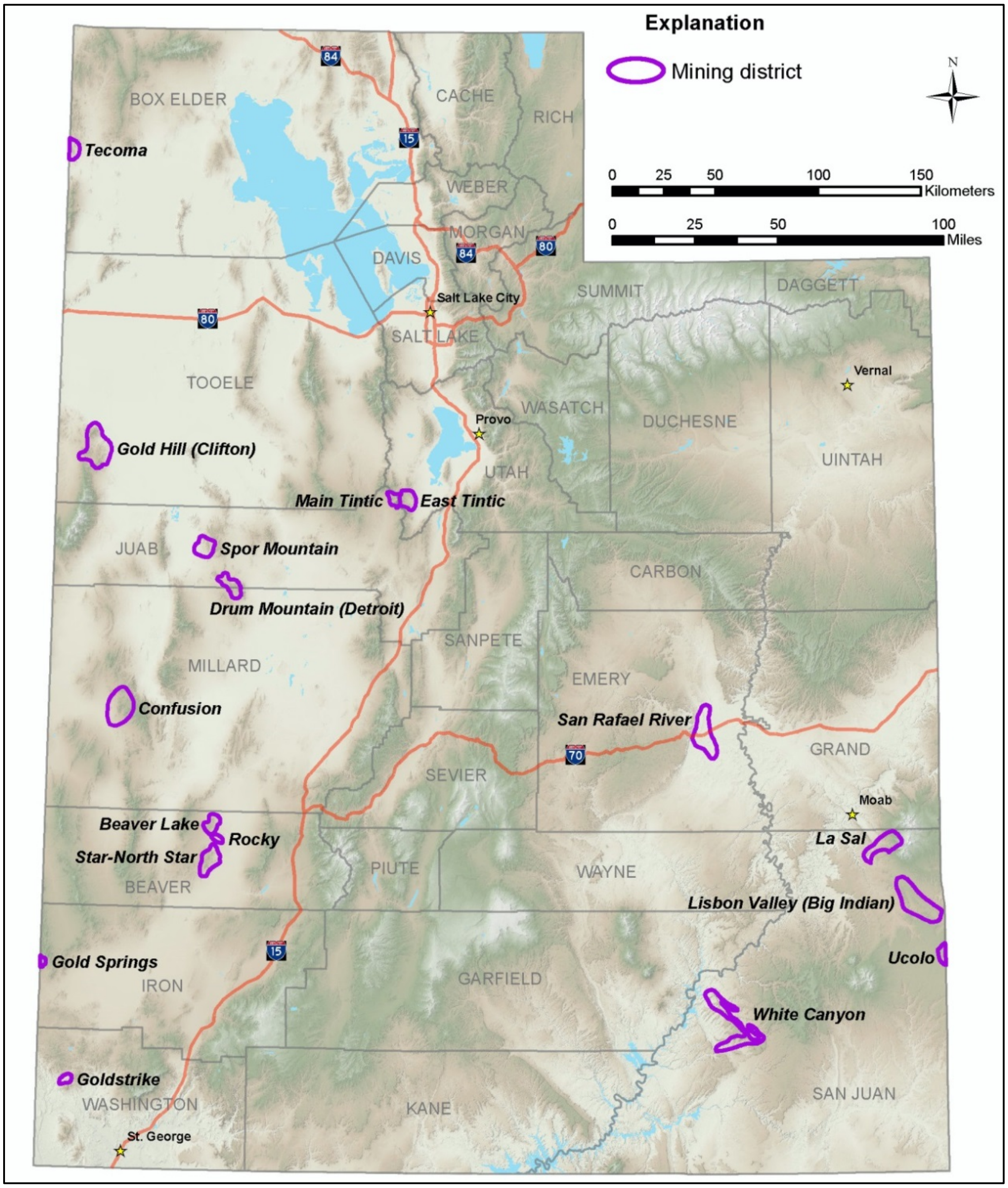
Confusion Range

In 2012, Pine Cliff Energy Limited acquired 100 percent interest in the 2,300-acre Kings Canyon sedimentary rock-hosted gold-silver property in western Millard County (Figure 8.8). The property was explored in the early 1990s, primarily by Crown Resources. The property contains several known gold zones; the largest defined resource is in the Crown zone, about 7.9 million tons averaging roughly 0.93 ppm gold (Krahulec 2011). Geomark is continuing drilling to expand Kings Canyon and a more poorly defined Royal resource, with intersections including KC12-17 in the Royal zone of 110 feet of 1.09 ppm gold.

Gold Springs District

The Gold Spring mining district is located in extreme western Iron County, southwestern Utah (Figure 8.8). The district is a small historic low-sulfidation, epithermal, gold-silver quartz-adularia-calcite vein/stockwork district. High Desert Gold Corporation controls a 6000-acre block of ground in the Gold Springs district. High Desert Gold announced an initial inferred resource on the Jumbo gold-silver stockwork of 10,353,079 tons at 0.57 ppm gold and 12.90 ppm silver (Katsura and Armitage 2012). A follow-up four- to eight-hole reverse-circulation drilling program on the Jumbo zone was scheduled to begin in April 2013.

Figure 8.8
Base and Precious Metals and Uranium Exploration and Development Activity Locations in Utah During 2012



Source: Utah Geological Survey, Utah's Extractive Resource Industries 2012.

Gold Hill District

Clifton Mining Company and Desert Hawk Gold Corporation agreed in 2009 to jointly develop Clifton's mineral properties in the Gold Hill district (Figure 8.8) in western Tooele County. Desert Hawk plans a heap leach operation at the Kiewit low-sulfidation, quartz-carbonate-adularia stockwork gold deposit. The Kiewit deposit is known to contain a crudely estimated 1.7 million tons averaging about 1 ppm gold. Permitting of the Kiewit open pit and cyanide heap leach operation is underway.

Tintic District

Andover Ventures, Incorporated purchased 78.5 percent of Chief Consolidated Mining Company in 2008. Chief Consolidated's main assets are properties in the East Tintic district (Figure 8.8), Utah County. Andover has released an indicated resource for the Burgin Extension deposit containing 920,000 tons at 0.86 ppm gold, 249 ppm silver, 9.3 percent lead, and 3.5 percent zinc with an additional inferred resource of 1,357,000 tons at 0.45 ppm gold, 299 ppm silver, 14.4 percent lead, and 5.2 percent zinc (Tietz et al. 2011).

In addition, KEC, through a joint venture with Andover, acquired a porphyry copper lithocap target on Big Hill near the center of the East Tintic district. KEC began work in 2010 by running a magnetotelluric grid, six lines of induced polarization (IP), and a high-resolution aeromagnetic survey along with geologic/alteration mapping and collection of about 200 geochemical samples. Four reverse-circulation holes, totaling 4,311 feet, were precollared in 2011 and two of these holes, totaling 5,159 feet, were core drilled to completion in 2012 (Russ Franklin, KEC, written communication, May 2013).

Quaterra Resources, Incorporated acquired about 3,200 acres of patented and unpatented mining claims encompassing the Southwest Tintic porphyry copper system, Juab County, in 2007. The property hosts a known historic resource of approximately 400 million tons of 0.33 percent copper and 0.01 percent molybdenum (Krahulec and Briggs 2006). This property was joint-ventured with Freeport-McMoRan Exploration Corporation in 2009, and Freeport began an integrated program of geological mapping, geochemical sampling, geophysical surveying, and drilled seven holes in 2010–11. No additional drilling was completed in 2012.

Star District

Firestrike Resources Limited acquired a property position in the eastern Star Range, Beaver County in 2012 (Figure 8.8). Following an initial dump rock sampling program they drilled 19 shallow, close-spaced holes totaling about 6,542 feet. The best hole (FSRC12-19) cut 44 feet of 0.72 ppm gold beginning at a depth of just 13 feet apparently in a ferruginous fissure zone in the Oligocene Vicksburg quartz monzonite stock.

Spor Mountain

Avalon Rare Metals controls 383 unpatented lode claims (7,900 acres) on a Spor Mountain rare metal prospect, Juab County (Figure 8.8). Geologic and ground magnetic surveys were completed in 2011. In 2012, Avalon completed four core holes totaling 4,055 feet at Spor Mountain. All four holes reportedly encountered intense alteration, brecciation, and faulting typically found near hydrothermal mineralization.

IBC Advanced Alloys Corporation acquired 371 claims adjacent to Materion's (Brush-Wellman's) Spor Mountain beryllium mine, the largest beryllium producer in the world. IBC completed a 4,657-line-mile airborne magnetic and radiometric survey in 2010, which defined several potential targets. In 2011, IBC began drill testing these targets, completing an east-west fence of 35 reverse-circulation holes totaling 18,040 feet south of Materion's property. Preliminary analytical results released in mid-2012 appeared unfavorable, with the best intercept being just 617 ppm beryllium.

Miscellaneous Base Metal and Precious Metal Developments

Newmont Mining Corporation drilled five holes for gold at the Cina mine in north-central Iron County in 2011. The Cina mine is a high-level, epithermal mercury-sulfur system. Analytical results showed very little gold and the property was dropped. Newmont also has two additional sedimentary rock-hosted gold claim blocks in the northern Pilot Range and Goose Creek Mountains of extreme western Box Elder County.

In 2012, Kinross Gold USA, Incorporated staked 305 claims in the Fortuna mining district, Beaver County. The Fortuna district hosts Miocene low-sulfidation, epithermal, gold-silver quartz-adularia-calcite veins. Kinross also acquired a core block of 25 lode claims and a block of patented mining claims covering an additional 260 acres to the south. Drilling was anticipated in 2013.

During 2012, Eurasian Minerals (Bronco Creek) staked 238 lode claims at the Sand Pass distal disseminated silver-gold prospect in the northern House Range, Juab County. Eurasian also acquired a small patented claim block in the northern Ophir mining district, Tooele County.

Grand Central controls a large 4,779-acre Cave mine property position in the Bradshaw silver-gold-lead district of the southern Mineral Mountains, Beaver County. The Cave mine targets include copper-gold skarns and high-grade, precious metal-rich, polymetallic carbonate replacement deposits, like the old Cave mine itself. Initial work included surface and underground geological mapping and geochemical sampling along with a 93-line-mile ground magnetometer survey and some IP surveying.

The Coyote Knolls low-sulfidation silver-gold deposit, Juab County, was acquired by Amnor Energy Corporation in 2012. Coyote Knolls hosts a small, partly drill-defined resource estimated at about 50,000 tons averaging roughly 150 ppm silver and 1 ppm gold developed on a narrow, steeply dipping, high-grade vein/pebble dike that is open at depth. Amnor Energy Corporation began mining operations and built a small, off-site gravity mill west of Eureka. The mill operated by fine crushing and using shaker gravity concentrating tables to produce a concentrate. The whole operation was shut down after only a few weeks of operation due to high levels of mining dilution.

8.1.5 Industrial Minerals

Production and Values

Industrial minerals production in Utah in 2012 had an estimated value of $1.2 billion and was second, at 32 percent, in contribution to the total value of nonfuel minerals produced in Utah (Table 8.4 and Figure 8.6, above). Industrial minerals value in 2012 was approximately equal to the record-breaking value set in 2011. Industrial minerals production value remained steady from 2011 due to continued higher prices and production for some commodities.

The largest overall contributors to the value of industrial minerals production in Utah during 2012 were the brine-derived products of potash, salt, and magnesium chloride, having a combined value of $421.2 million. This value represented 35 percent of total industrial mineral value in 2012, and was an 8 percent increase over 2011. The sand and gravel, crushed stone (including limestone and dolomite), and dimension stone commodity group was the second-largest contributor to the value of industrial minerals production at $201 million. The value of this commodity group accounted for 17 percent of total industrial mineral value in 2012, and decreased 5 percent from 2011. The third-largest overall contribution to the value of industrial minerals production came from Portland cement and lime products, having a combined value of $194 million that accounts for 16 percent of total industrial mineral value in 2012, an increase of 10 percent in value over 2011. These three commodity groups contributed 68 percent of the total value of industrial minerals produced in Utah during 2012. The remaining 32 percent of Utah's total industrial mineral value came from, in decreasing order of value, phosphate, sulfuric acid, gilsonite, clays, expanded shale, and gypsum.

Potash, Salt, and Magnesium Chloride

The brine-derived commodities produced from Great Salt Lake and other deposits were important contributors to the value of Utah's industrial mineral production in 2012, and consisted of salt, magnesium chloride, and potash (in the form of potassium sulfate). Potash in the form of potassium chloride, along with significant amounts of magnesium chloride and lesser amounts of salt, were produced by operations in other parts of the state. Small amounts of concentrated magnesium brine for use in nutritional supplements were produced by Mineral Resources International, Incorporated (NorthShore Limited Partnership).

Potash production in Utah was over 450,000 tons in 2012, and was the largest contributor to the value of the brine-derived commodities group. The 2012 value of potash produced in Utah was approximately $233 million, an increase of about 6 percent from 2011 that was due to increases in production of potassium sulfate and increases in the price of potash. Great Salt Lake Minerals Corporation produces the potassium sulfate variety, whereas Intrepid Potash–Wendover and Intrepid Potash–Moab produce the potassium chloride variety (Figure 8.7).

Utah's salt production in 2012 was approximately 3.18 million tons, an increase of about 10 percent from 2011. This salt production was valued at approximately $154.5 million, an increase of about 8 percent over 2011 that was due to higher production in 2012, since prices remained steady from 2011. Some 84 percent of this salt was produced from Great Salt Lake brine by four operators who were, in descending order of production, (1) Great Salt Lake Minerals Corporation, (2) Cargill Salt Company, (3) Morton International, and (4) U.S. Magnesium (Figure 8.7). The remaining 16 percent came from another three operators who were, in descending order of production, (1) Redmond Minerals, Incorporated near Redmond in Sanpete County, (2) Intrepid Potash–Wendover near Wendover in Tooele County, and (3) Intrepid Potash–Moab near Moab in Grand County.

Magnesium chloride production in Utah was approximately 850,000 tons in 2012, about a 25 percent increase from 2011. Magnesium chloride prices remained steady from 2011, and production value of magnesium chloride was estimated at $34 million, an increase of about 25 percent from 2011 to 2012. Great Salt Lake Minerals Corporation on the east side of Great Salt Lake and Intrepid Potash–Wendover produced the magnesium chloride.

Sand and Gravel, Crushed Stone, and Dimension Stone

Sand and gravel, crushed stone, and dimension stone are produced by commercial operators as well as various county, state, and federal agencies. Due to the large number of producers in this commodity group, it is not practical for the UGS to send annual production questionnaires to all of the operators. However, the UGS does compile data from selected operators to track these commodities, and uses USGS data for production and value figures. In Utah during 2012, approximately 6.8 million tons of sand and gravel was produced, valued at $146 million (USGS, 2013b). About 7.56 million tons of crushed stone having a value of $54.3 million (USGS, 2013b), and an estimated 9,000 tons of dimension stone having a value of approximately $0.7 million, was produced in 2012. Production value for the commodity group in 2012 is approximately $201 million, about a 5 percent decrease from 2011. Unit price for sand and gravel and crushed stone remained steady from 2011, and the value decrease resulted from slightly lower production of these two commodities.

Portland Cement, Lime, and Limestone

Two companies, Ash Grove Cement Company and Holcim, Incorporated, produced Portland cement in Utah during 2012, which amounted to over 1.1 million tons having a value over $100 million. Ash Grove Cement Company operates the Leamington quarry and plant located east of Leamington in Juab County, and Holcim operates the Devils Slide quarry and plant located east of Morgan in Morgan County (Figure 8.7). Portland cement production in 2012 increased about 3 percent over 2011, resulting in a slight value increase for 2012 as well. However, production still remained below the combined potential capacity of the companies' plants of 1.5 million tons of cement annually. Along with limestone, Ash Grove Cement and Holcim also mine small amounts of sandstone, clay, and shale that are used in cement manufacturing.

Lime in 2012 was produced solely by Graymont Western U.S., Incorporated. In the past Lhoist North America has produced dolomitic lime, but their quarry and plant in Tooele County have been idle since 2008. Lime production increased approximately 3 percent from 2011 to 2012. Graymont Western U.S. produces high-calcium quicklime and dolomitic quicklime from their quarry and plant in the Cricket Mountains about 35 miles southwest of Delta in Millard County (Figure 8.7). The annual production capacity when both plants are in operation is over 1.0 million tons.

Limestone production for 2012 amounted to approximately 3.6 million tons. The three operators responsible for most of this production were, in decreasing order of production, (1) Graymont Western U.S., Incorporated, (2) Ash Grove Cement Company, and (3) Holcim, Incorporated. Cotter Corporation in San Juan County produced a lesser amount of limestone for flue-gas desulfurization in coal-fired power plants. Limestone is primarily used in the manufacture of cement and lime products, with lesser amounts used in various aspects of the construction industry, for flue-gas desulfurization in coal-fired power plants, and as a safety product for the coal mining industry as "rock dust."

Phosphate

Simplot Phosphates continues to be the only active phosphate producer in Utah. The company's phosphate operation is located 12 miles north of Vernal in Uintah County (Figure 8.7). In 2012, the mine produced approximately 3.9 million tons of ore, about 7 percent less than in 2011. The ore yields roughly 1.3 million tons of phosphate concentrate (P_2O_5) after processing. The concentrate is then transported in slurry form through a 96-mile underground pipeline to the company's fertilizer plant near Rock Springs, Wyoming. More than 95 percent of the phosphate rock mined in the U.S. was used to manufacture phosphoric acids to make ammonium phosphate fertilizers and animal feed supplements (USGS, 2013a).

Sulfuric Acid

In 2012, KUC's Bingham Canyon mine generated approximately 800,000 tons of sulfuric acid (H_2SO_4), slightly less than in 2011, as a byproduct of the copper-gold-silver smelting process. Although sulfuric acid has been recovered at the Bingham copper smelter since 1917, this is just the second year its dollar value is included in the UGS production survey, now ranking it 5th in contribution to the value of Utah industrial minerals. In 2012, sulfuric acid prices averaged about $138/ton, suggesting a very approximate total value of about $110 million. Sulfuric acid is used in the production of fertilizer and by some gold, copper, uranium, and beryllium producers, as well as in chemical manufacturing, power plants, steel companies, farming, and water treatment.

Gilsonite

Gilsonite is a shiny, black, solid hydrocarbon that forms a swarm of laterally and vertically extensive veins in the Uinta Basin. It has been mined since the late 1880s in Utah and Colorado. In 2012, American Gilsonite Company (Figure 8.7) and Ziegler Chemical and Mineral Company both mined and processed gilsonite at their operations in southeastern Uintah County. Gilsonite production has remained steady from 2011 to 2012 at about 82,000 tons, with American Gilsonite Company responsible for most of that production. Gilsonite production in 2012 is valued at approximately $88.9 million, at an average price of $1087.61/ton (Office of Natural Resources Revenue, 2013), an increase of about 35 percent from 2011 to 2012 due to the significant price increase. Utah is the only place in the world that contains large economic deposits of gilsonite, and it has been shipped worldwide for use in a large number of diverse products ranging from asphalt paving mixes and coating, inks and paints, to oil and gas well drilling (Boden and Tripp, 2012).

Bentonite, Common Clay, and High-Alumina Clay

Production of bentonite, common clay, and high-alumina clay in Utah during 2012 amounted to approximately 273,600 tons, about the same production as in 2011. These commodities are produced by many small and large mines, often on an intermittent basis. Bentonite was produced by two companies, Western Clay Company and Redmond Minerals, Incorporated, which together produced about 70 percent of the total production. Uses for bentonite include well drilling and foundry operations, various civil engineering applications, and as litter-box filler. The largest producers of common clay and high-alumina clay were Interstate Brick Company, and Holcim, Incorporated, respectively, which together produced the remaining 30 percent of the total production. The manufacturing of bricks was the primary use for common clay, and high-alumina clay was used for manufacturing of Portland cement.

Expanded Shale

Expanded shale in Utah is solely produced by Utelite, Incorporated at their quarry and plant near Wanship in Summit County (Figure 8.7). The company produced approximately 119,000 tons in 2012, a decrease of about 14 percent from 2011 production. Expanded shale is a lightweight aggregate, sometimes referred to as “bloated shale,” mainly used by the construction industry. It is produced by heating high-purity shale from the Cretaceous Frontier Formation to about 2000º F, causing it to expand and vitrify. The resulting aggregate is durable, inert, uniform in size, and lightweight, having a density about one-half that of conventional aggregates. Their material is used as aggregate in roof tile, concrete block, and structural concrete, and in other ways in horticulture, highway construction, and loose fill. Some of Utelite’s production is used locally along the Wasatch Front, but much of it is shipped out of state.

Gypsum

Four operators reported combined Utah gypsum production of about 271,000 tons in 2012, an increase of approximately 20 percent over 2011. This production had an estimated value of roughly $3.2 million, also a 20 percent increase over 2011 because 2011 prices remained unchanged (USGS, 2013a). In descending order of production, the four producers were (1) Sunroc Corporation, (2) United States Gypsum Company, (3) Diamond K Gypsum, Incorporated, and (4) Nephi Gypsum. Two wallboard plants are located in Utah, both near the town of Sigurd in Sevier County. The plant operated by United States Gypsum was active in 2012 (Figure 8.7), but the plant operated by Georgia Pacific remains idle due to economic considerations. Utah gypsum is primarily used in the manufacturing of wallboard. Lesser amounts of raw gypsum are used by regional cement companies as an additive to retard the setting time of cement, and by the agriculture industry as a soil conditioner.

Exploration and Development Activity

Industrial minerals exploration and development in Utah follows two separate paths. High-value-per-ton commodities like potash respond to the strength of the world economy because of their ability to withstand shipping charges, and the demand for these products has grown over the past decade. Low-value-per-ton commodities like sand and gravel are developed and used locally and are more reflective of the vigor of the regional market.

Potash

In 2012, industrial minerals exploration activity increased in Utah, principally for potash. Potash exploration has focused on such diverse sources as deep evaporites in the Paradox Basin, and shallow brines in the Sevier Lake playa and in the Great Salt Lake Desert, and alunitized $[KAl_3(SO_4)_2(OH)_6]$ volcanic rocks. The numerous Utah potash projects currently in exploration and development are briefly summarized in Table 8.5.

Table 8.5
Potash Exploration Projects in Utah, 2012

Property	Deposit Type	County	Company	Progress
Blawn Wash	Alunite alteration	Beaver	Potash Ridge Corporation	In-place measured and indicated resource of 620 million tons of about 30% alunite; completed 84 drill holes with more planned for 2013; completed preliminary economic assessment
Bounty Potash	Great Salt Lake Desert, shallow brine	Box Elder	Mesa Exploration Company	Acquired 66,048 acres; historic resource of 5.14 million tons KCl; seeking exploration permits
Crescent Junction	Paradox Basin, deep evaporites	Grand	Pinnacle Potash International	Acquired 13 state leases, completed 1 hole
Green River	Paradox Basin, deep evaporites	Grand	American Potash LLC (Magna Resources Ltd.)	Project area 50,950 acres; received drilling permits on state leases; drilling planned for early 2013
Paradox Basin	Paradox Basin, deep evaporites	Grand	Universal Potash Corporation	Applied for 29,000 acres
Salt Wash	Paradox Basin, deep evaporites	Grand	Mesa Exploration Company	Applied for 21,184 acres
Whipsaw	Paradox Basin, deep evaporites	Grand	Mesa Exploration Company	Applied for 17,968 acres
White Cloud	Paradox Basin, deep evaporites	Grand	Mesa Exploration Company	Applied for 35,510 acres
Sevier Lake	Sevier (Dry) Lake, shallow brine	Millard	Peak Minerals Inc. (EPM Mining Ventures Inc.)	124,221 acres under lease; 426 exploration holes in 2011 and 2012; in-place measured and indicated resource of 32.5 million tons of potassium sulfate; working on preliminary feasibility study
Hatch Point	Paradox Basin, deep evaporites	San Juan	K2O Utah LLC (Potash Minerals Limited)	90,190 acres in Hatch Point area; completed 3 deep holes on SITLA tracts in 2011; seeking federal exploration permit
Lisbon Valley	Paradox Basin, deep evaporites	San Juan	Potash Green Utah LLC (North American Potash Developments Inc.)	State leases and federal prospecting permit applications totaling 31,061 acres in Lisbon Valley, completed 1 hole
Monument	Paradox Basin, deep evaporites	San Juan	Paradox Basin Resources Corp.	Holdings include 104,467 acres of federal land under application, state leases, and private land

Source: Utah Geological Survey, Utah's Extractive Resource Industries 2012.

Halloysite

The Dragon mine is situated in the southern Main Tintic mining district of Juab County in central Utah (Figure 8.8). The Dragon mine had historic production of approximately 1.3 million tons of halloysite, at least 500,000 tons of iron ore, and an uncertain tonnage of oxidized silver-gold ore. Halloysite [$Al_2Si_2O_5(OH)_4$] is a specialty kaolinite-group clay with a unique micro-tubular structure. The iron ore is an exceptionally pure goethite-hematite gossan, probably developed after a massive pyrite vein, and the halloysite is an unusual hydrothermal replacement of susceptible dolomite beds in the adjoining Upper Cambrian Opex Formation. The Dragon open pit has been closed since the last halloysite production in 1976.

Applied Minerals, Incorporated owns the Dragon property (38 patented lode claims) including the Dragon pit, has a large mine permit, and is working toward reopening the mine as an underground operation to produce halloysite and possibly an iron-oxide pigment by-product. Recent drill results from 80 shallow holes in the Dragon pit indicate a measured resource of about 552,500 tons of 64.8 percent halloysite (Applied Minerals, Incorporated 2011). Underground mine development is currently in progress.

Gilsonite

Gilsonite is experiencing increased interest from the oil and gas industry due to its use as a lost circulation additive in well drilling fluids and cementing slurries. Gilsonite sales to the oilfield market have increased over 150 percent since 2009. In response to increased demand, American Gilsonite Company has initiated a significant investment program to open new mines, explore new mine development methods, and develop strategic long-term reserves. The American Gilsonite Company expects to double its current production capacity in the near future (O'Driscoll 2012).

8.1.6 Mineral Resources of Wilderness Study Areas

When the Bureau of Land Management recommends a Wilderness Study Area for wilderness designation, by law a mineral assessment report must be prepared. According to the BLM, there are currently about 3.2 million acres in 95 WSAs in Utah.[209] What follows are excerpts from the mineral assessments conducted for 49 recommended WSAs and excerpts from the EIS for the King Top WSA, which the BLM recommended not be designated wilderness. These materials are taken verbatim from the published reports.

Definitions of Mineral Resource Potential and Certainty of Assessment

The U.S. Geological Survey (USGS) uses a standard classification scheme to estimate mineral resource potential and to characterize the level of certainty behind those estimates. Below is the explanation provided with each mineral assessment conducted for WSAs.

LOW mineral resource potential is assigned to areas where geologic, geochemical, and geophysical characteristics define a geologic environment in which the existence of resources is unlikely. This broad category embraces areas with dispersed but insignificantly mineralized rock as well as areas with few or no indications of having been mineralized.

[209] See www.blm.gov/ut/st/en/prog/blm_special_areas/utah_wilderness/qs_and_as_re__wsas.html, accessed July 30, 2014.

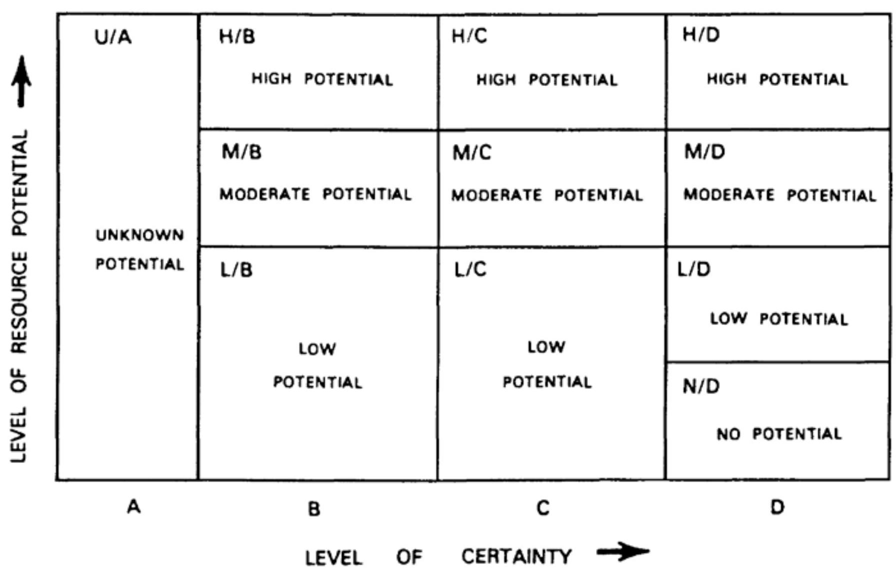
MODERATE mineral resource potential is assigned to areas where geologic, geochemical, and geophysical characteristics indicate a geologic environment favorable for resource occurrence, where interpretations of data indicate a reasonable likelihood of resource accumulation, and (or) where an application of mineral-deposit models indicates favorable ground for the specified type(s) of deposits.

HIGH mineral resource potential is assigned to areas where geologic, geochemical, and geophysical characteristics indicate a geologic environment favorable for resource occurrence, where interpretations of data indicate a high degree of likelihood for resource accumulation, where data support mineral-deposit models indicating presence of resources, and where evidence indicates that mineral concentration has taken place. Assignment of high resource potential to an area requires some positive knowledge that mineral-forming processes have been active in at least part of the area.

UNKNOWN mineral resource potential is assigned to areas where information is inadequate to assign low, moderate, or high levels of resource potential.

NO mineral resource potential is a category reserved for a specific type of resource in a well-defined area.

Figure 8.9
USGS Resource Potential and Certainty Matrix



Source: Dickerson, Case, and Barton 1988.

A. Available information is not adequate for determination of the level of mineral resource potential.
B. Available information suggests the level of mineral resource potential.
C. Available information gives a good indication of the level of mineral resource potential.
D. Available information clearly defines the level of mineral resource potential.

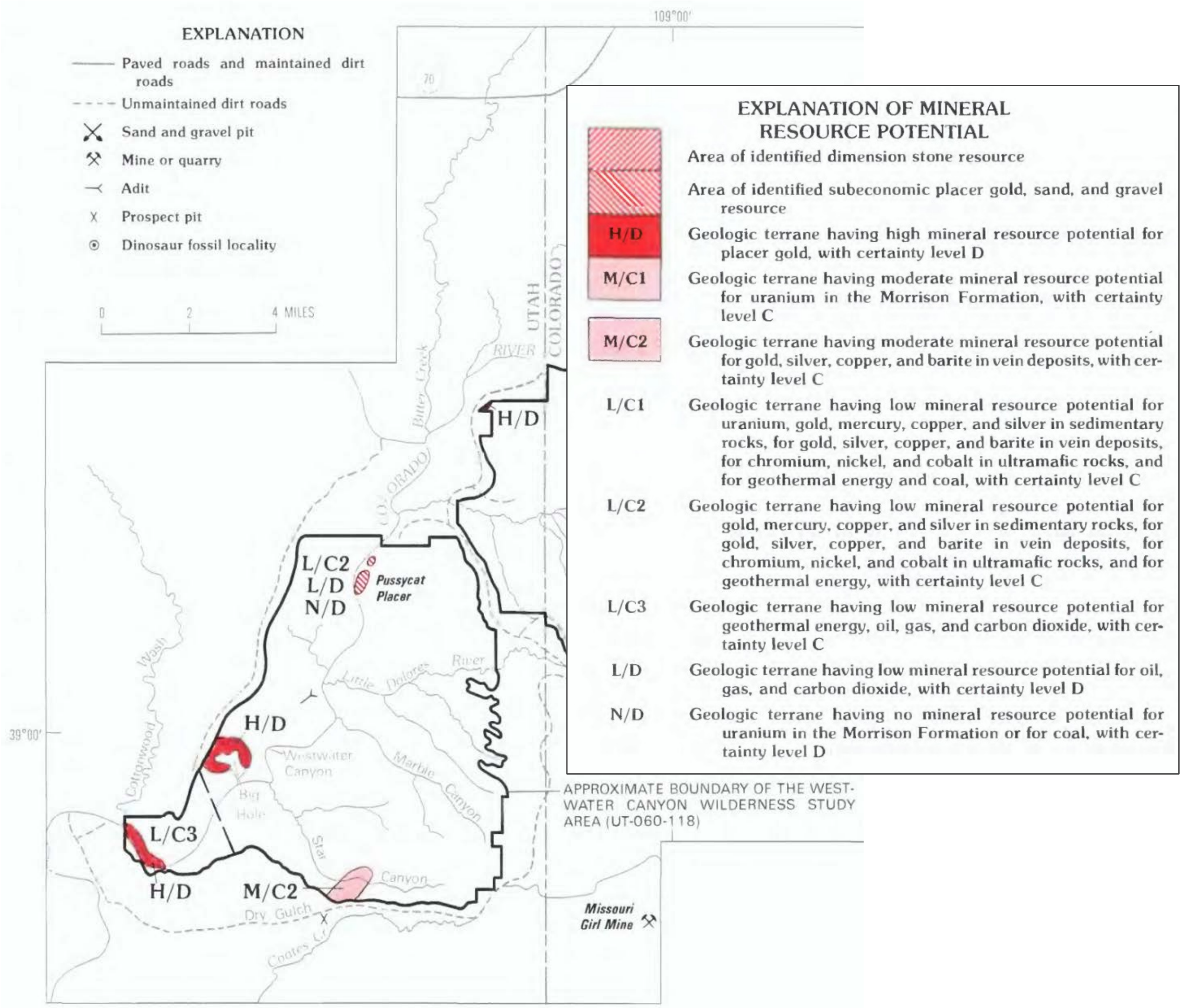
(Reproduced from the appendix of Dickerson, Case, and Barton 1988.)

Westwater Canyon

In 1986 the U.S. Bureau of Mines and the U.S. Geological Survey conducted studies to appraise the identified mineral resources (known) and assess the mineral resource potential (undiscovered) of 73,937 acres of the Black Ridge Canyons (CO-Q70-113/113A; UT-060-116/117) and 31,160 acres of the Westwater Canyon (UT-060-118) Wilderness Study Areas in western Colorado and eastern Utah.[210] Subeconomic placer gold deposits were identified along the Colorado River at the Pussycat claims in the Westwater Canyon study area. There is a high mineral resource potential for placer gold adjacent to the Colorado River and in terrace deposits above it. There is a moderate resource potential for gold, silver, copper, and barite in vein deposits in the southern part of the Westwater Canyon Wilderness Study Area. There is no resource potential for uranium occurrence due to complete erosion of the Morrison Formation. There is a low resource potential for gold, silver, mercury, copper, and uranium in the Chinle Formation, and for chromium, nickel, and cobalt resources in Precambrian rocks. Geological, geochemical, and geophysical studies indicate a low energy resource potential for undiscovered oil, natural gas, carbon dioxide, and geothermal energy, and a low mineral resource potential for the above-mentioned mineral resources where not specified differently. There is no potential for coal in the Westwater Canyon Study Area (Figure 8.10). (Dickerson, Case, and Barton 1988)

[210] The Black Ridge Canyons WSA became Designated Wilderness as part of the Omnibus Public Lands Management Act of 2009, Public Law 111-11. Discussion of this WSA's mineral resources has been omitted.

Figure 8.10
Mineral Resource Potential of the Westwater Canyon WSA

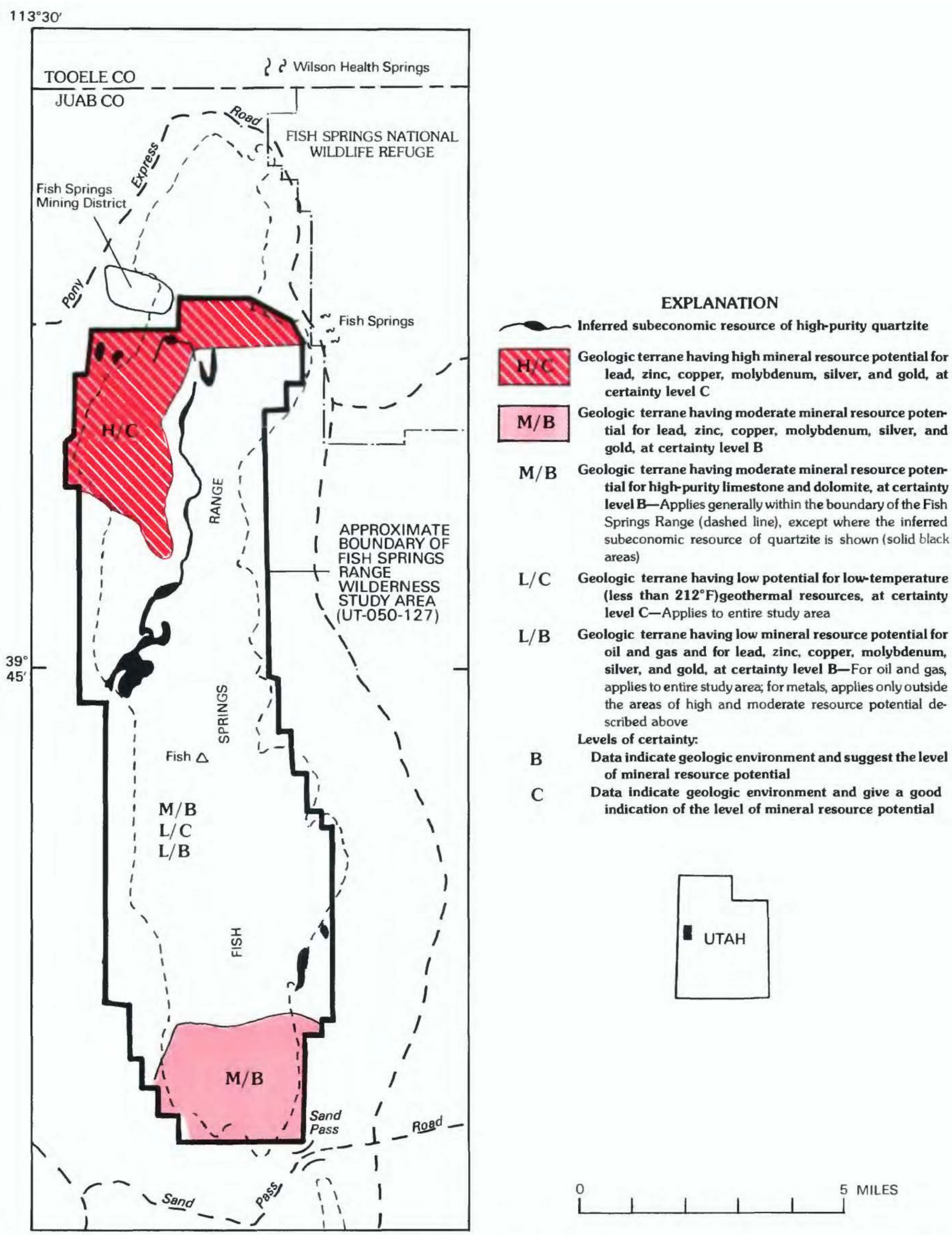


Source: Dickerson, Case, and Barton 1988.

Fish Springs Range

The Fish Springs Range Wilderness Study Area (UT-050-127) includes most of the Fish Springs Range and is located north of the House Range, about 50 miles northwest of the city of Delta, Utah. A mineral resource study of the 33,840-acre area was completed in 1987 by the U.S. Geological Survey (USGS) and U.S. Bureau of Mines (USBM). The northwestern and southeastern parts of the wilderness study area contain inferred subeconomic resources of high-purity quartzite. No metallic mineral resources were identified in the study area, but more than 17 million pounds of lead, 2.6 million ounces of silver, and minor copper, zinc, and gold have been produced from the Fish Springs mining district, which is immediately outside the northwest boundary of the wilderness study area. The potential for undiscovered deposits of these metals and molybdenum is high near the northern end of the study area, adjacent to the mining district, moderate near the southern end, and low in the remainder of the area. The resource potential for undiscovered deposits of high-purity limestone and dolomite is moderate throughout the study area except where quartzite is present; potential for undiscovered low-temperature geothermal resources and for oil and gas is low throughout the study area (Figure 8.11). (Lindsey et al. 1989)

Figure 8.11
Identified Resources and Mineral Resource Potential of the Fish Springs Range WSA



Source: Lindsey at al., 1989.

North Stansbury Mountains

In 1985, the USBM and the USGS appraised the mineral resources and assessed the mineral resource potential of the North Stansbury Mountains (UT-020-089) Wilderness Study Area. This area covers approximately 10,175 acres (15.9 square miles) near the northern end of the Stansbury Mountains in northwestern Utah. The area lies 45 miles west of Salt Lake City, about 20 miles west of the Oquirrh Mountains, and 55 miles northwest of the East Tintic Mountains. Both the Oquirrh and East Tintic Mountains are noted for large base- and precious-metal deposits.

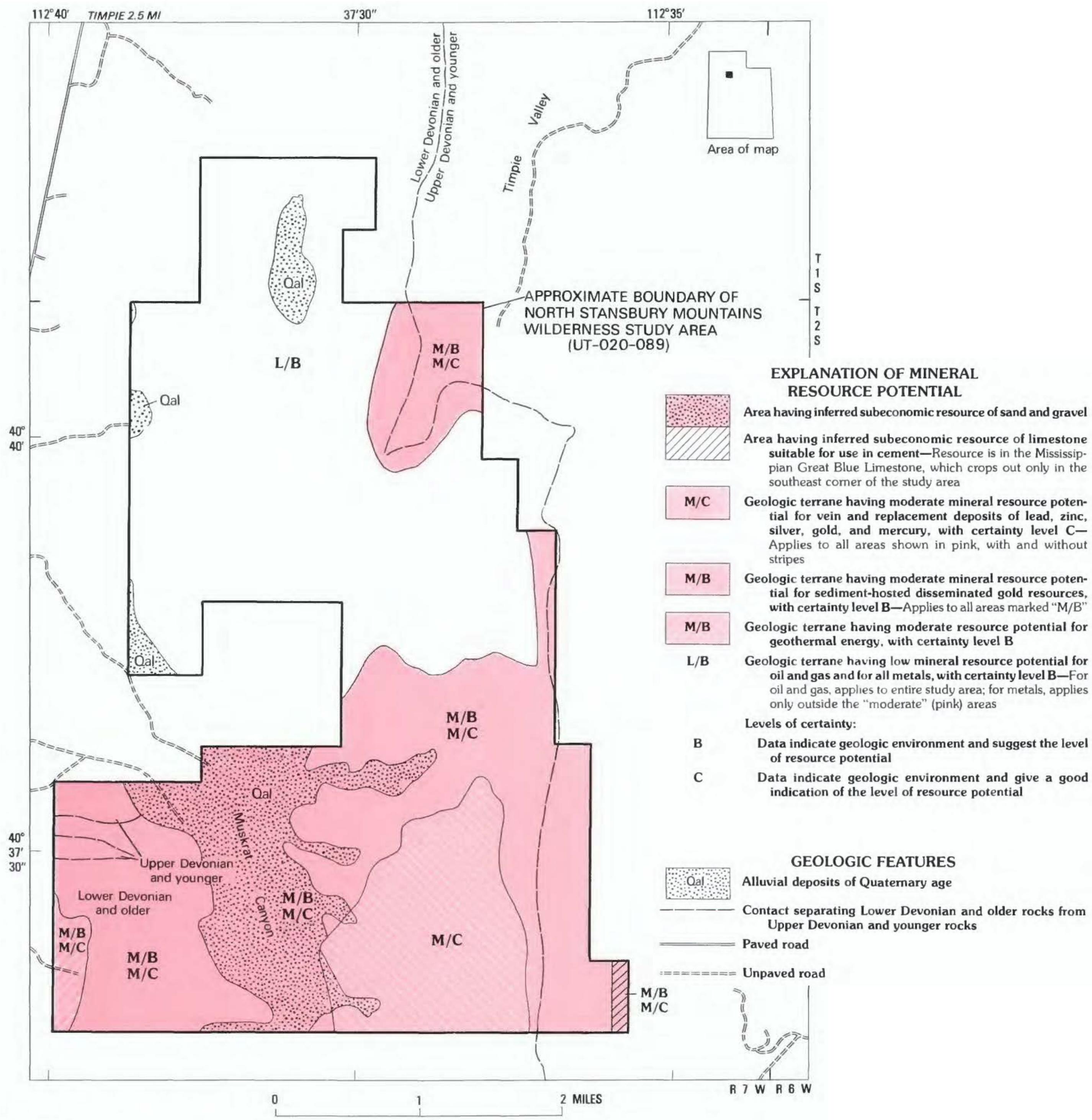
A small area in the southeastemmost part of the study area has inferred subeconomic resources of limestone suitable for use in making cement. Inferred subeconomic resources of sand and gravel exist within Muskrat Canyon. These inferred subeconomic resources are not likely to be developed. There are no other identified resources in the study area.

Mineral occurrences and geochemical anomalies in and near the study area are similar to those observed near some of the deposits in the Oquirrh and East Tintic Mountains and provide evidence that hydrothermal mineralization has occurred within the eastern and southern parts of the study area. These parts are considered to have a moderate mineral resource potential for undiscovered lead, zinc, silver, gold, and mercury in vein and replacement deposits. The remaining parts of the study area are assigned a low mineral resource potential for lead, zinc, silver, gold, and mercury in vein and replacement deposits.

In the southwestern and eastern parts of the study area, some samples contain anomalous amounts of silver, bismuth, antimony, arsenic, and, in a few cases, mercury. This same geochemical suite is associated with some sediment-hosted disseminated gold deposits, such as the Mercur deposit in the adjacent Oquirrh Mountains. Based on this association, areas underlain by carbonate and fine-grained siliceous rocks in the southern and eastern parts of the study area are assigned a moderate potential for undiscovered sediment-hosted, disseminated gold resources. The remainder of the area has low potential for gold resources.

A small portion of the southwestern part of the study area may contain thermal waters and is assigned a moderate potential for undiscovered geothermal resources. The entire study area is assigned a low potential for oil and gas resources (Figure 8.12). (Foose et al. 1989)

Figure 8.12
Mineral Resource Potential and Pertinent Geologic Features of the North Stansbury Mountains WSA



Source: Foose et al. 1989.

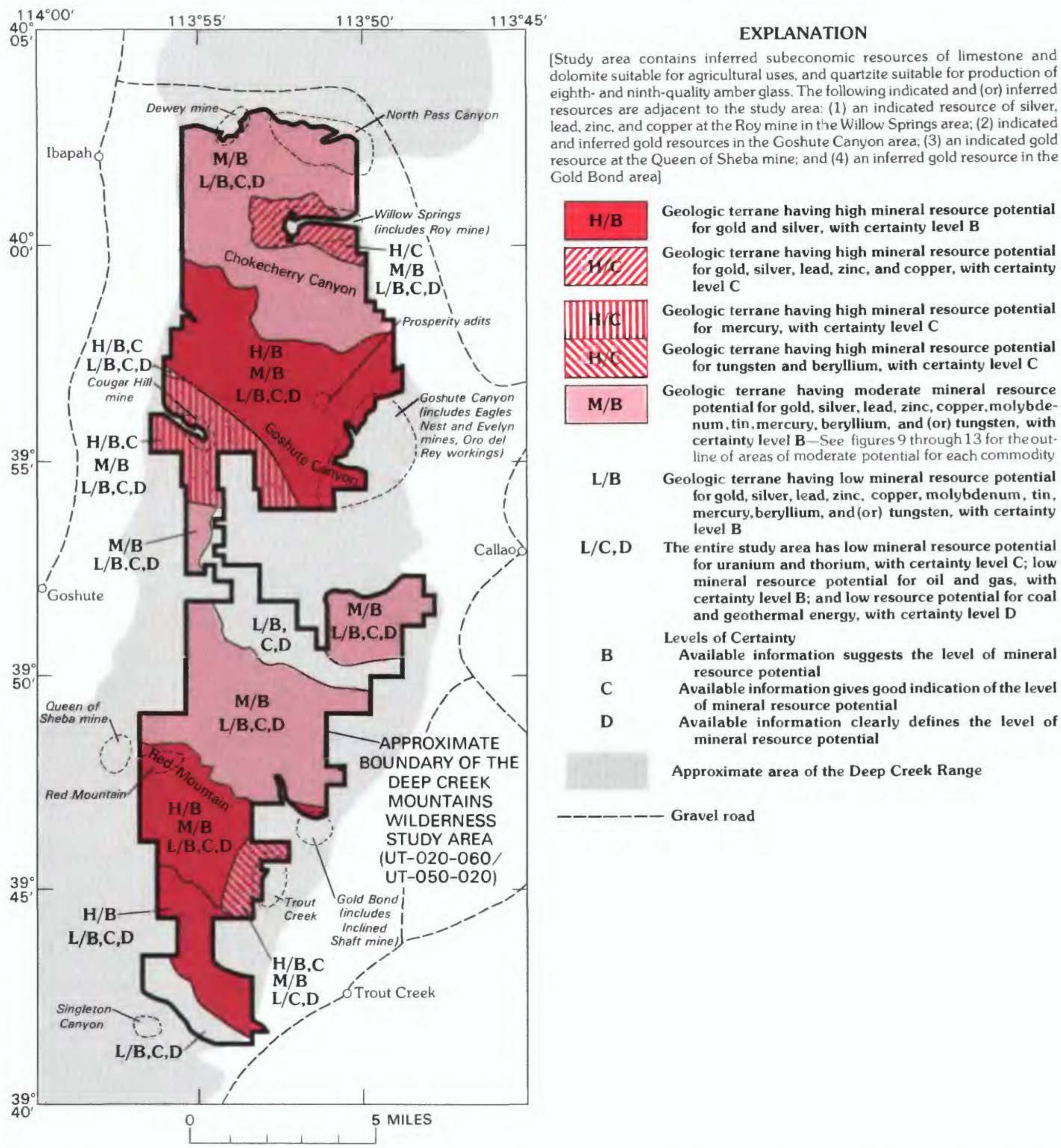
Deep Creek Mountains

The Deep Creek Mountains Wilderness Study Area (UT-020-Q60/UT-Q50-020) includes most of the Deep Creek Range of west-central Utah. The area is near the Utah-Nevada State line, south of Wendover, Utah, and northwest of Delta, Utah. Eleven areas of mineralized rock in and near the study area were evaluated by the USBM. Four of these areas contain identified resources: (1) an indicated resource of 5,000 tons of 16.5 ounces silver per short ton, 4.1 percent lead, 4.6 percent zinc, and 0.25 percent copper, at the Willow Springs area, which is almost surrounded by the study area in the northeast corner although it is not part of the study area; (2) an indicated gold resource of 774,000 tons of 0.4 ounces per ton and an inferred gold resource of 5.7 million tons of 0.4 ounces per ton in the Goshute Canyon area immediately east of the study area; (3) an indicated gold resource of 75,000 tons of 0.22 ounces per ton in the Queen of Sheba mine just west of the study area; and (4) an inferred gold resource of 3,800 tons of 0.26 ounces per ton in the Gold Bond area immediately east of the study area. Gold resources at the Queen of Sheba mine and at the Gold Bond area are too low grade to warrant an economic evaluation. The small tonnage and thin vein width of the deposit at the Willow Springs area combine to make that deposit subeconomic.

Much of the study area is underlain by Late Proterozoic to Lower Cambrian quartzite and Middle Cambrian to Pennsylvanian carbonate rock and contains vast quantities of limestone, dolomite, and quartzite. The limestone and dolomite are suitable for agricultural uses, and the quartzite is suitable for use in the production of eighth- and ninth-quality amber glass. These commodities are not likely to be mined in the foreseeable future because the study area is so remote.

Most of the study area has moderate to high potential for undiscovered tungsten, mercury, gold, silver, lead, zinc, copper, molybdenum, tin, and (or) beryllium resources. The entire study area has low potential for undiscovered uranium, thorium, oil, gas, coal, and geothermal energy resources (Figure 8.13). (Nutt et al. 1990)

Figure 8.13
Mineral Resource Potential of the Deep Creek Mountains WSA

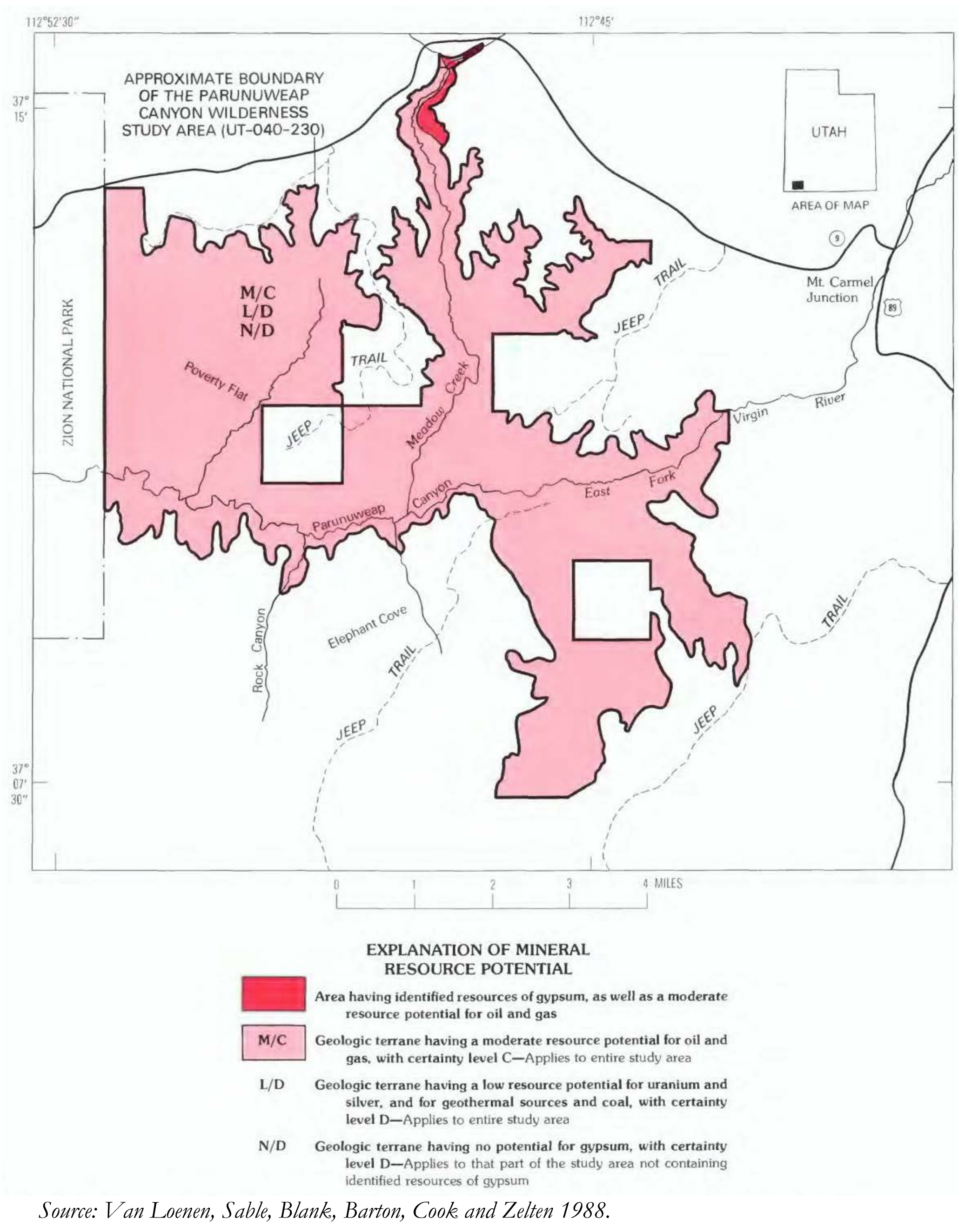


Source: Nutt et al. 1990.

Parunuweap Canyon

The Parunuweap Canyon Wilderness Study Area (UT-Q4Q-230) is in southwestern Utah adjacent to Zion National Park. A small part of the study area contains identified (known) resources of gypsum, and the study area also contains inferred subeconomic resources of sandstone, sand and gravel, and ornamental stone. The study area has a moderate resource potential for undiscovered oil and gas; a low potential for undiscovered uranium and silver resources, and for undiscovered geothermal energy and coal resources; and no potential for gypsum outside the small area that has identified resources (Figure 8.14). (Van Loenen, Sable, Blank, Barton, Cook and Zelten 1988)

Figure 8.14
Mineral Resource Potential of the Parunuweap Canyon WSA

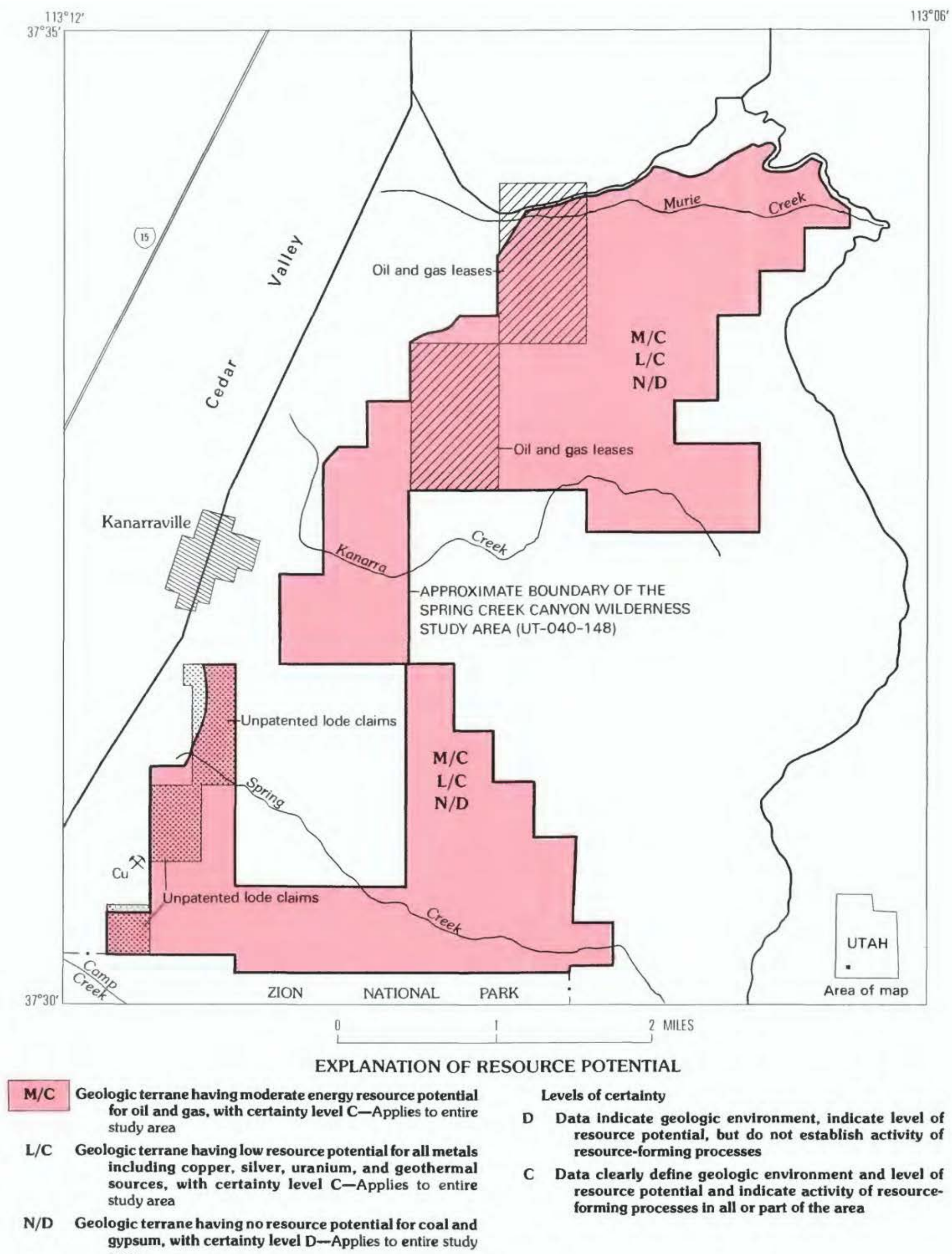


Source: Van Loenen, Sable, Blank, Barton, Cook and Zelten 1988.

Spring Creek Canyon

The Spring Creek Canyon Wilderness Study Area (UT-040-148) is in southwestern Utah adjacent to the northern boundary of Zion National Park and covers about 4,433 acres. Inferred subeconomic resources of common variety sand, sandstone, and limestone occur in the study area. The study area has a moderate potential for undiscovered resources of oil and gas and low potential for all metallic resources (including copper, silver, and uranium) and geothermal resources (Figure 8.15). No potential exists for coal and gypsum resources. (Van Loenen, Blank, Sable, Lee, Cook, and Zelten 1989)

Figure 8.15
Mineral and Energy Resource Potential of the Spring Creek Canyon WSA

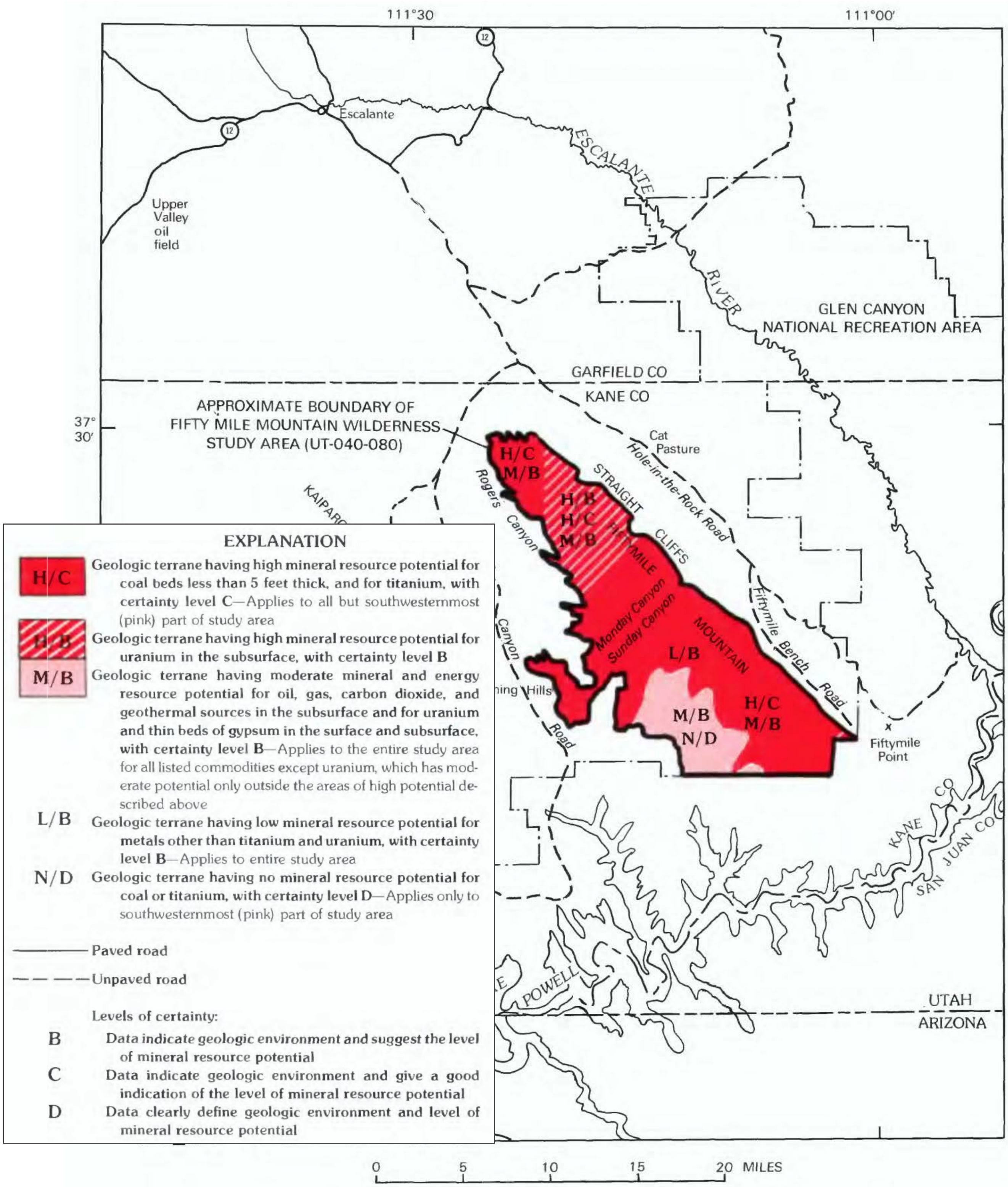


Source: Van Loenen, Blank, Sable, Lee, Cook, and Zelten 1989.

Fifty Mile Mountain

The Fifty Mile Mountain Wilderness Study Area (UT-040-080) is in south-central Utah in Kane County near the border with Arizona. No economic or marginally economic resources were identified in the study area. There are, however, inferred subeconomic resources of sandstone and sand and gravel. All or part of four lode and one placer claim blocks have been staked within the study area. All are located for either uranium or titanium. The mineral resource potential for undiscovered coal and titanium resources is high, except in the southwesternmost part of the study area, which has no potential for either commodity. The mineral resource potential for undiscovered uranium is high in the north-central part and southeastern tip of the study area and moderate elsewhere. The potential for undiscovered geothermal, oil, gas, gypsum, and carbon dioxide resources is moderate. The potential for undiscovered metals, excluding uranium and titanium, is low (Figure 8.16). (Bartsch-Winkler, Barton, Cady, Cook, and Martin 1988)

Figure 8.16
Mineral Resource Potential of the Fifty Mile Mountain WSA

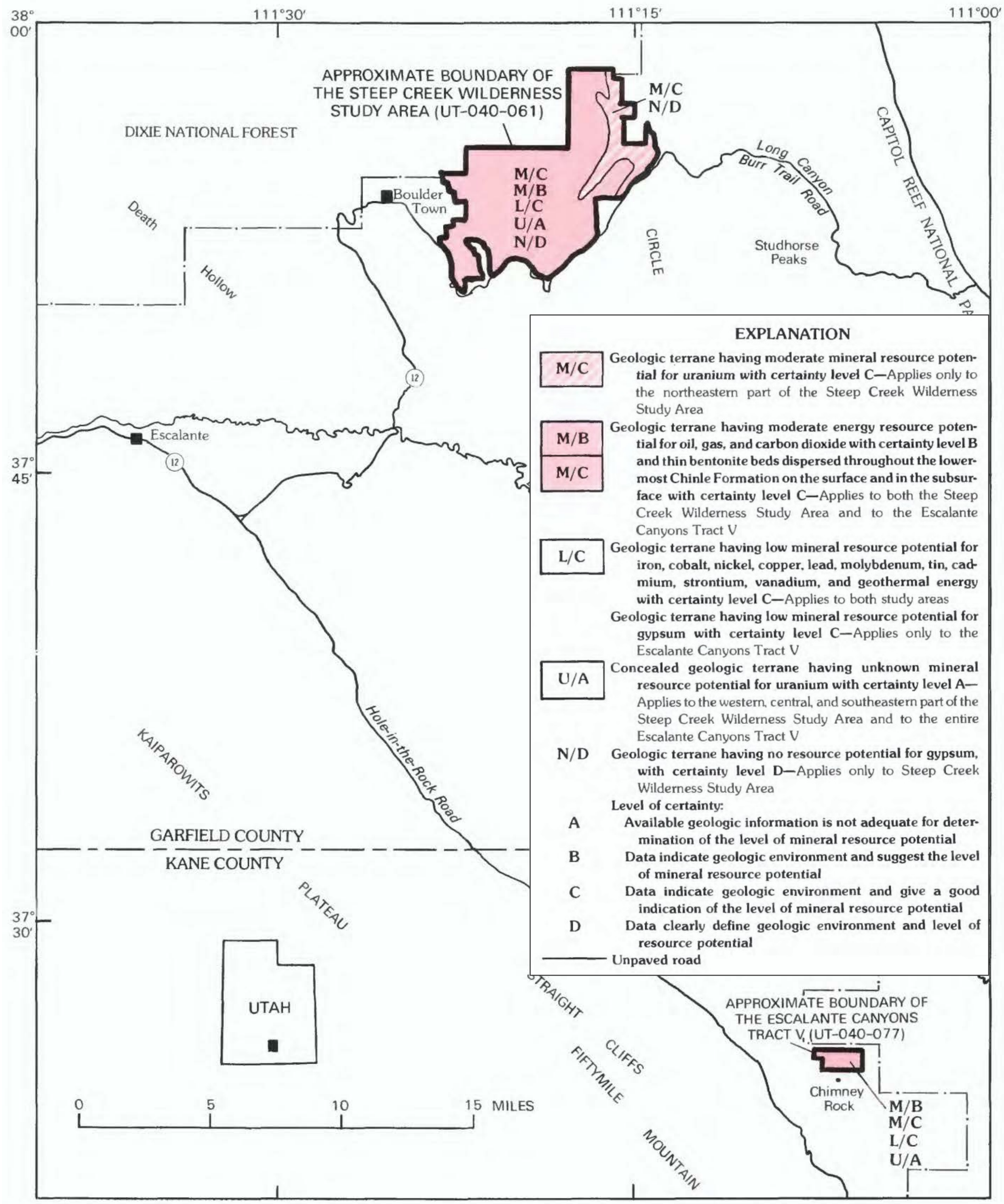


Source: Bartsch-Winkler, Barton, Cady, Cook, and Martin 1988.

Steep Creek and Escalante Canyons Tract V

The Steep Creek Wilderness Study Area (UT-040-061) and the Escalante Canyons Tract V (UT-040-077) are located in south-central Utah in Garfield and Kane Counties, respectively, west of Capitol Reef National Park. Inferred subeconomic resources of bentonite are present in the Steep Creek Wilderness Study Area; inferred subeconomic resources of decorative and dimension stone are present in both study areas. Petrified wood is present in the Steep Creek Wilderness Study Area, but does not constitute a resource. The mineral resource potential for undiscovered bentonite, oil, gas, and carbon dioxide is moderate in both study areas, and the mineral resource potential for undiscovered uranium is moderate in the northeastern part of the Steep Creek Wilderness Study Area and unknown in the western part of the Steep Creek Wilderness Study Area and in the Escalante Canyons Tract V. In both areas, the mineral resource potential for undiscovered iron, cobalt, nickel, copper, lead, molybdenum, tin, cadmium, strontium, and vanadium is low, as is the potential for geothermal energy. Low potential for undiscovered gypsum resources exists in the Escalante Canyons Tract V, and no potential for undiscovered gypsum resources exists in the Steep Creek Wilderness Study Area (Figure 8.17). (Bartsch-Winkler, Goldfarb, Cady, Duval, Kness, Corbetta, and Cook, 1988)

Figure 8.17
Mineral Resource Potential of the Steep Creek WSA and Escalante Canyons Tract V

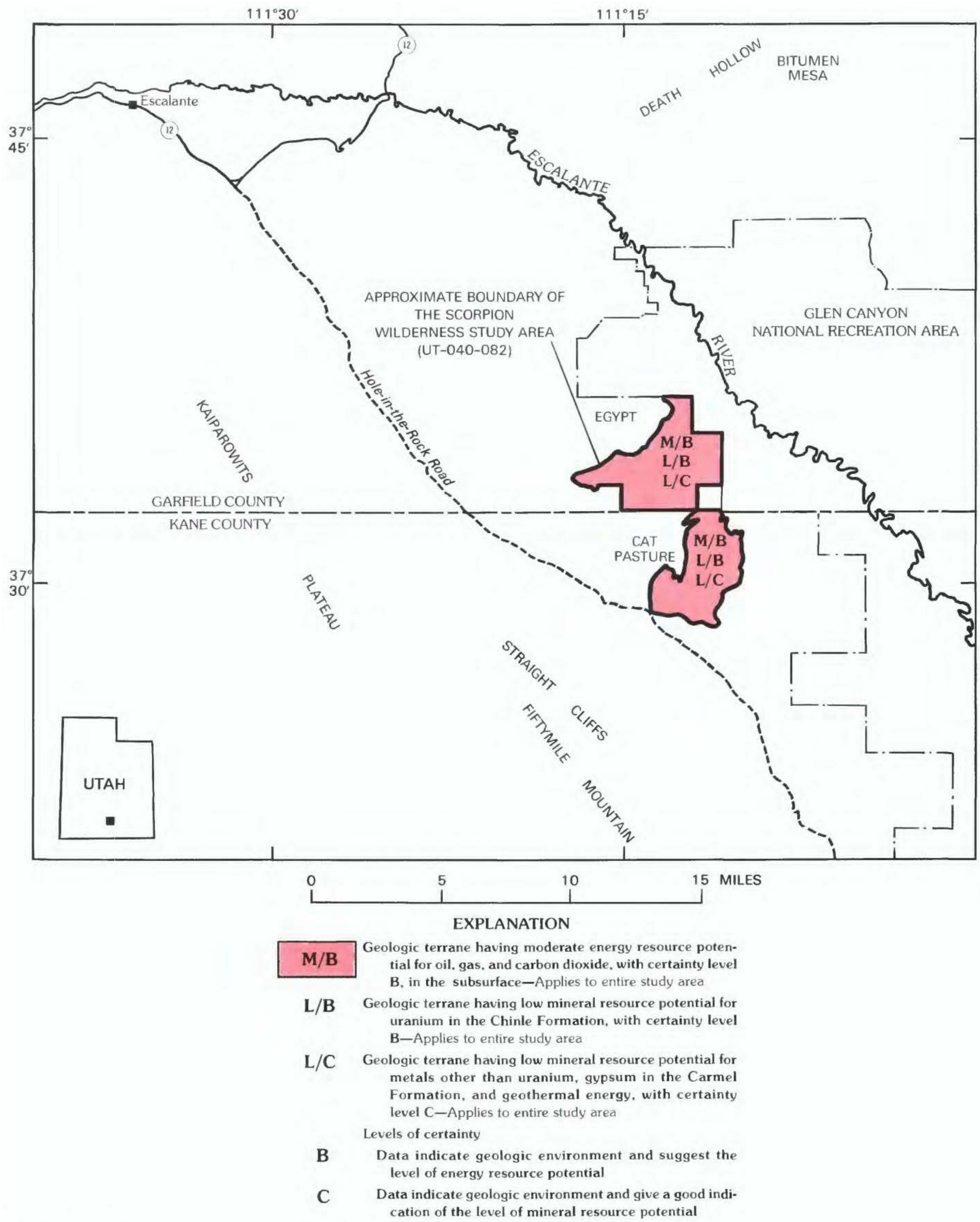


Source: Bartsch-Winkler, Goldfarb, Cady, Duval, Kness, Corbetta, and Cook, 1988

Scorpion

The Scorpion Wilderness Study Area is in south-central Utah in Garfield and Kane Counties west of Glen Canyon National Recreation Area and Capitol Reef National Park. No mining claims or oil and gas leases or lease applications extend inside the study-area boundary. Demonstrated subeconomic resources of less than 30,000 short tons of gypsum are estimated to occur in the study area. The Navajo Sandstone could have industrial uses, but it is not considered an economic resource within the study area due to the distance from markets. Sand deposits in the study area are not unique, and similar deposits are closer to existing markets. The mineral resource potential for undiscovered gypsum in the Carmel Formation and the energy resource potential for geothermal resources is low. The mineral resource potential for uranium is low. The mineral resource potential for metals other than uranium is low. The energy resource potential for oil, gas, and carbon dioxide is moderate (Figure 8.18). (Bartsch-Winkler, Jones, Kilburn, Cady, Duval, Cook, Lane, and Corbetta 1989)

Figure 8.18
Mineral Resource Potential of the Scorpion WSA

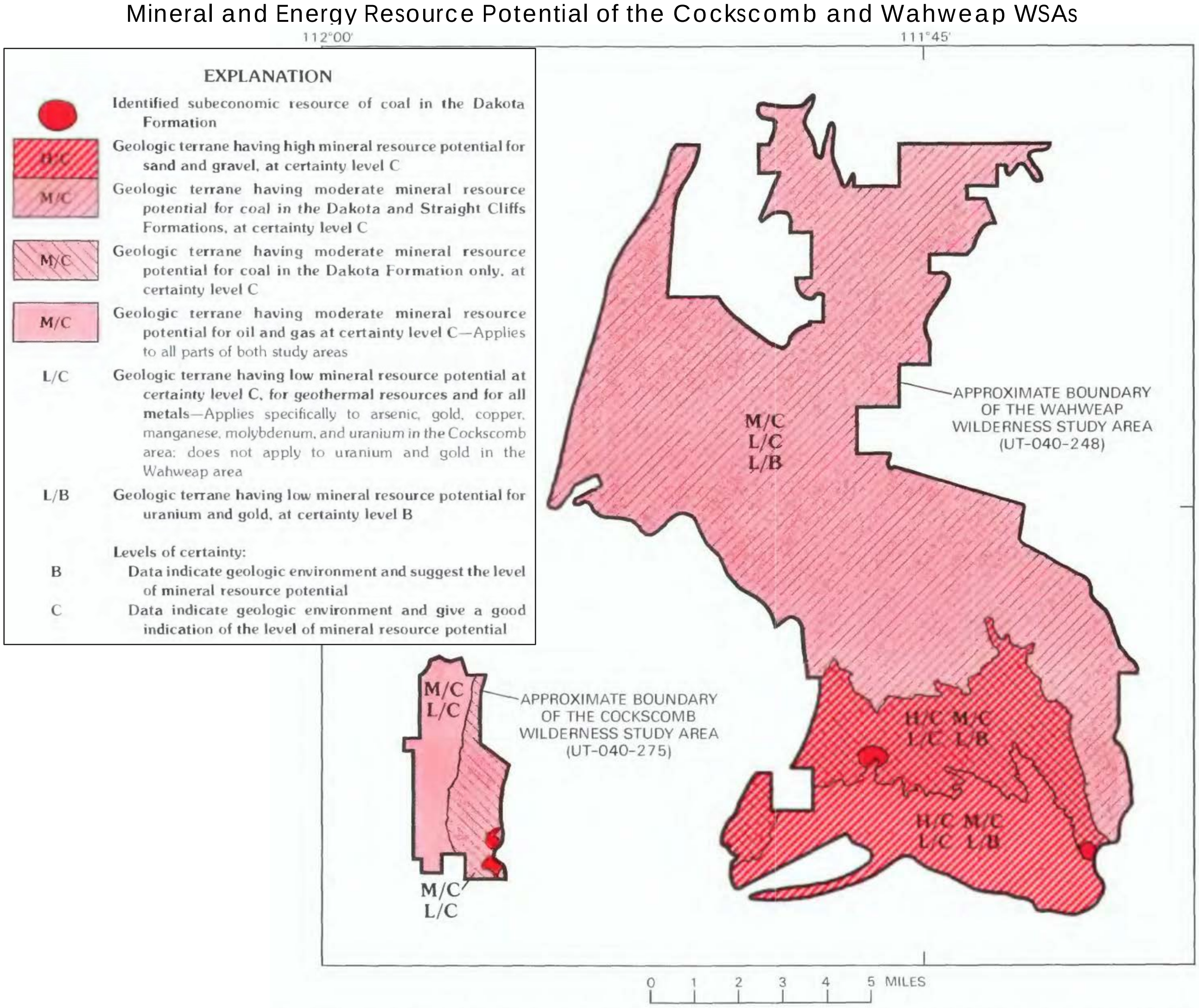


Source: Bartsch-Winkler, Jones, Kilburn, Cady, Duval, Cook, Lane, and Corbetta 1989.

Cockscomb and Wahweap

The Cockscomb (UT-040-275) and Wahweap (UT-040-248) Wilderness Study Areas are in Kane County, Utah, west of the Kaiparowits Plateau. These study areas are underlain by gently folded sedimentary rocks: the eastdipping East Kaibab monocline in the western part of the Cockscomb study area, and relatively horizontal beds to the east and in the Wahweap study area. No identified resources of metals or nonmetallic minerals occur, but about 1.8 million tons of identified subbituminous coal resources are estimated for the Cockscomb study area, and about 350,000 tons for the Wahweap area. The mineral resource potential for all metals, including gold and uranium, is low in both study areas. Gravel deposits have been mined nearby, and the mineral resource potential is high for additional deposits of sand and gravel in the southern end of the Wahweap Wilderness Study Area. A moderate energy resource potential exists for coal in the Dakota Formation in both study areas, and for coal in the Straight Cliffs Formation in the Wahweap Study Area. The resource potential in both study areas is moderate for oil and gas, and low for geothermal energy (Figure 8.19). (Bell, Kilburn, Cady, and Lane 1990)

Figure 8.19
Mineral and Energy Resource Potential of the Cockscomb and Wahweap WSAs

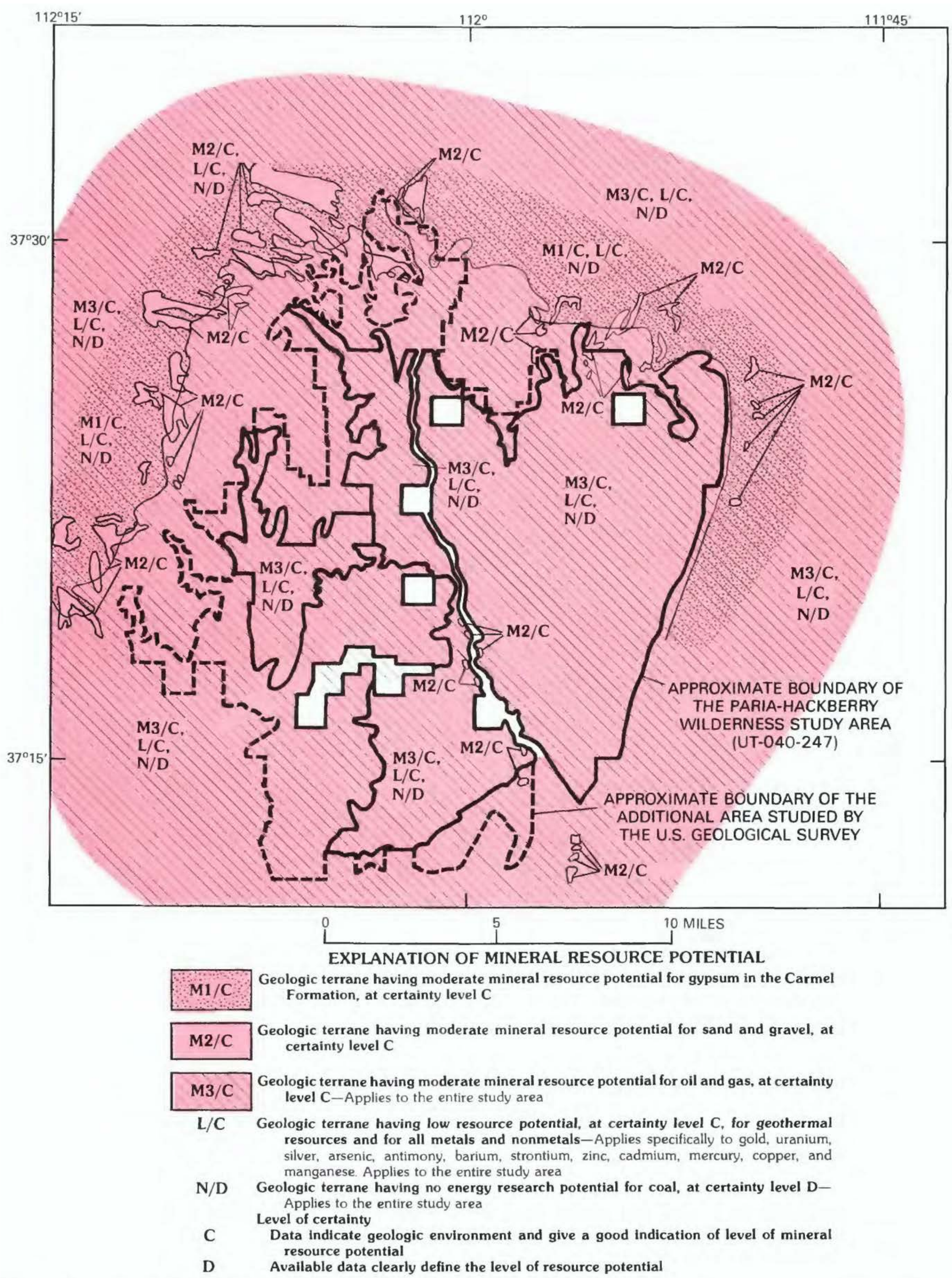


Source: Bell, Kilburn, Cady, and Lane 1990.

Paria-Hackberry

The Paria-Hackberry Wilderness Study Area, in central Kane County, southern Utah, is a region of generally flat-lying, gently folded sedimentary rocks, bounded on the east by the east-dipping limb of the East Kaibab monocline and cut by sheer-walled, narrow canyons. The area selected for study by the U.S. Bureau of Land Management totaled 94,642 acres (148 square miles); because of uncertainty as to final boundaries, the U.S. Geological Survey studied an additional contiguous 41,180 acres (64 square miles). No identified resources of metals or nonmetallic minerals are present in the study area. An unsuccessful attempt to recover "flour" gold from the Chinle Formation was made at the now-abandoned townsite of Paria. The mineral resource potential for all metals, including gold, uranium, barium, silver, strontium, arsenic, antimony, mercury, copper, manganese, cadmium, and zinc, is low for the entire wilderness study area. The likelihood of occurrence of "decorative-use" gypsum and of sand and gravel is moderate in limited areas of the northern part of the Paria-Hackberry Wilderness Study Area and, for sand and gravel, in a few small occurrences along the Paria River valley. A moderate energy resource potential is assessed for oil and gas and a low potential for geothermal energy, for the entire study area. There is no energy resource potential for coal (Figure 8.20). (Bell, Bush, Turner, Cady, Brown, Hannigan, and Thompson 1991)

Figure 8.20
Mineral and Energy Resource Potential of the Paria-Hackberry WSA

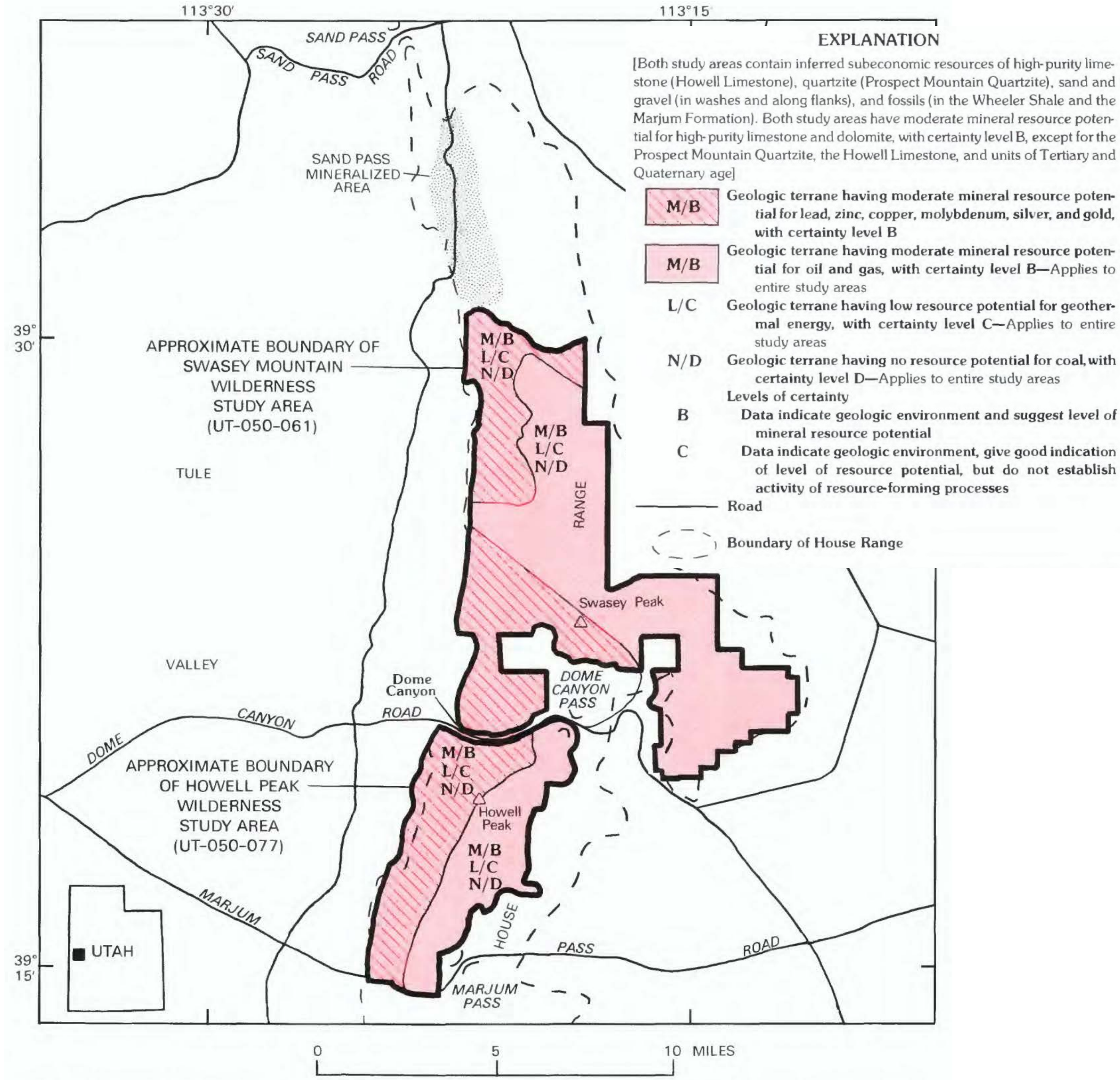


Source: Bell, Bush, Turner, Cady, Brown, Hannigan, and Thompson 1991

Swasey Mountain and Howell Peak

The Swasey Mountain (UT-050-061) and Howell Peak (UT-050-077) Wilderness Study Areas are in the northern House Range, Millard County, Utah. The Swasey Mountain Wilderness Study Area includes 34,376 acres, and the Howell Peak Wilderness Study Area includes 14,800 acres that were evaluated for this report. The House Range is about 40 miles west of the city of Delta. A mineral resource study of the areas was completed in 1987 by the USGS and USBM. No mineral production has been recorded for either the Swasey Mountain or the Howell Peak Wilderness Study Areas. Oil and gas leases cover most of both study areas. Inferred subeconomic resources in both study areas are high-purity limestone, quartzite, and sand and gravel. Fossils, especially trilobites, of interest to collectors are also present in both areas. The northern part of the Swasey Mountain Wilderness Study Area has moderate potential for undiscovered resources of lead, zinc, copper, molybdenum, silver, and gold, including disseminated gold deposits. The southwestern part of the Swasey Mountain Wilderness Study Area and the western part of the Howell Peak Wilderness Study Area have moderate potential for resources of these metals. Potential for undiscovered deposits of high-purity limestone and dolomite and for oil and gas is moderate for both study areas. The potential for undiscovered resources of geothermal energy is low in both areas. There is no potential for undiscovered resources of coal (Figure 8.21). (Lindsey, Zimbelman, Campbell, Duval, Cook, Podwysocki, Brickey, Yambrick, and Tuftin 1989)

Figure 8.21
Mineral Resource Potential of the Swasey Mountain and Howell Peak WSAs

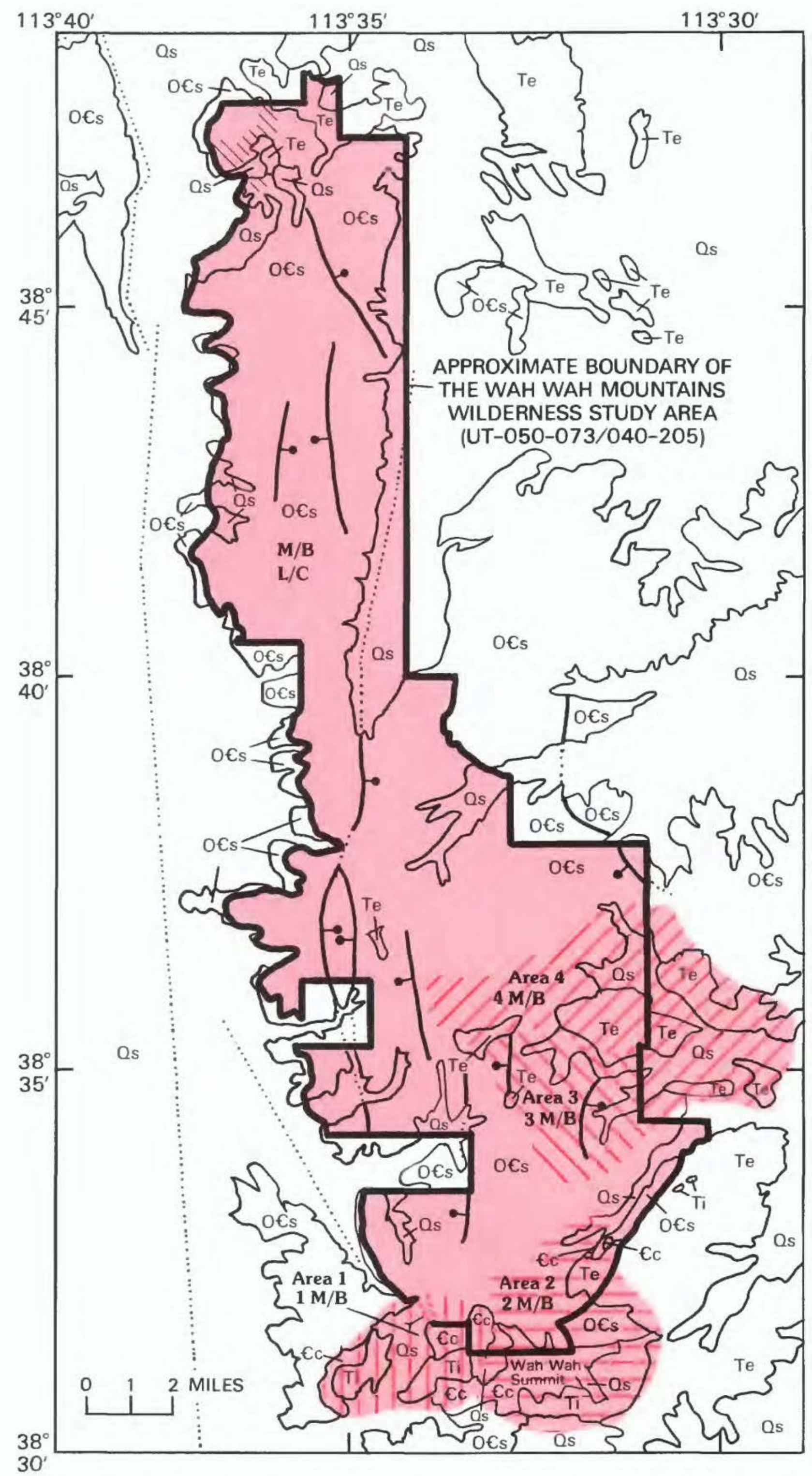


Source: Lindsey, Zimbelman, Campbell, Duval, Cook, Podwysocki, Brickey, Yambrick, and Tuftin 1989.

Wah Wah Mountains

The Wah Wah Mountains Wilderness Study Area (UT-050-073/040-205) includes 36,382 acres in the northern part of the Wah Wah Mountains in western Utah. Identified resources in the Wah Wah Mountains Wilderness Study Area include two small iron occurrences on the southwestern boundary, consisting of less than 100 tons of inferred subeconomic iron-rich material. The study area also has millions of cubic yards of inferred subeconomic resources of limestone and dolomite suitable for industrial and agricultural uses; of sandstone and quartzite suitable for container glass and industrial use; and of limestone, sandstone, and volcanic rock suitable for construction purposes. The wilderness study area has moderate energy resource potential for undiscovered oil and natural gas, and low energy resource potential for undiscovered uranium and geothermal energy. Several areas in the southern half of the wilderness study area have moderate mineral resource potential for undiscovered zinc, cadmium, and antimony, and moderate resource potential for associated molybdenum, lead, arsenic, bismuth, tungsten and gold in several types of vein and replacement bodies and in concealed igneous breccia deposits. The metal occurrences are attributed to episodes of epithermal (low-temperature) mineralization originating with Tertiary igneous activity. Some of the metals occur within an alteration zone around Tertiary intrusions. The rest of the study area has low resource potential for undiscovered zinc, cadmium, antimony, tungsten, molybdenum, lead, arsenic, bismuth, and gold (Figure 8.22 and Table 8.6). (Cox et al. 1989)

Figure 8.22
Identified Resources and Mineral Resource Potential of the
Wah Wah Mountains WSA



Source: Cox et al. 1989.

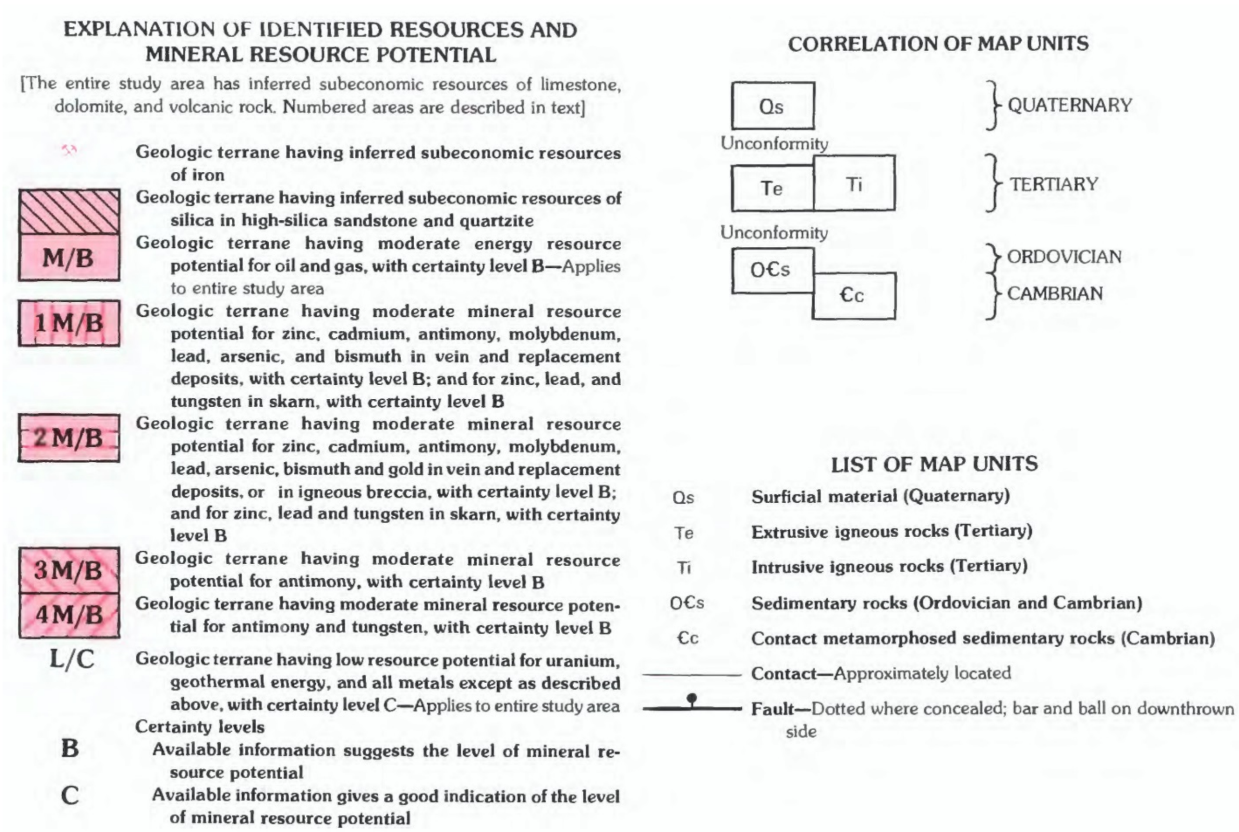


Table 8.6
Summary of Areas Having Mineral Resource Potential in and Adjacent to the Wah Wah WSA
(Commodities Listed in Order of Relative Importance)

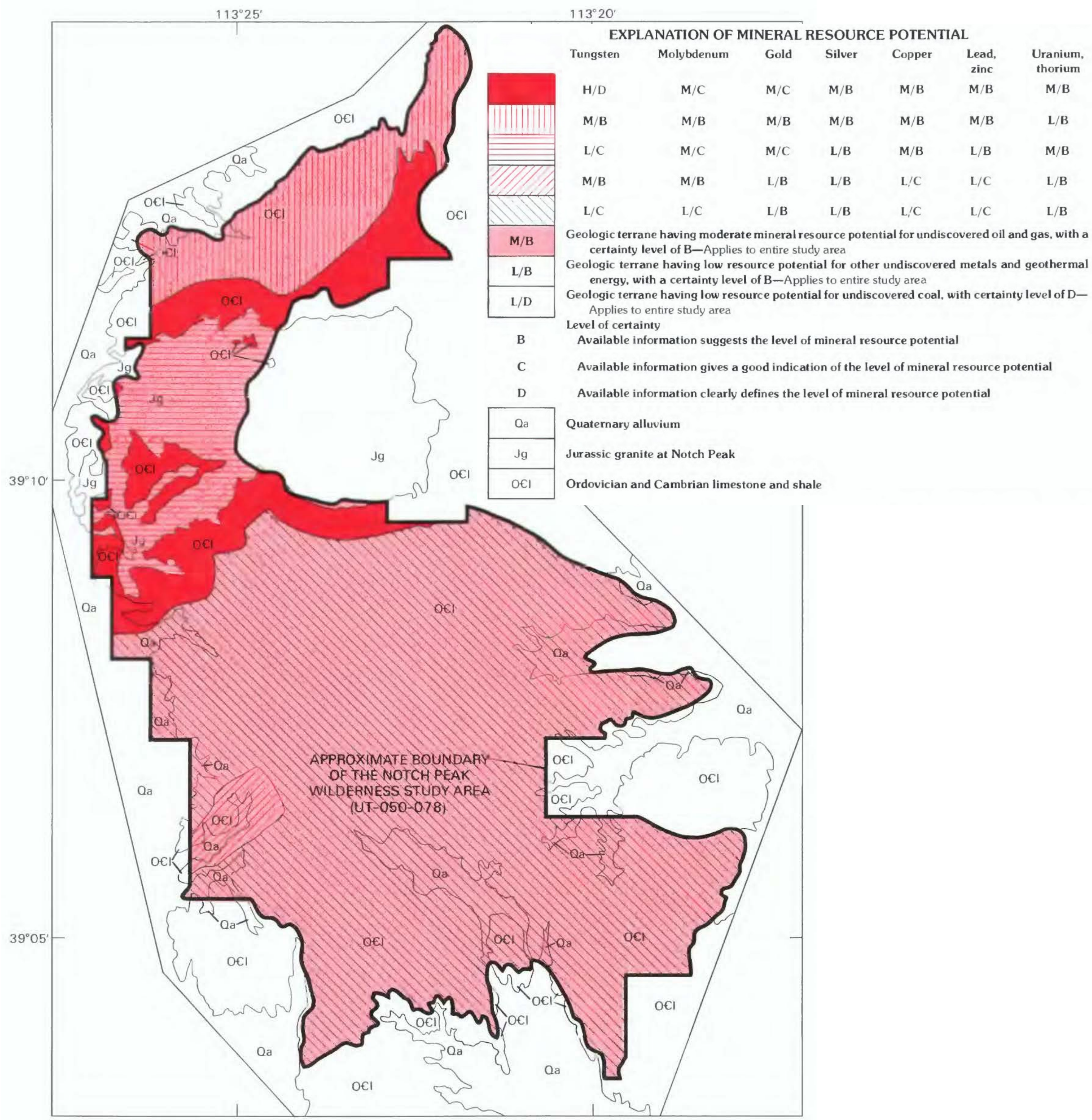
Area Name and Number (where applicable)	**Resource Potential**	**Level of potential/ level of certainty**	**Commodities**	**Type of Deposit**
Wah Wah Summit (west), 1	Moderate	M/B	Zn,Cd,Sb,Mo,Pb,As, Bi	Vein and replacement in carbonate host rock
	Moderate	M/B	Zn, Pb, W	Skarn
Wah Wah Summit (east), 2	Moderate	M/B	Zn,Cd,Sb,Mo,Pb,As, Bi, Au	Vein and replacement in carbonate host rock
	Moderate	M/B	Pb, Sb, Bi, As, Mo	Igneous breccia host
	Moderate	M/B	Zn, Pb, W	Skarn
Wah Wah Cove (south), 3	Moderate	M/B	Sb	Vein and replacement in carbonate or volcanic host rock
Wah Wah Cove, 4	Moderate	M/B	Sb, W	Vein and replacement in carbonate or volcanic host rock
Study area outside of areas 1–4	Low	L/C	Zn,Cd,Sb,W,Mo,Pb, As, Bi, Au	
Entire study area	Moderate	M/B	Oil and Gas	Subsurface sedimentary rocks
Entire study area	Low	L/C	Geothermal resources	
Entire study area	Low	L/C	Uranium	

Source: Cox et al. 1989.

Notch Peak

The Notch Peak Wilderness Study Area (UT-050-078) is located in the central House Range, Millard County, west-central Utah, about 43 miles west of the city of Delta. The geology of the study area consists of a Jurassic granite that intrudes gently dipping Cambrian and Ordovician limestone and shale. The northern part of the study area includes part of the Notch Peak mining district, which has produced tungsten from mines within and near the study area. Mining within the district, but outside the study area, included gold placer mining. Mineralization in the district is primarily related to the Notch Peak intrusive. A resource of 775 tons, which averages 0.47 percent tungsten trioxide was defined at the Brown Queen mine in the northern part of the study area. Limestone and sand and gravel occur within the study area. For the purposes of assessing mineral resource potential the study area was divided into five subareas: the granite (Notch Peak intrusive), the metamorphic contact zone of the granite, the area north of the contact zone, the area south of the contact zone, and a small drainage in the southwestern part of the study area. The Notch Peak intrusive has moderate mineral resource potential for undiscovered molybdenum, gold, copper, uranium, and thorium, and low mineral resource potential for undiscovered tungsten, silver, lead, and zinc. The metamorphic contact zone of the granite has high mineral resource potential for undiscovered tungsten, and moderate mineral resource potential for undiscovered molybdenum, gold, silver, copper, lead, zinc, uranium, and thorium. The area to the north of the contact zone of the granite has moderate mineral resource potential for undiscovered tungsten, molybdenum, gold, silver, copper, lead, and zinc, and low mineral resource potential for undiscovered uranium and thorium. The area to the south of the contact zone of the granite has low mineral resource potential for undiscovered tungsten, molybdenum, gold, silver, copper, lead, zinc, uranium, and thorium. The area underlying a small drainage in the southwestern part of the study area has moderate mineral resource potential for undiscovered tungsten and molybdenum, and low mineral resource potential for undiscovered gold, silver, copper, lead, zinc, uranium, and thorium. The entire study area has moderate resource potential for undiscovered oil and gas. The entire study area has low resource potential for all other metals, coal, and geothermal energy (Figure 8.23). (Stoeser et al. 1990)

Figure 8.23
Mineral Resource Potential of the Notch Peak WSA

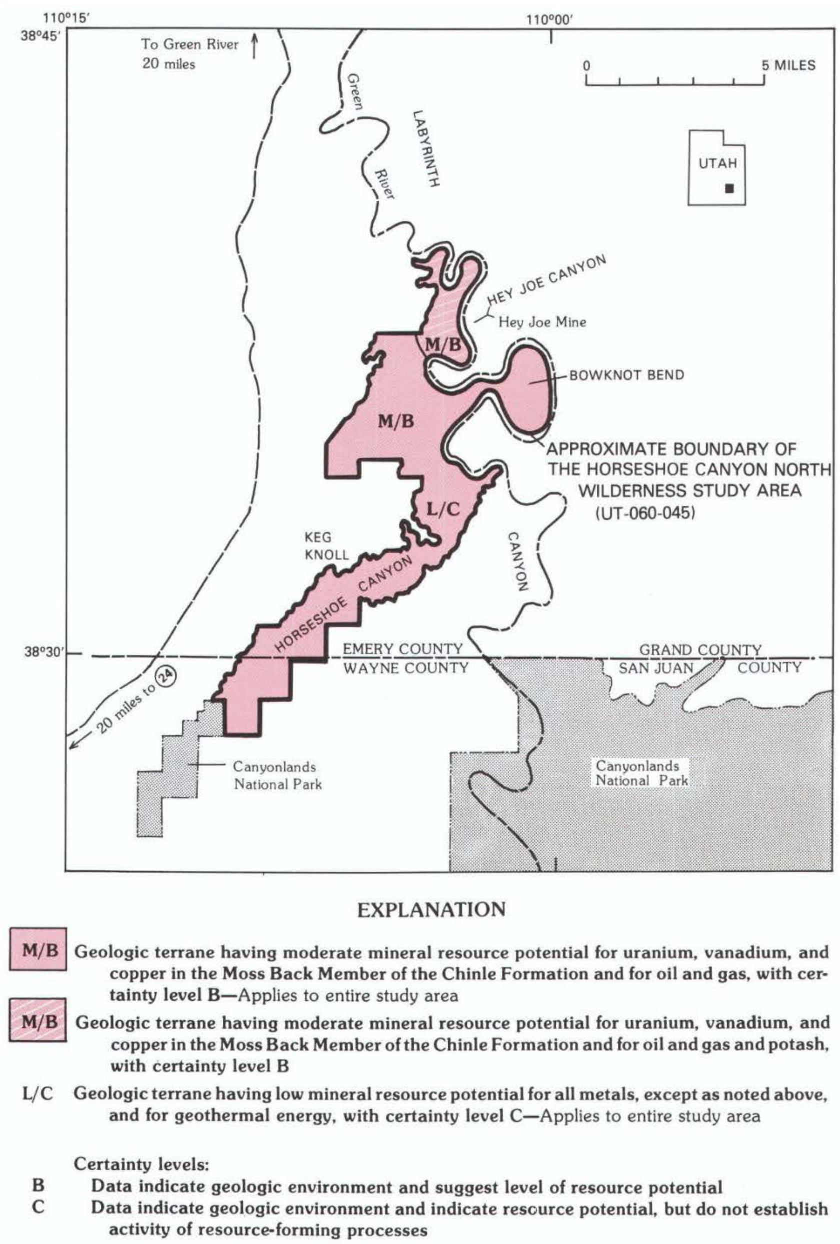


Source: Stoeser et al. 1990.

Horseshoe Canyon North

The Horseshoe Canyon North (UT -{)SQ--045) Wilderness Study Area is in Emery and Wayne Counties, Utah, about 30 miles south of the town of Green River. Investigations by the U.S. Bureau of Mines and the U.S. Geological Survey indicate that the study area has no known economic resources, has inferred subeconomic resources of common variety sandstone, and has occurrences of common variety sand and gravel. The entire study area has moderate mineral resource potential for uranium, vanadium, and copper and for oil and gas; the northernmost part of the study area has moderate resource potential for potash. The entire study area also has low mineral resource potential for all other metals and geothermal energy (Figure 8.24). (Soulliere, Lee, and Martin 1988)

Figure 8.24
Mineral Resource Potential of the Horseshoe Canyon North WSA

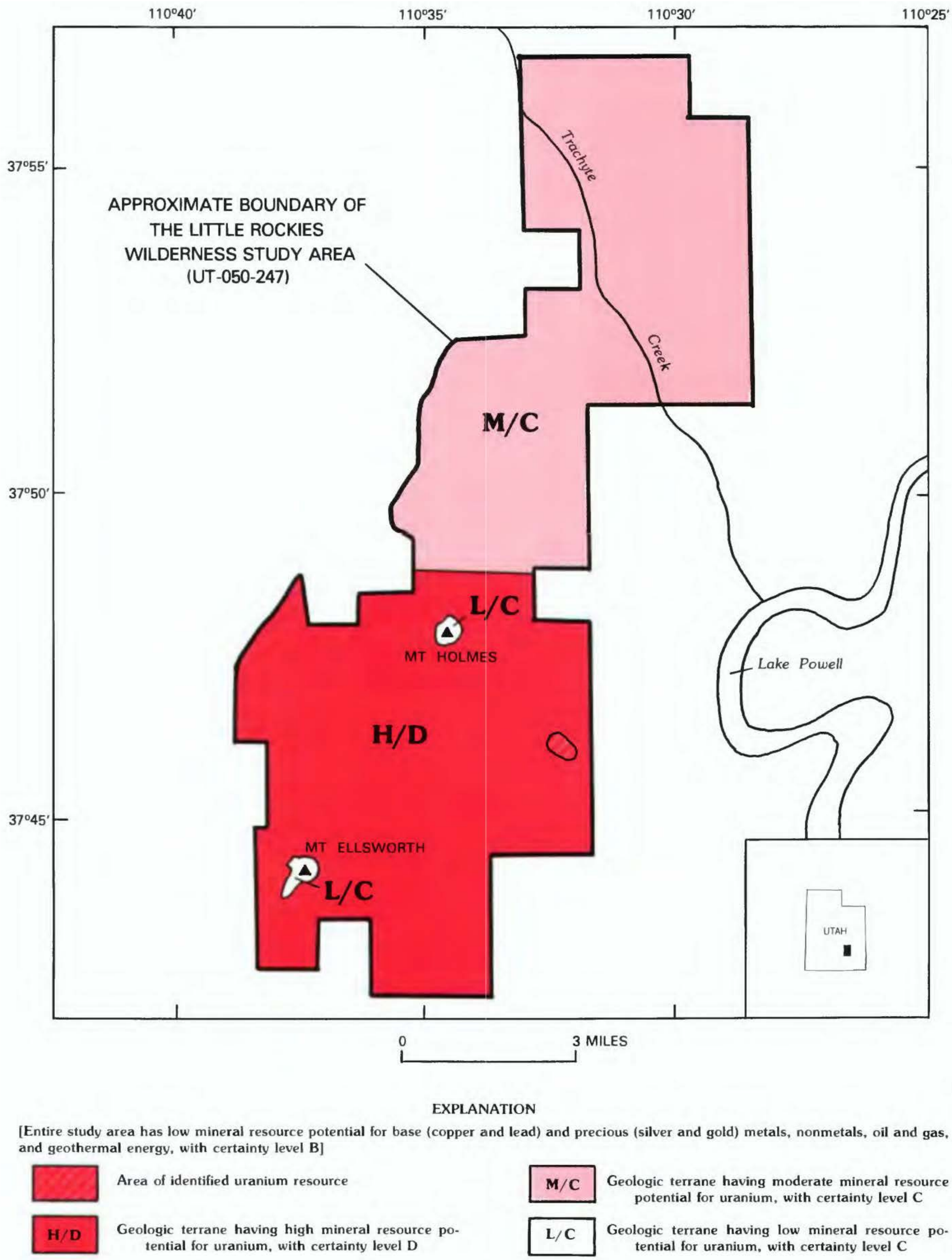


Source: Soulliere, Lee, and Martin 1988.

Little Rockies

The Little Rockies (UT-050-247) Wilderness Study Area comprises 38,700 acres in the Henry Mountains in Garfield County, Utah. Field and laboratory investigations were conducted by the USGS and the USBM from 1981 to 1984. These investigations indicate that a small part of the study area approximately 4 miles northeast of Mt. Ellsworth along Fourmile Canyon contains an identified subeconomic resource of uranium) in sandstone beds of the Shinarump Member of the Chinle Formation. The southern part of the study area has a high mineral resource potential (the likelihood of the presence of undiscovered occurrences) for uranium in sandstone beds of the Shinarump Member of the Chinle Formation, except for two small areas comprising the igneous stocks of Mt. Holmes and Mt. Ellsworth. These two areas have a low mineral resource potential for uranium. The northern part of the study area has a moderate mineral resource potential for uranium in sandstone beds of the Shinarump and Monitor Butte Members of the Chinle Formation. The entire study area has a low mineral resource potential for base (copper and lead) and precious (silver and gold) metals, nonmetals (sand, gravel, and stone), oil and gas, and geothermal energy (Figure 8.25). (Dubiel, Bromfield, Church, Kemp, Larson, Peterson, Pierson, and Kreidler 1987)

Figure 8.25
Mineral Resource Potential of the Little Rockies WSA

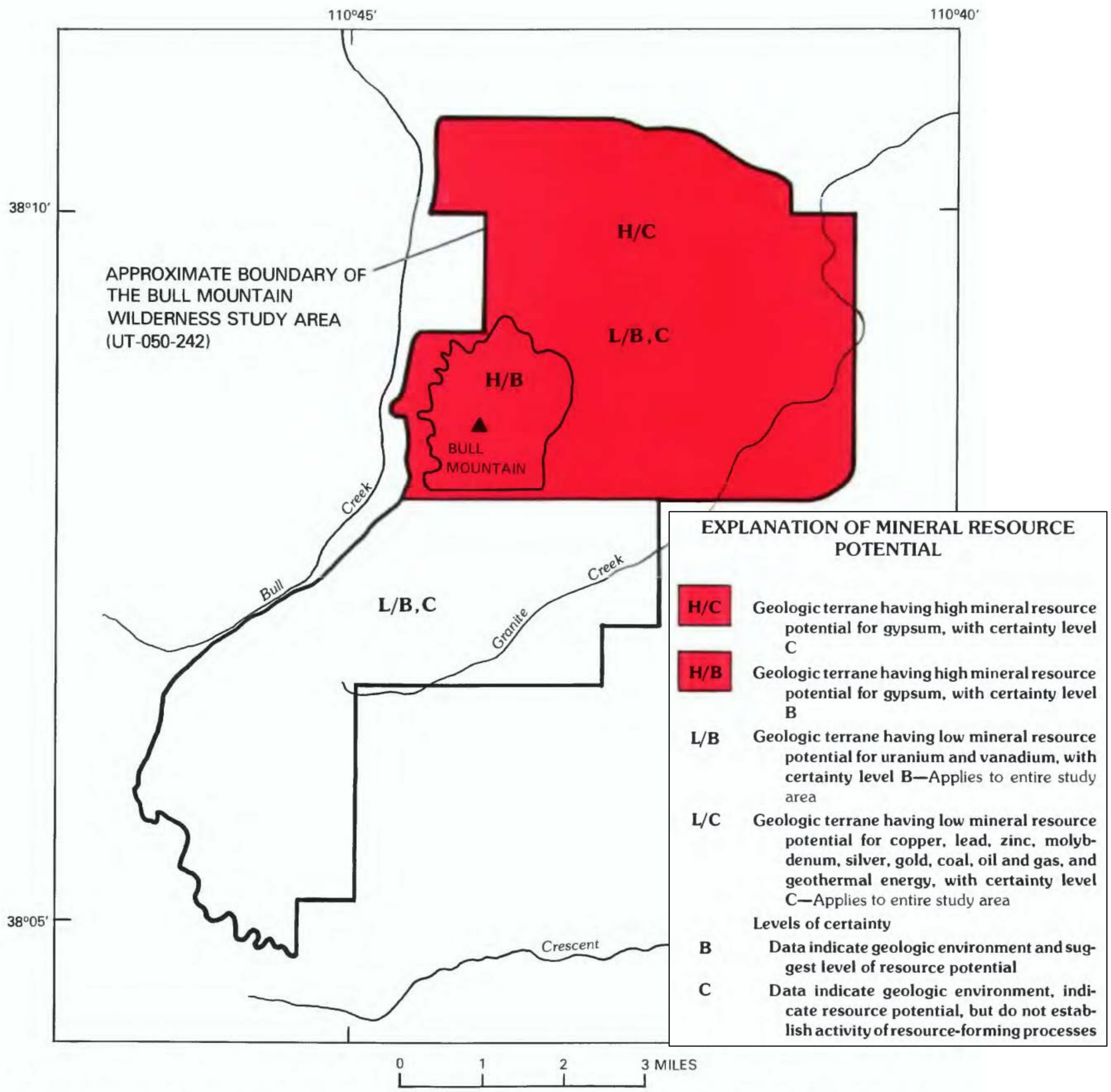


Source: Dubiel, Bromfield, Church, Kemp, Larson, Peterson, Pierson, and Kreidler 1987.

Bull Mountain

The Bull Mountain (UT-050-242) Wilderness Study Area comprises 11,800 acres in the Henry Mountains in Garfield and Wayne Counties, Utah. Field and laboratory investigations were conducted by the USGS from 1981 to 1984 and by the USBM in 1986. These investigations indicate that there are no identified resources in the study area. The northern part of the study area has a high potential for undiscovered gypsum resources, and the entire area has a low resource potential for undiscovered copper, lead, zinc, molybdenum, silver, gold, uranium and vanadium, coal, oil and gas, and geothermal resources (Figure 8.26). (Dubiel, Bromfield, Church, Kemp, Larson, Peterson, and Neubert 1988a)

Figure 8.26
Mineral Resource Potential of the Bull Mountain WSA

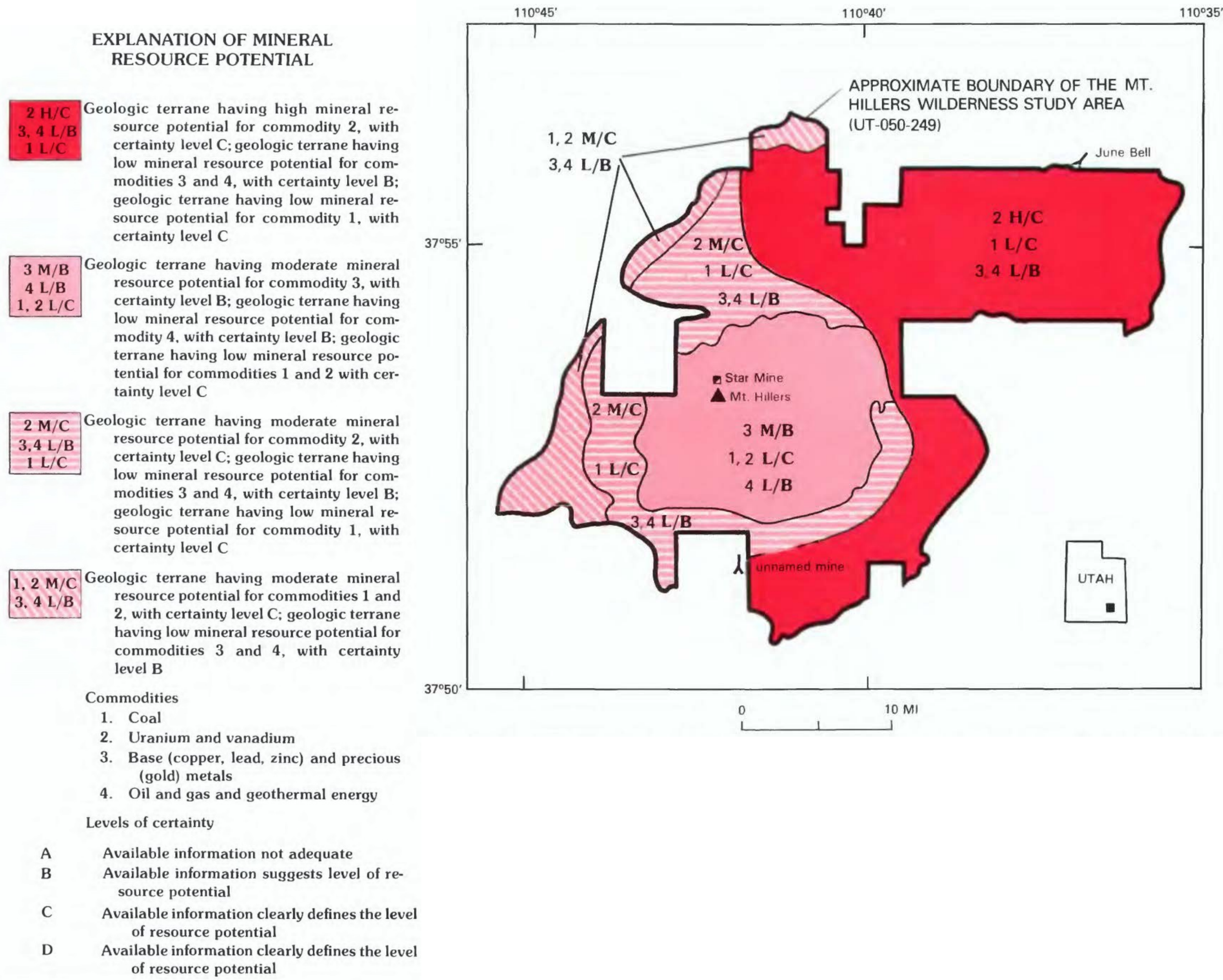


Source: Dubiel, Bromfield, Church, Kemp, Larson, Peterson, and Neubert 1988a.

Mt. Hillers

The Mt. Hillers Wilderness Study Area (UT-050-249) comprises 20,000 acres in the Henry Mountains, Garfield County, Utah. Field and laboratory investigations were conducted by the USGS from 1981 to 1984 and by the USBM in 1986. The area was studied for identified (known) resources as well as for mineral resource potential (undiscovered resources). These investigations indicate that small occurrences of uranium and vanadium are present near the northeastern and southern boundaries of the study area, and that copper, gold, lead, and zinc occur in the study area, but no identified resources of these commodities are present. Inferred subeconomic resources of the common variety materials, sand and gravel and stone, in the study area have no unique qualities and are not likely to be developed. The eastern part of the study area has a high mineral resource potential for uranium and vanadium and a low mineral resource potential for all other metals, and coal. The central part of the study area has a moderate mineral resource potential for base (copper, lead, and zinc) and precious (gold) metals, and a low mineral resource potential for uranium and vanadium, and coal. The western part of the study area has a moderate mineral resource potential for coal and uranium and vanadium, and a low mineral resource potential for all other metals. The entire Mt. Hillers Wilderness Study Area has a low mineral resource potential for oil and gas and for geothermal energy (Figure 8.27). (Dubiel, Bromfield, Church, Kemp, Larson, Peterson, and Neubert 1988b)

Figure 8.27
Mineral Resource Potential of the Mt. Hillers WSA

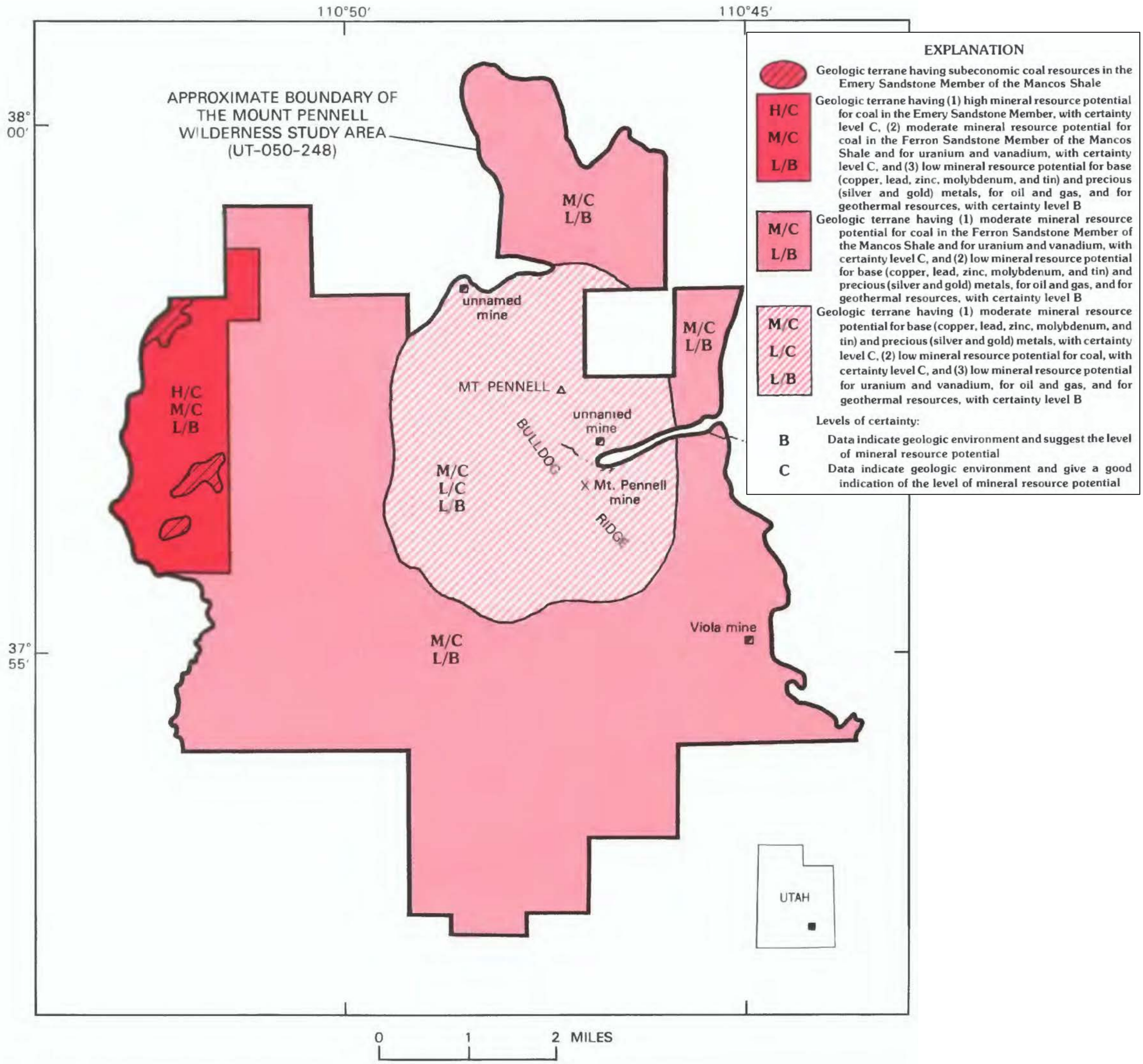


Source: Dubiel, Bromfield, Church, Kemp, Larson, Peterson, and Neubert 1988b.

Mount Pennell

The Mount Pennell (UT-050-248) Wilderness Study Area comprises 25,800 acres in the Henry Mountains in Garfield County, Utah. Field and laboratory investigations were conducted by the USGS from 1981 to 1984 and by the USBM in 1988. The investigations indicate that subeconomic measured coal resources of approximately 1.3 million tons occur in the Emery Sandstone Member of the Mancos Shale within the western boundary of the study area. Several mines and prospects for base and precious metals are within the study area, and placer workings for precious metals are just outside the study area boundary; however, no resources are associated with any of these workings. The central portion of the study area underlain by igneous rocks has a moderate mineral resource potential for base (copper, lead, tin, molybdenum, and zinc) and precious (silver and gold) metals; the remainder of the study area has a low mineral resource potential for these metals. The central part of the study area has a low mineral resource potential for uranium and vanadium. The remainder of the study area has a moderate mineral resource potential for uranium and vanadium. The central part of the study area underlain by igneous rocks has a low mineral resource potential for coal; all of the study area outside of this central part has a moderate resource potential for coal in the Perron Sandstone Member of the Mancos, and the extreme western part of the study area additionally has a high resource potential for coal in the Emery Sandstone Member of the Mancos. The entire study area has a low resource potential for oil and gas and for geothermal energy (Figure 8.28). (Dubiel, Bromfield, Church, Kemp, Larson, Peterson, Pierson, and Gese 1990)

Figure 8.28
Subeconomic Coal Resources and Mineral Resource Potential of the Mount Pennell WSA



Source: Dubiel, Bromfield, Church, Kemp, Larson, Peterson, Pierson, and Gese 1990.

San Rafael Swell Wilderness Study Areas

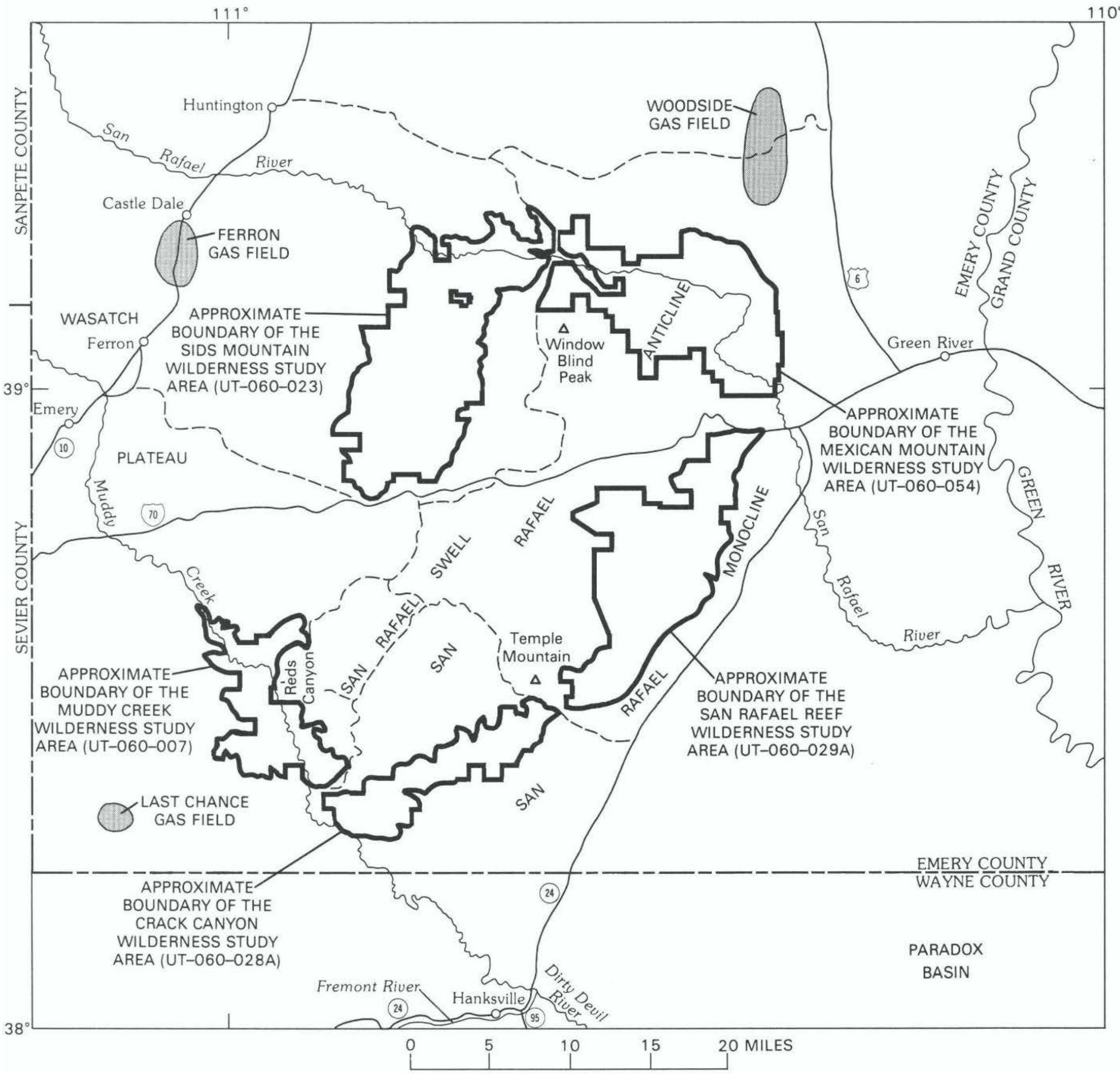
The San Rafael Swell wilderness study areas, including the Muddy Creek, Crack Canyon, San Rafael Reef, Mexican Mountain, and Sids Mountain Wilderness Study Areas, are in Emery County, south-central Utah. At least 4,100 current and historic mining claims have been located in or near the study areas, primarily for uranium. Vanadium is the most valuable byproduct of uranium mining, although minor copper, silver, lead, zinc, and gold also occur in some deposits. Past production totaled at least 7 million pounds of U_3O_8 (uranium oxide) from the entire San Rafael Swell area, and approximately 3 million pounds was mined from within and near the wilderness study areas. Mined ore bodies contained 100–10,000 tons of ore with an average grade of 0.2 percent U_3O_8 and less than 0.5 percent V_2O_5. Within and near the Crack Canyon Wilderness Study Area is about 221,000 tons of identified subeconomic uranium and vanadium resources (0.05–0.26 percent U_3O_8 and 0.3–0.5 percent V_2O_5). Within the Carmel Formation, inferred subeconomic resources of about 11 million tons of gypsum are in the Muddy Creek Wilderness Study Area, about 680,000 tons in the San Rafael Reef Wilderness Study Area, and about 103 million tons in the Sids Mountain Wilderness Study Area. An identified subeconomic resource of about 20 million tons of gypsum is in the Summerville Formation in the Crack Canyon Wilderness Study Area. Other commodities evaluated include geothermal energy, gypsum, limestone, oil and gas, sand and gravel, sandstone, semiprecious gemstones, sulfur, petrified wood, and tar sand.

The Crack Canyon Wilderness Study Area contains parts of the Delta, Temple Mountain, and Little Wild Horse mining districts. Between 1950 and 1973, about 472 tons of U_3O_8 were produced from 10 mines in districts within or adjacent to the study area, and about 414 tons were produced from two mines within the study area.

The mineral resource potential for localized, thin tar sands of variable grade in all wilderness study areas, except the Eardley Canyon area of the San Rafael Reef Wilderness Study Area, is high. The resource potential for gypsum on the surface in the western part of the Muddy Creek Wilderness Study Area, in the eastern and southeastern part of the San Rafael Reef Wilderness Study Area, in the northeastern part of the Mexican Mountain Wilderness Study Area, in the southern and southeastern part of the Crack Canyon Wilderness Study Area, and in the western part of the Sids Mountain Wilderness Study Area is high. The Sids Mountain Wilderness Study Area, Crack Canyon Wilderness Study Area, northeastern part of the Mexican Mountain Wilderness Study Area, eastern and southeastern part of the San Rafael Reef Wilderness Study Area, and western part of the Muddy Creek Wilderness Study Area have high resource potential for uranium and vanadium in the Chinle Formation. The resource potential for uranium and vanadium in the Morrison Formation is low in the southern part of the Crack Canyon Wilderness Study Area. The resource potential for oil and gas in all wilderness study areas is moderate. The resource potential for geothermal energy in the wilderness study areas is moderate. The resource potential for carbon dioxide and helium gases in the wilderness study areas is moderate. The resource potential in all wilderness study areas for metals other than uranium and vanadium, including gold and copper, is low. The resource potential for minor, localized sulfur deposits is low in the Mexican Mountain and San Rafael Reef Wilderness Study Areas. The resource potential for bentonite in the Chinle Formation on the surface and in the subsurface is low in the Sids Mountain Wilderness Study Area, Crack Canyon Wilderness Study Area, northeastern part of the Mexican Mountain Wilderness Study Area, eastern and southeastern part of the San Rafael Reef Wilderness Study Area, and western part of the Muddy Creek Wilderness Study Area, and is also low for bentonite with minor zeolite in the southernmost part of the Crack Canyon Wilderness

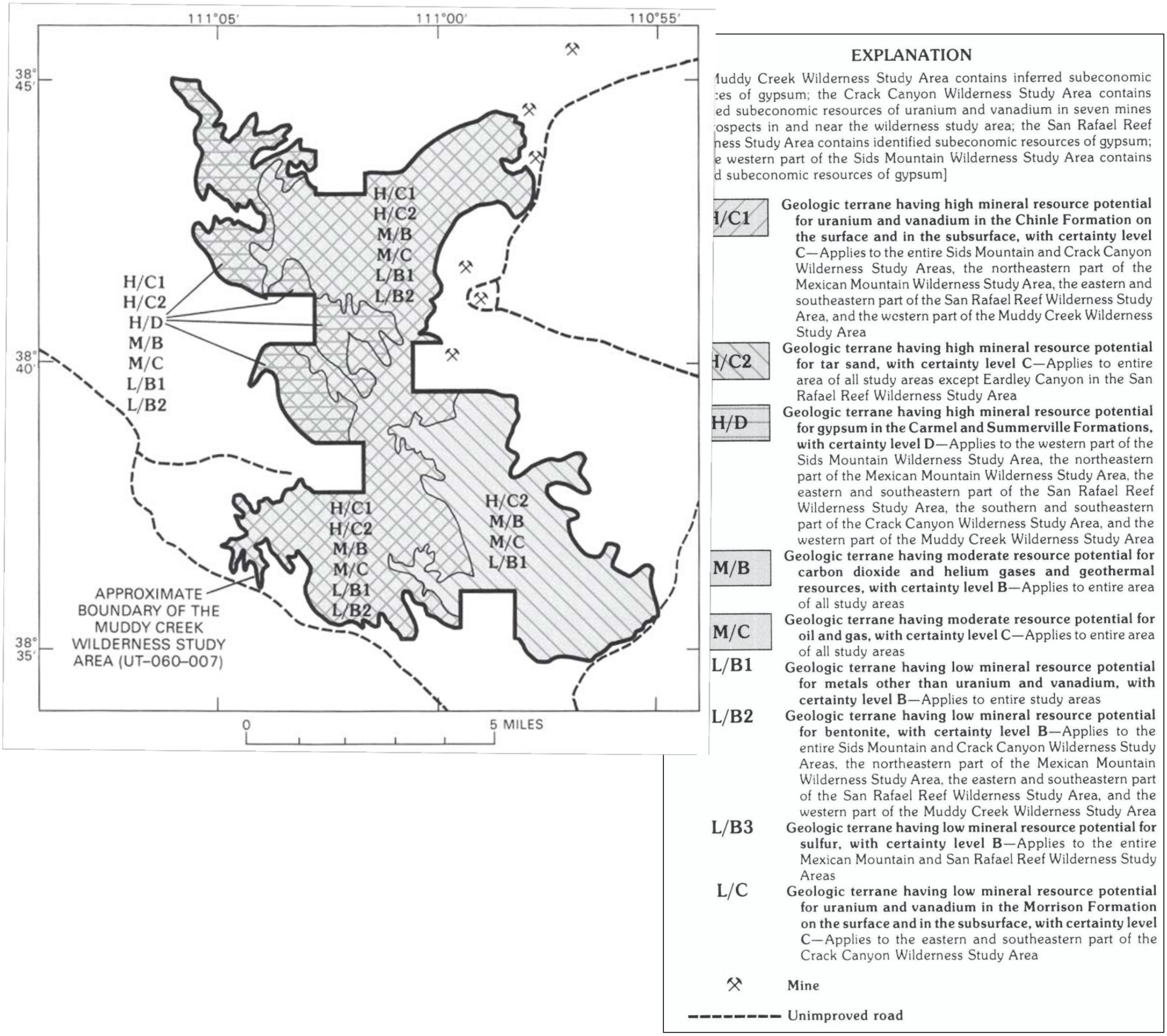
Study Area (Figures 8.29 through 8.34). (Bartsch-Winkler, Dickerson, Barton, McCafferty, Grauch, Koyuncu, Lee, Duval, Munts, Benjamin, Close, Lipton, Neumann, and Willett 1990)

Figure 8.29
Index Map of the San Rafael Swell Region Showing Approximate Locations of the Five WSAs



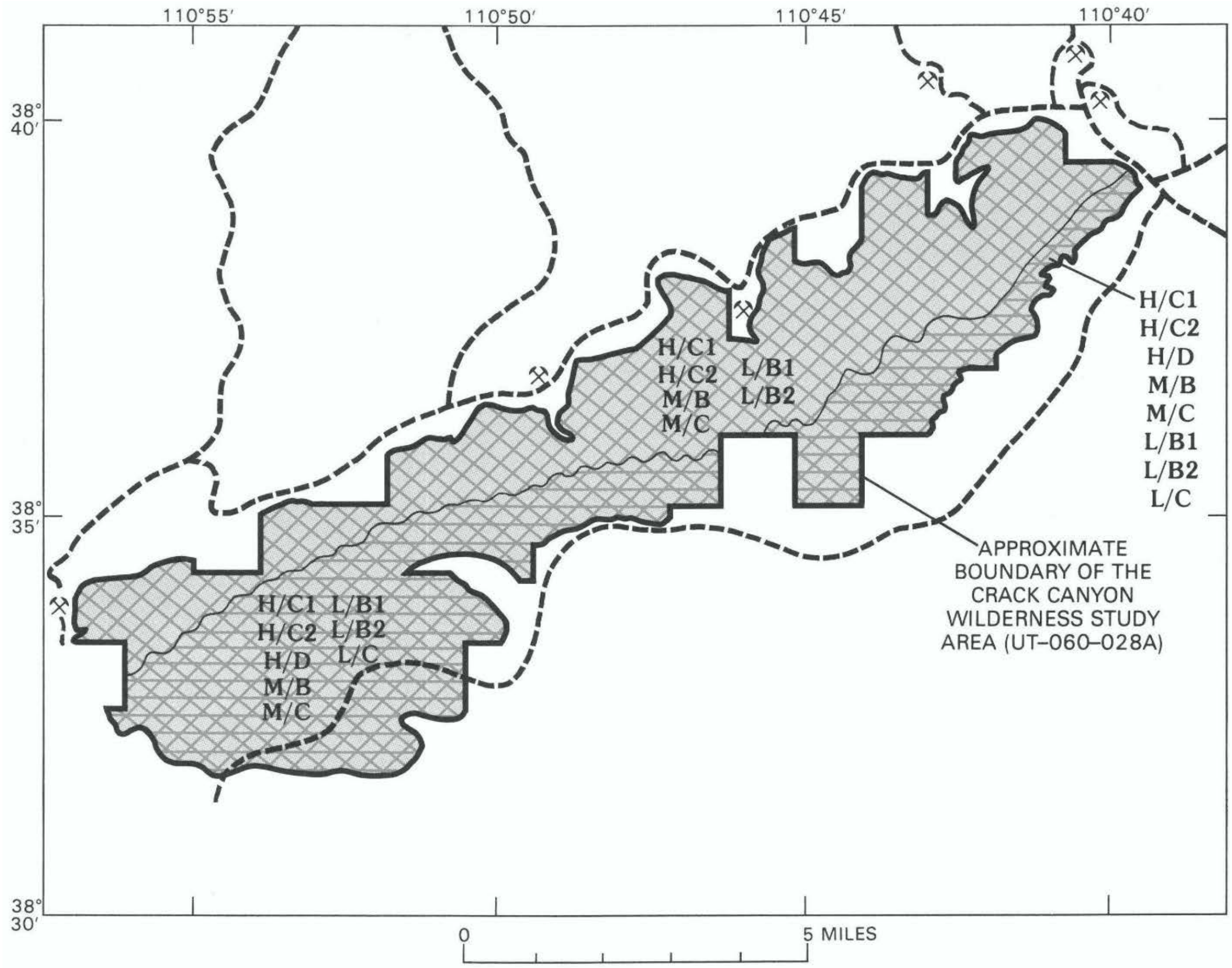
Source: Bartsch-Winkler, Dickerson, Barton, McCafferty, Grauch, Koyuncu, Lee, Duval, Munts, Benjamin, Close, Lipton, Neumann, and Willett 1990.

Figure 8.30
Mineral Resource Potential of the Muddy Creek WSA



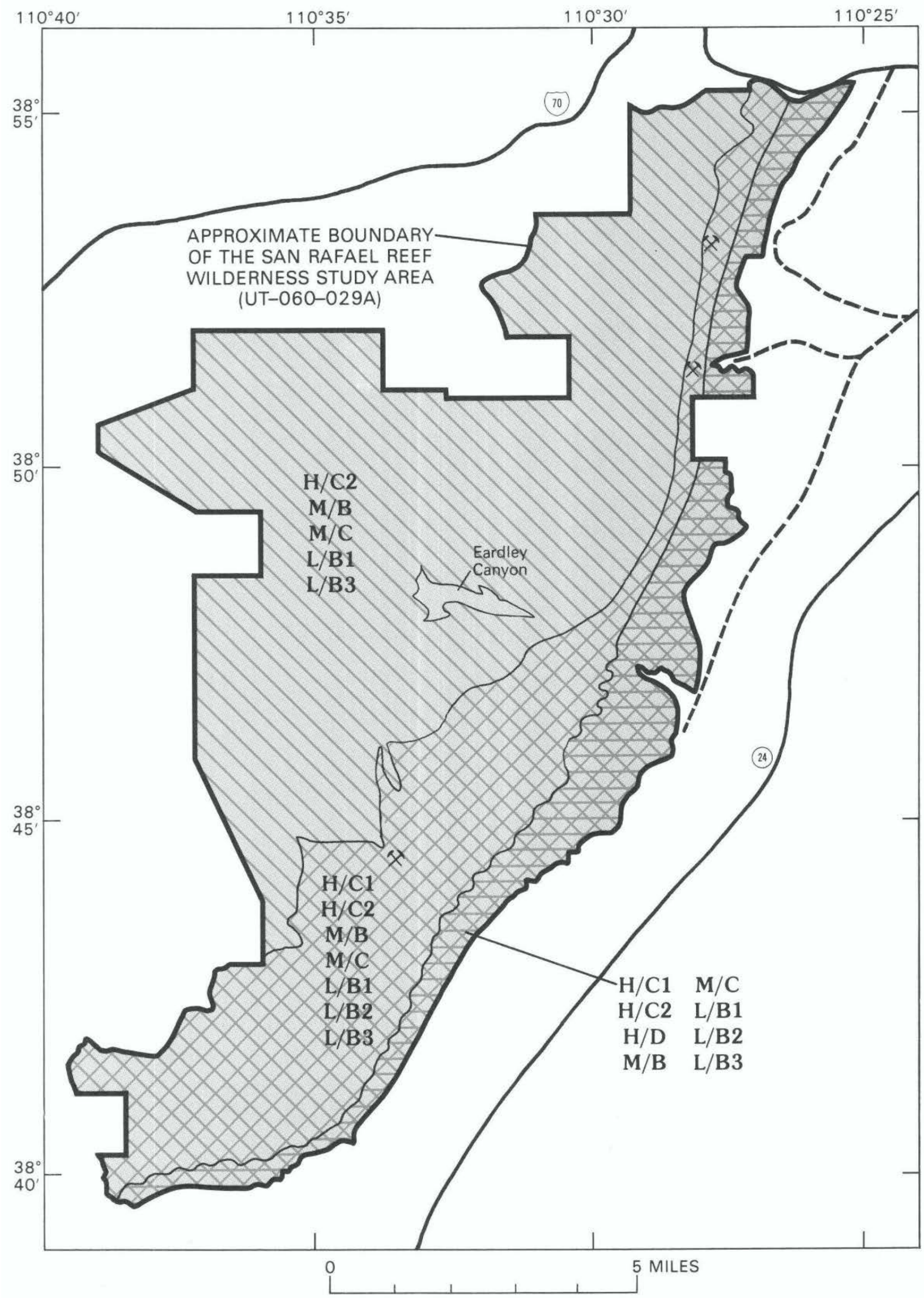
Source: Bartsch-Winkler, Dickerson, Barton, McCafferty, Grauch, Koyuncu, Lee, Duval, Munts, Benjamin, Close, Lipton, Neumann, and Willett 1990.

Figure 8.31
Mineral Resource Potential of the Crack Canyon WSA
(See Figure 8.30 for Explanation)



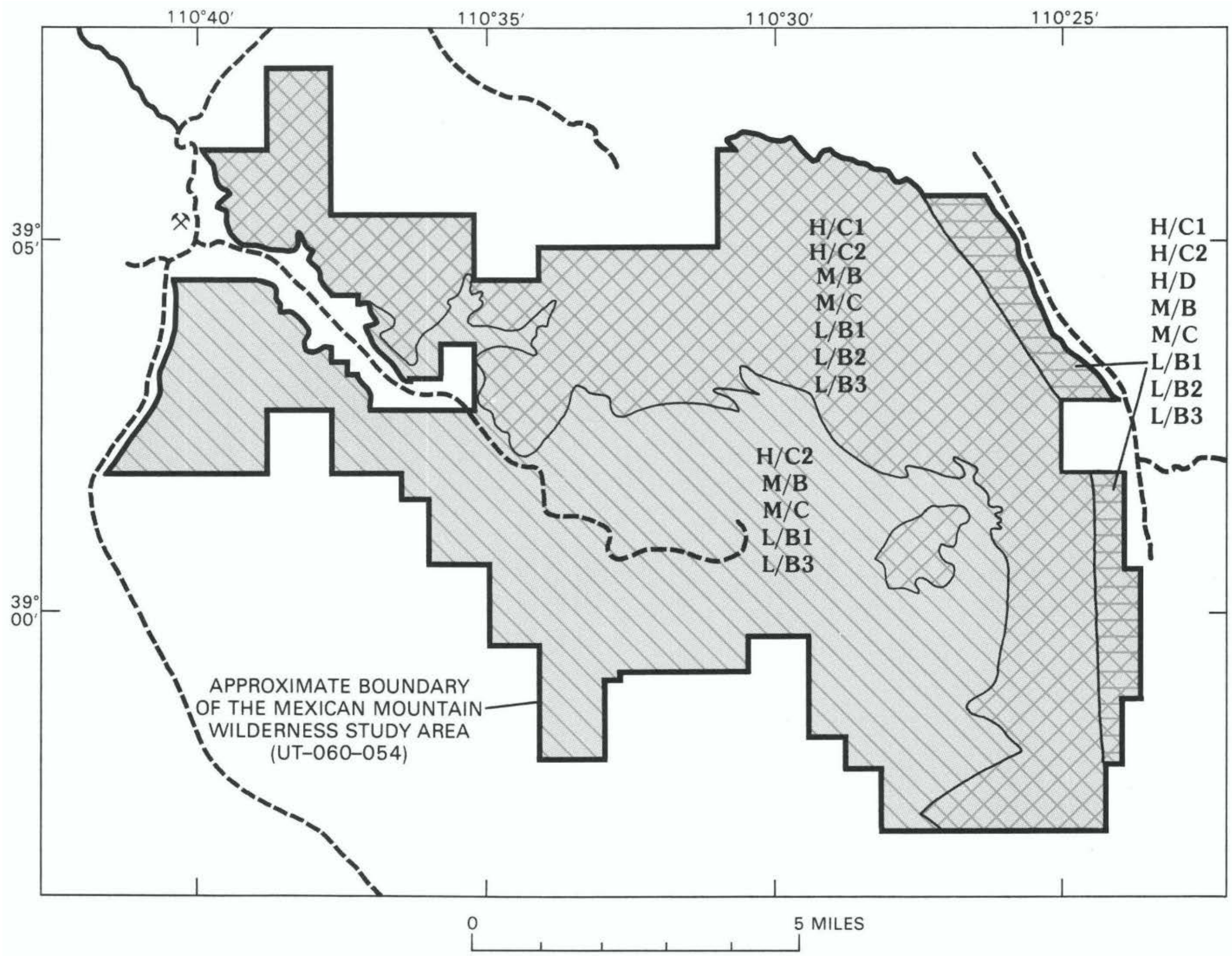
Source: Bartsch-Winkler, Dickerson, Barton, McCafferty, Grauch, Koyuncu, Lee, Duval, Munts, Benjamin, Close, Lipton, Neumann, and Willett 1990.

Figure 8.32
Mineral Resource Potential of the San Rafael Reef WSA
(See Figure 8.30 for Explanation)



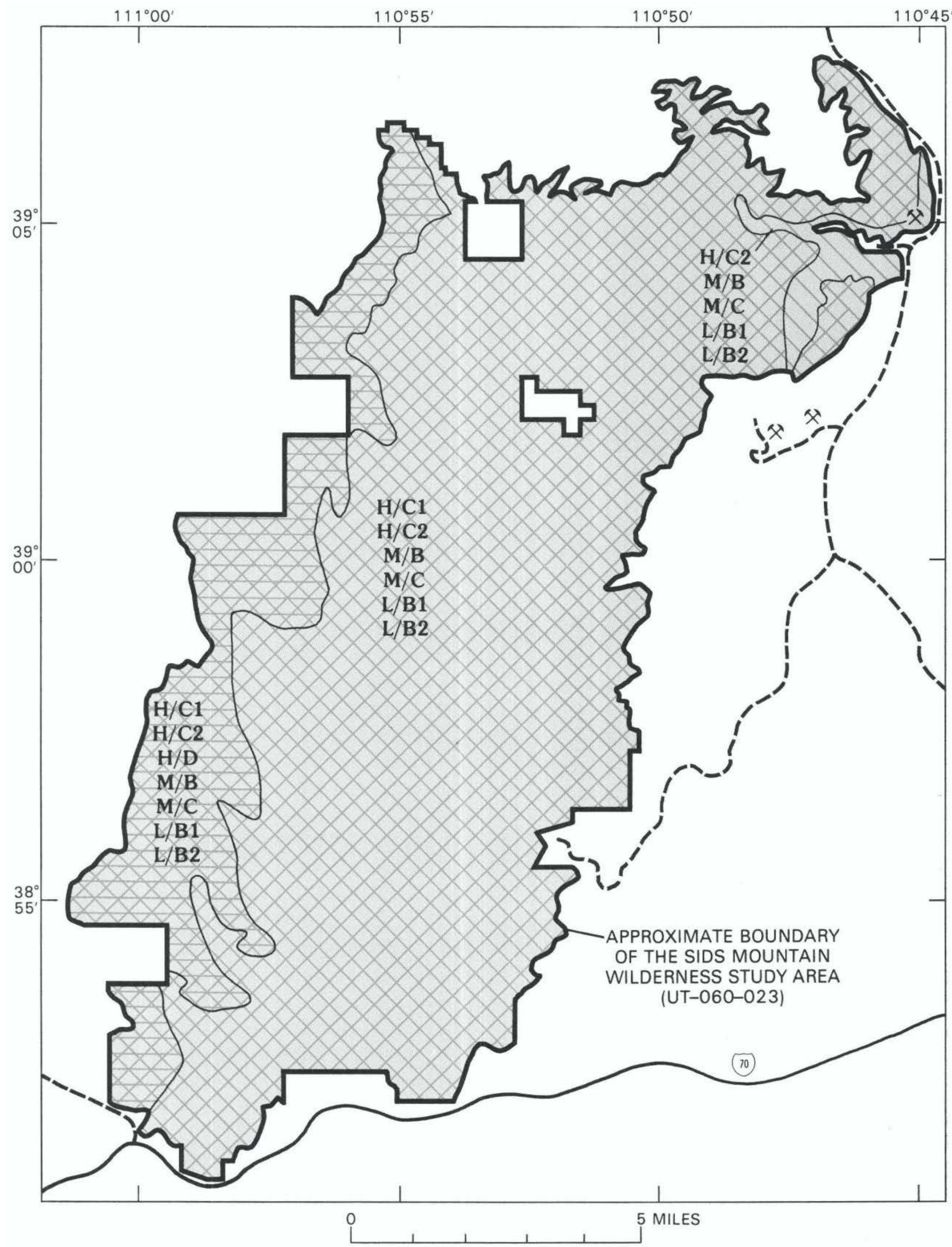
Source: Bartsch-Winkler, Dickerson, Barton, McCafferty, Grauch, Koyuncu, Lee, Duval, Munts, Benjamin, Close, Lipton, Neumann, and Willett 1990.

Figure 8.33
Mineral Resource Potential of the Mexican Mountain WSA
(See Figure 8.30 for Explanation)



Source: Bartsch-Winkler, Dickerson, Barton, McCafferty, Grauch, Koyuncu, Lee, Duval, Munts, Benjamin, Close, Lipton, Neumann, and Willett 1990.

Figure 8.34
Mineral Resource Potential of the Sids Mountain WSA
(See Figure 8.30 for Explanation)

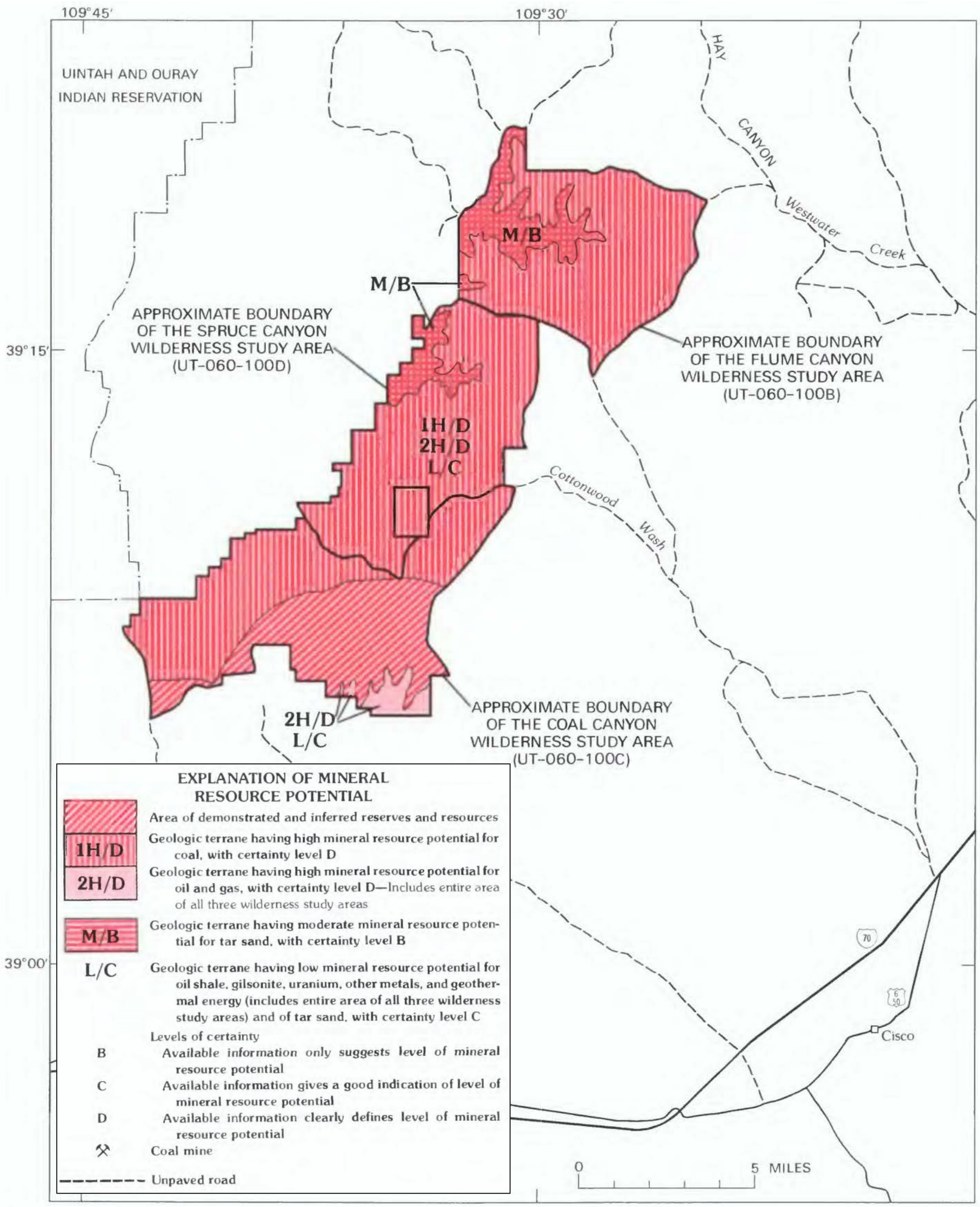


Source: Bartsch-Winkler, Dickerson, Barton, McCafferty, Grauch, Koyuncu, Lee, Duval, Munts, Benjamin, Close, Lipton, Neumann, and Willett 1990.

Coal Canyon, Spruce Canyon, and Flume Canyon

The Coal Canyon (UT-060-100C), Spruce Canyon (UT-060-100D), and Flume Canyon (UT-060-100B) Wilderness Study Areas are in the Book Cliffs in Grand County, eastern Utah. Demonstrated coal reserves totaling 22,060,800 short tons, and demonstrated subeconomic coal resources totaling 39,180,000 short tons are in the Coal Canyon Wilderness Study Area. Also, inferred subeconomic coal resources totaling 143,954,000 short tons are within the Coal Canyon Wilderness Study Area. No known deposits of industrial minerals are in any of the wilderness study areas. All three of the wilderness study areas have a high resource potential for undiscovered deposits of coal and for undiscovered oil and gas. There is a moderate resource potential for tar sand in the northwestern parts of the Spruce Canyon and Flume Canyon Wilderness Study Areas, and a low potential for tar sand in the rest of the wilderness study areas. All three wilderness study areas have a low potential for resources of oil shale, gilsonite, uranium and other metals, and geothermal energy (Figure 8.35). (Dickerson, Gaccetta, Kulik, and Kreidler 1990)

Figure 8.35
Coal Reserves and Resources and Mineral Resource Potential of the Coal Canyon, Spruce Canyon, and Flume Canyon WSAs

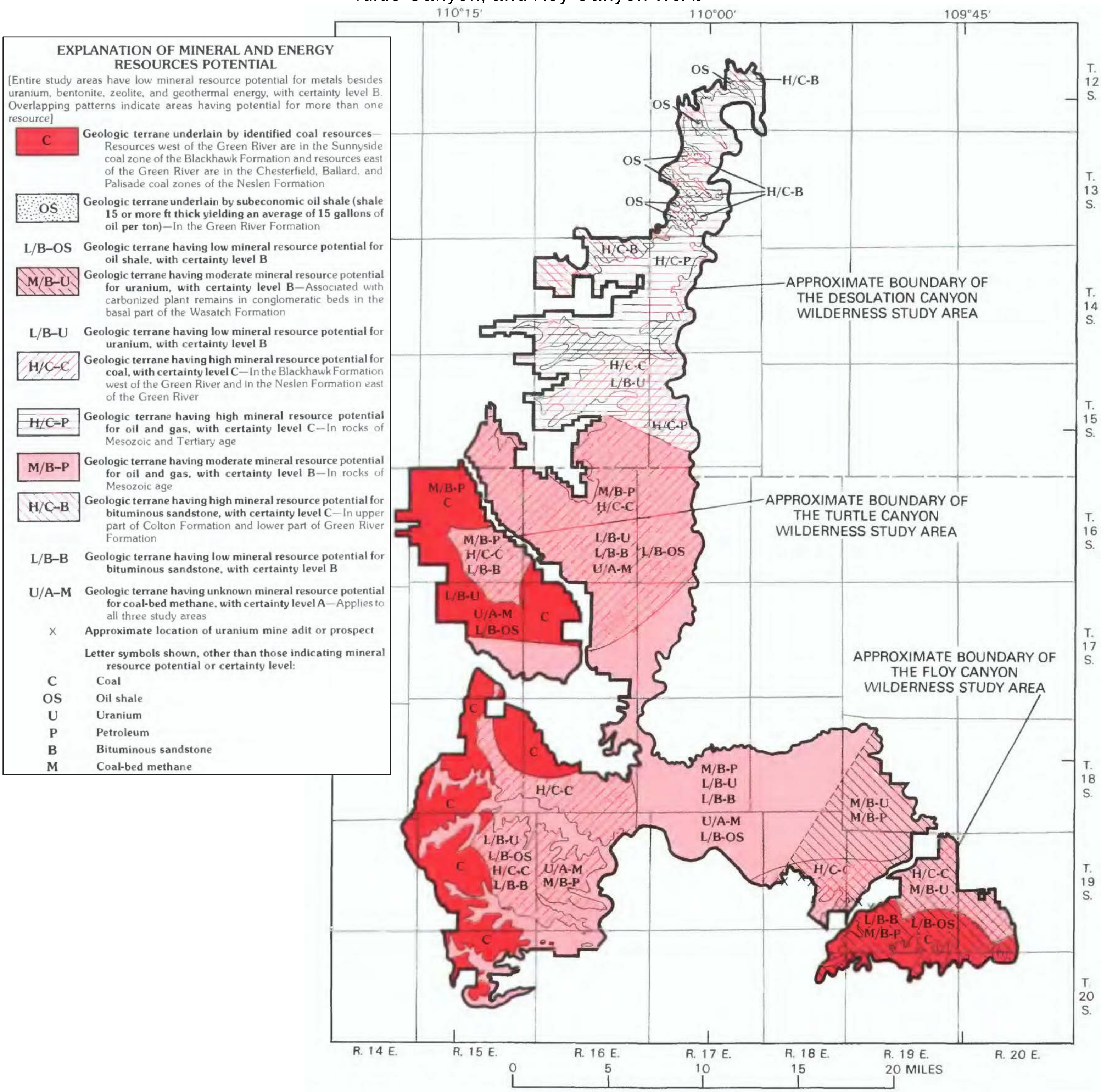


Source: Dickerson, Gaccetta, Kulik, and Kreidler 1990.

Desolation Canyon, Turtle Canyon, and Floy Canyon

In 1985,1986, and 1988, the USBM and the USGS studied the Desolation Canyon (UT-060-068A), Turtle Canyon (UT-060-067), and Floy Canyon (UT-060-068B) Wilderness Study Areas, which are contiguous and located in Carbon, Emery, and Grand Counties in eastern Utah. The study areas include 242,000 acres, 33,690 acres, and 23,140 acres respectively. Coal deposits underlie the Desolation Canyon, Turtle Canyon, and Floy Canyon study areas. Coal zones of Late Cretaceous age occur in the Blackhawk Formation (west of the Green River) and Neslen Formation (east of the Green River). Identified bituminous coal resources in beds 3.5 feet or more thick and under 2,000 feet or less of overburden are estimated to be 22 million tons in the Desolation Canyon study area, 6.3 million tons in the Turtle Canyon study area, and about 45 million tons in the Floy Canyon study area. In-place inferred oil-shale resources are estimated to contain 60 million barrels of subeconomic shale oil in the Green River Formation underlying the northern part of the Desolation Canyon Wilderness Study Area. Minor occurrences of uranium have been found in the basal part of the Wasatch Formation in the southeastern part of the Desolation Canyon study area and in the western part of the Floy Canyon study area. Mineral resource potential for the study areas is estimated to be (1) for coal, high for all areas, (2) for oil and gas, high for the northern tract of the Desolation Canyon Wilderness Study Area and moderate for all other tracts, (3) for bituminous sandstone, high for the northern part of the Desolation Canyon Wilderness Study Area, and low for all other tracts, (4) for oil shale, low in all areas, (5) for uranium, moderate for the Floy Canyon study area and the southeastern part of the Desolation 'Canyon study area and low for the remainder of the areas, (6) for metals other than uranium, bentonite, zeolites, and geothermal energy, low in all areas, and (7) for coal bed methane, unknown in all three areas (Figure 8.36). (Cashion, Kilburn, Barton, Kelley, Kulik, and McDonnell 1990)

Figure 8.36
Identified Resources and Mineral and Energy Resource Potential of the Desolation Canyon, Turtle Canyon, and Floy Canyon WSAs

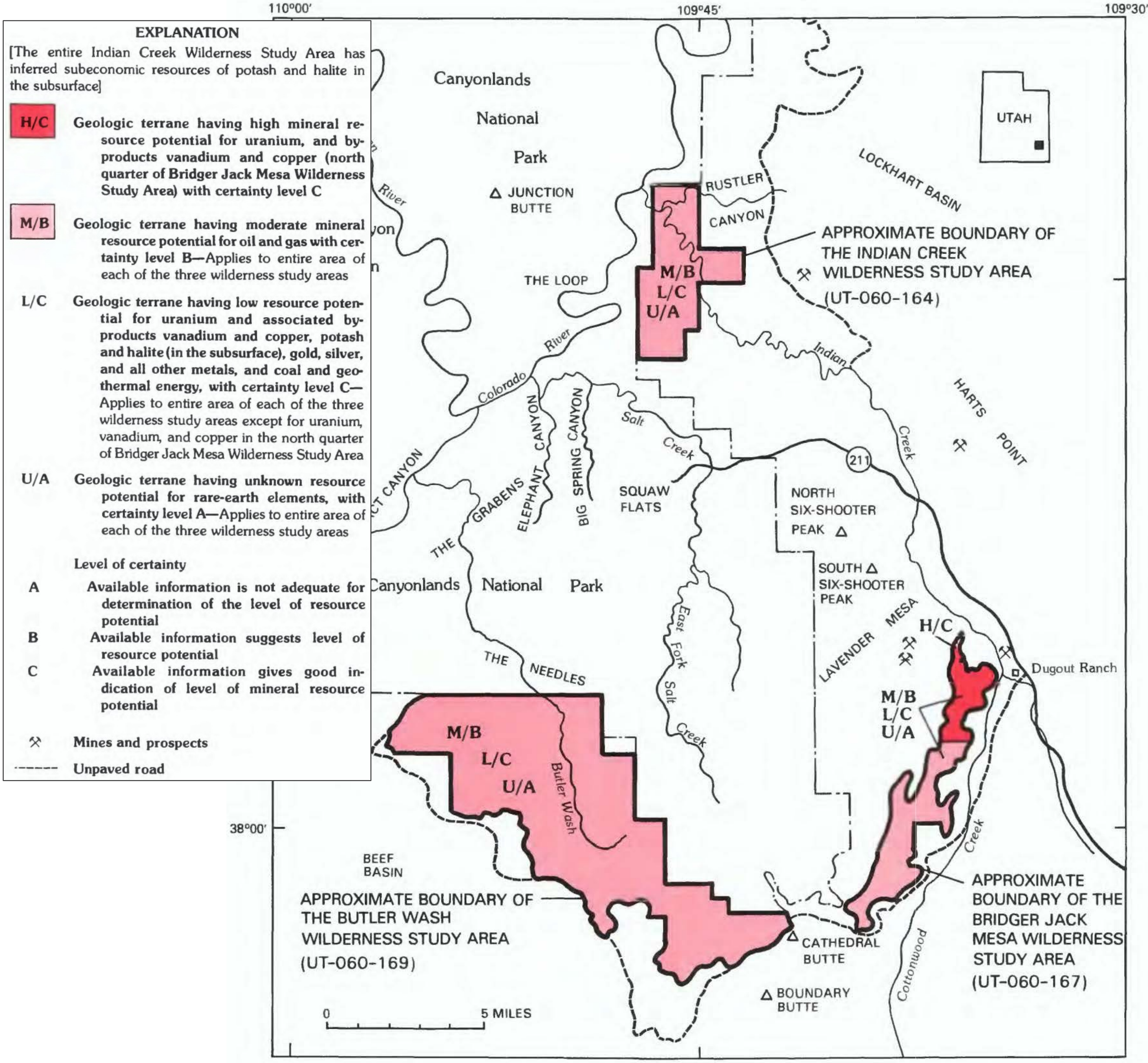


Source: Cashion, Kilburn, Barton, Kelley, Kulik, and McDonnell 1990.

Indian Creek, Bridger Jack Mesa, and Butler Wash

The Indian Creek (UT-060-164), Bridger Jack Mesa (UT-060-167), and Butler Wash (UT-060-169) Wilderness Study Areas are located in San Juan County, southeastern Utah. Inferred subeconomic resources of sandstone and sand and gravel exist within all three wilderness study areas, but because of their abundance throughout the region, their distance from current markets, and their lack of unique properties, these materials have no current likelihood for development. Inferred subeconomic resources of potash and halite are present beneath the Indian Creek Wilderness Study Area, but the likelihood for their development is low. The potential for undiscovered resources of uranium and byproducts vanadium and copper is high for the north quarter of Bridger Jack Mesa Wilderness Study Area and is low for the Butler Wash, Indian Creek, and remaining parts of the Bridger Jack Mesa Wilderness Study Areas. The resource potential for undiscovered oil and gas is moderate in all three wilderness study areas. The resource potential for undiscovered placer gold and silver is low in all three wilderness study areas. The resource potential for undiscovered potash and halite is low for the Butler Wash and Bridger Jack Mesa Wilderness Study Areas. The resource potential is low in all three wilderness study areas for undiscovered geothermal energy, coal, and metals other than uranium, vanadium, and copper. The mineral resource potential for the rare-earth mineral braitschite is unknown in all three wilderness study areas (Figure 8.37). (Patterson, Toth, Case, Barton, Green, Schreiner, and Thompson 1988)

Figure 8.37
Mineral Resource Potential of the Indian Creek, Bridger Jack Mesa, and Butler Wash WSAs

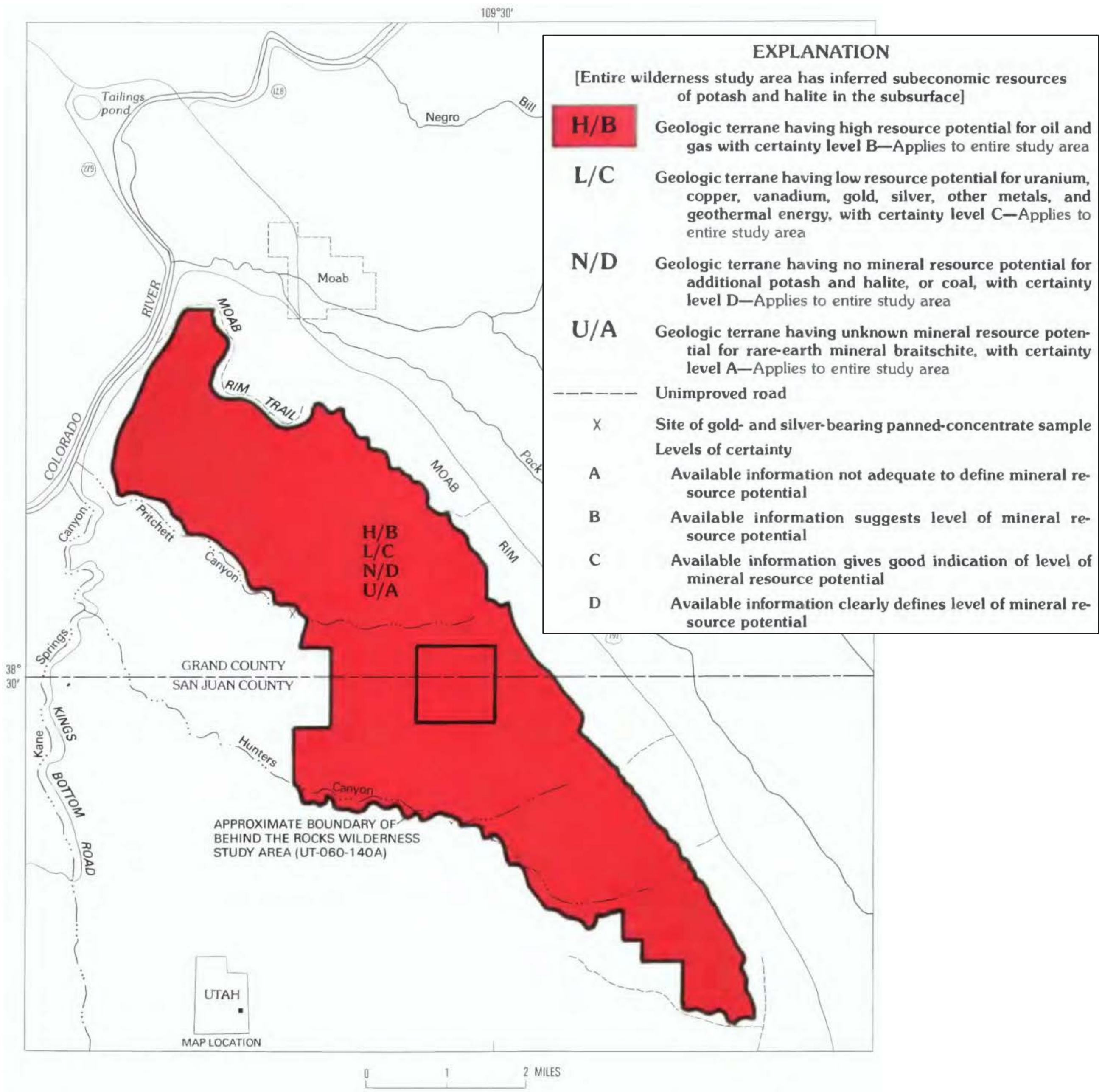


Source: Patterson, Toth, Case, Barton, Green, Schreiner, and Thompson 1988.

Behind the Rocks

The Behind the Rocks Wilderness Study Area (UT-060-140A) consists of 12,635 acres in Grand and San Juan counties, Utah. The study area has inferred subeconomic resources of potash and halite in the subsurface, and sandstone on the surface. The study area has high potential for undiscovered resources of oil and gas, low potential for undiscovered uranium, copper, vanadium, gold, silver, other metals, and geothermal energy, and unknown potential for the rare-earth mineral, braitschite. There is no resource potential for potash or halite (beyond the previously mentioned inferred resources) or for coal (Figure 8.38). (Patterson, Toth, Case, Green, Barton, and Thompson 1988)

Figure 8.38
Mineral Resource Potential of the Behind the Rocks WSA

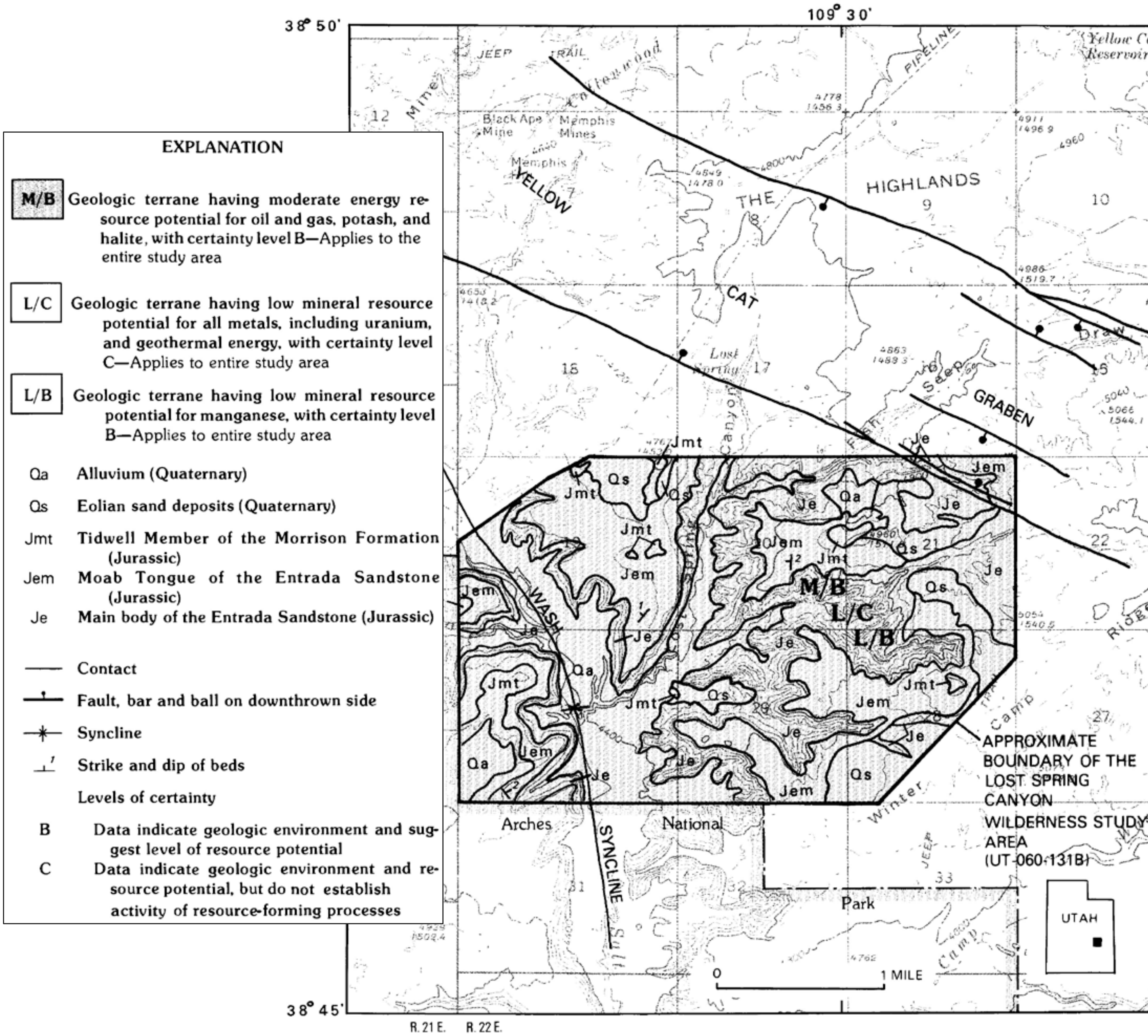


Source: Patterson, Toth, Case, Green, Barton, and Thompson 1988.

Lost Spring Canyon

The Lost Spring Canyon (UT-060-131B) Wilderness Study Area is about 15 miles north of Moab, Utah, and covers 3,880 acres adjacent to Arches National Park. Investigations by the USGS and the USBM conclude that the study area has no economic mineral resources, but has inferred subeconomic resources of sandstone and sand and gravel. There is moderate energy resource potential for undiscovered oil and gas, potash, and halite, and low resource potential for undiscovered geothermal resources and all metals, including uranium and manganese (Figure 8.39). (Soulliere, Lee, Case, and Gese 1988)

Figure 8.39
Mineral Resource Potential of the Lost Spring Canyon WSA

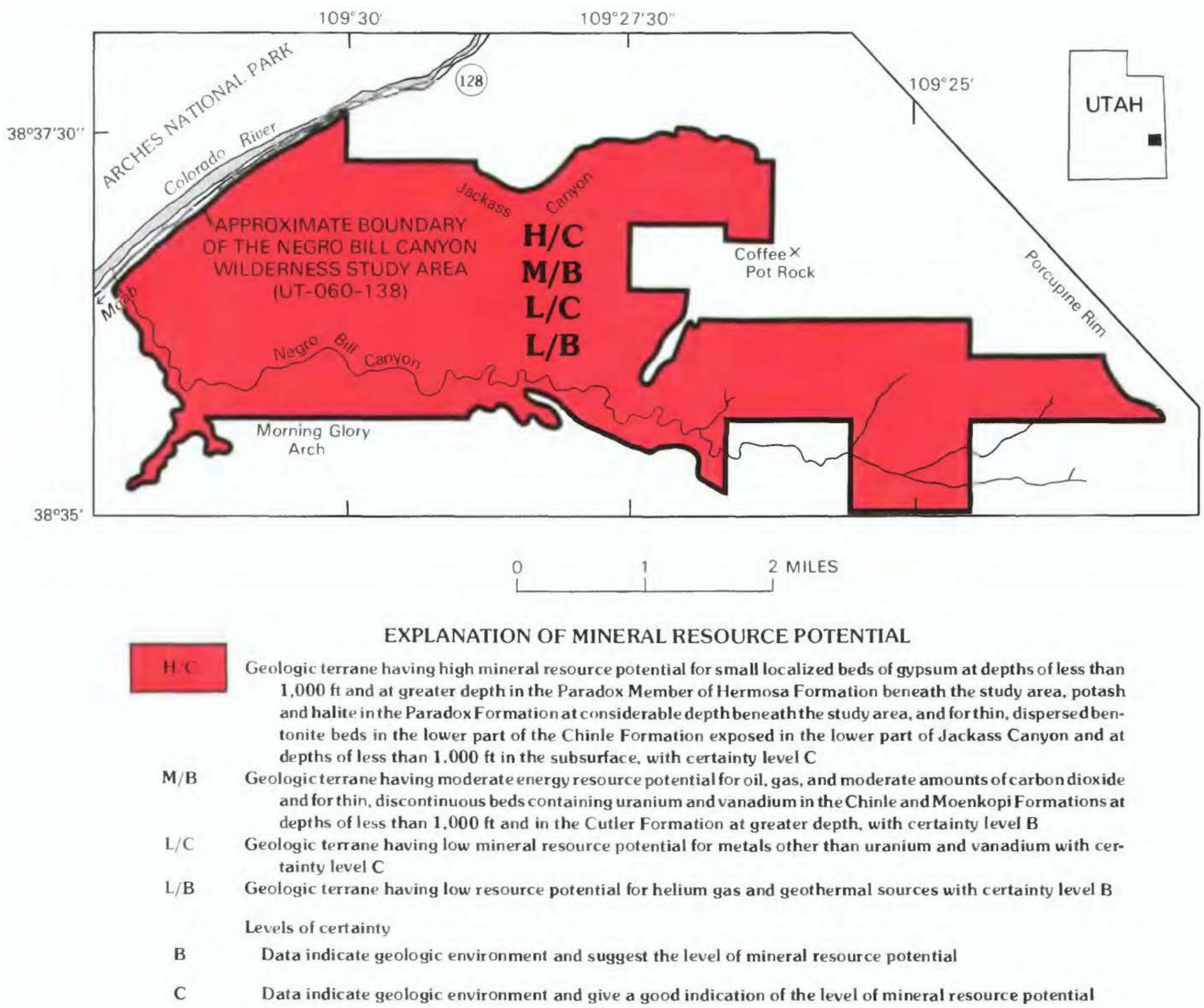


Source: Soulliere, Lee, Case, and Gese 1988.

Negro Bill Canyon

The Negro Bill Canyon (UT-060-138) Wilderness Study Area is in southeastern Utah in Grand County southeast of Arches National Monument and covers 7,620 acres. No mineral resources are identified in the study area. Lode mining claims cover the western part of the Negro Bill Canyon Wilderness Study Area; there are no patented claims in the study area. The mineral resource potential for gypsum, potash, halite, and bentonite on the surface and in the subsurface beneath the wilderness study area is high. The energy and mineral resource potential for oil, gas, carbon dioxide, uranium and vanadium on the surface and beneath the wilderness study area is moderate. The potential for helium gas, geothermal sources, and metals other than uranium and vanadium is low (Figure 8.40). (Bartsch-Winkler, Case, Barton, Duval, and Lane 1990)

Figure 8.40
Mineral Resource Potential of the Negro Bill Canyon WSA



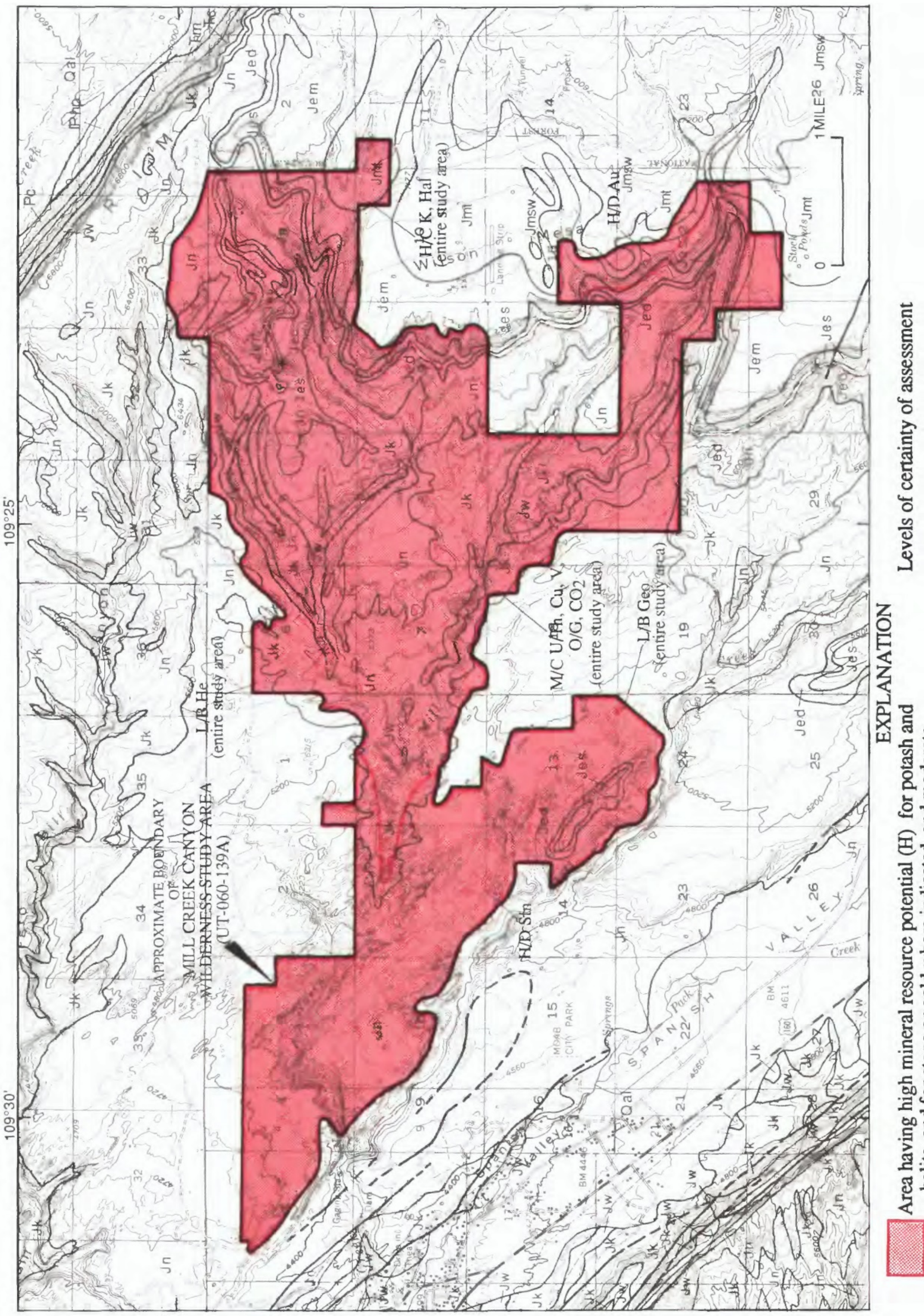
Source: Bartsch-Winkler, Case, Barton, Duval, and Lane 1990.

Mill Creek Canyon

At the request of the U.S. Bureau of Land Management, approximately 9,780 acres of the Mill Creek Canyon Wilderness Study Area (UT-060-139A) was evaluated for identified mineral resources (known) and mineral resource potential (undiscovered). Fieldwork was conducted in 1988 to assess the mineral resources and resource potential of the study area. No mineral resources were identified in the Mill Creek Canyon Wilderness Study Area. Placer gold is present in the eastern part of the study area but not in sufficient quantity to be considered a resource. Eolian sand and sandstone occur in the study area, but it is unlikely these will be developed. Oil and gas leases cover a small part of the study area; no geothermal resources are known to exist in the study area.

The entire study area has high potential for undiscovered mineral resources of potash and halite, and areas underlain by the Navajo Sandstone (Lower Jurassic) also have high potential for resources of flagstone. The top of Wilson Mesa also has high resource potential for small deposits of placer gold. The entire study area has moderate potential for resources of uranium, thorium, copper, vanadium, oil and gas, and carbon dioxide gas and has low potential for resources of helium gas and for geothermal energy (Figure 8.41). (Diggles, Case, Barton, Duval, and Lane 1990)

Figure 8.41
Mineral Resource Potential of the Mill Creek Canyon WSA

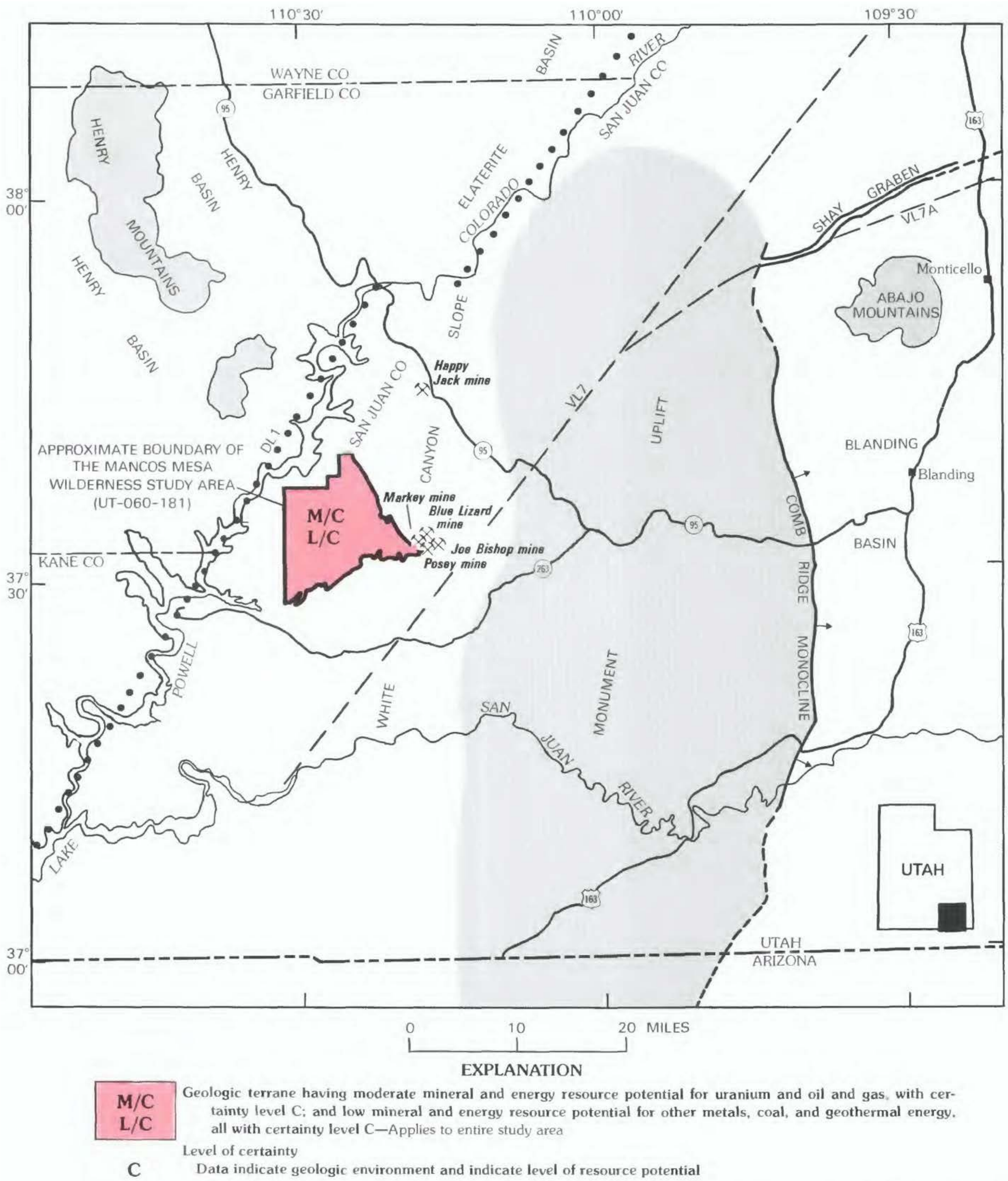


Source: Diggles, Case, Barton, Duval, and Lane 1990

Mancos Mesa

The USGS and the USBM conducted investigations to appraise the identified mineral resources (known) and assess the mineral resource potential (undiscovered) of 51,440 acres of the Mancos Mesa (UT-060-181) Wilderness Study Area, San Juan County, Utah. The wilderness study area has no identified resources. It has moderate mineral resource potential for uranium and moderate energy resource potential for oil and gas. Moderate mineral resource potential for uranium in channel-fill sandstones exists in the Shinarump Member of the Chinle Formation in the subsurface beneath Mancos Mesa. The wilderness study area has low mineral resource potential for other metals, coal, and geothermal energy (Figure 8.42). (Poole, Desborough, Barton, Hanna, Lee, and Kness 1989)

Figure 8.42
Mineral Resource Potential of the Mancos Mesa WSA

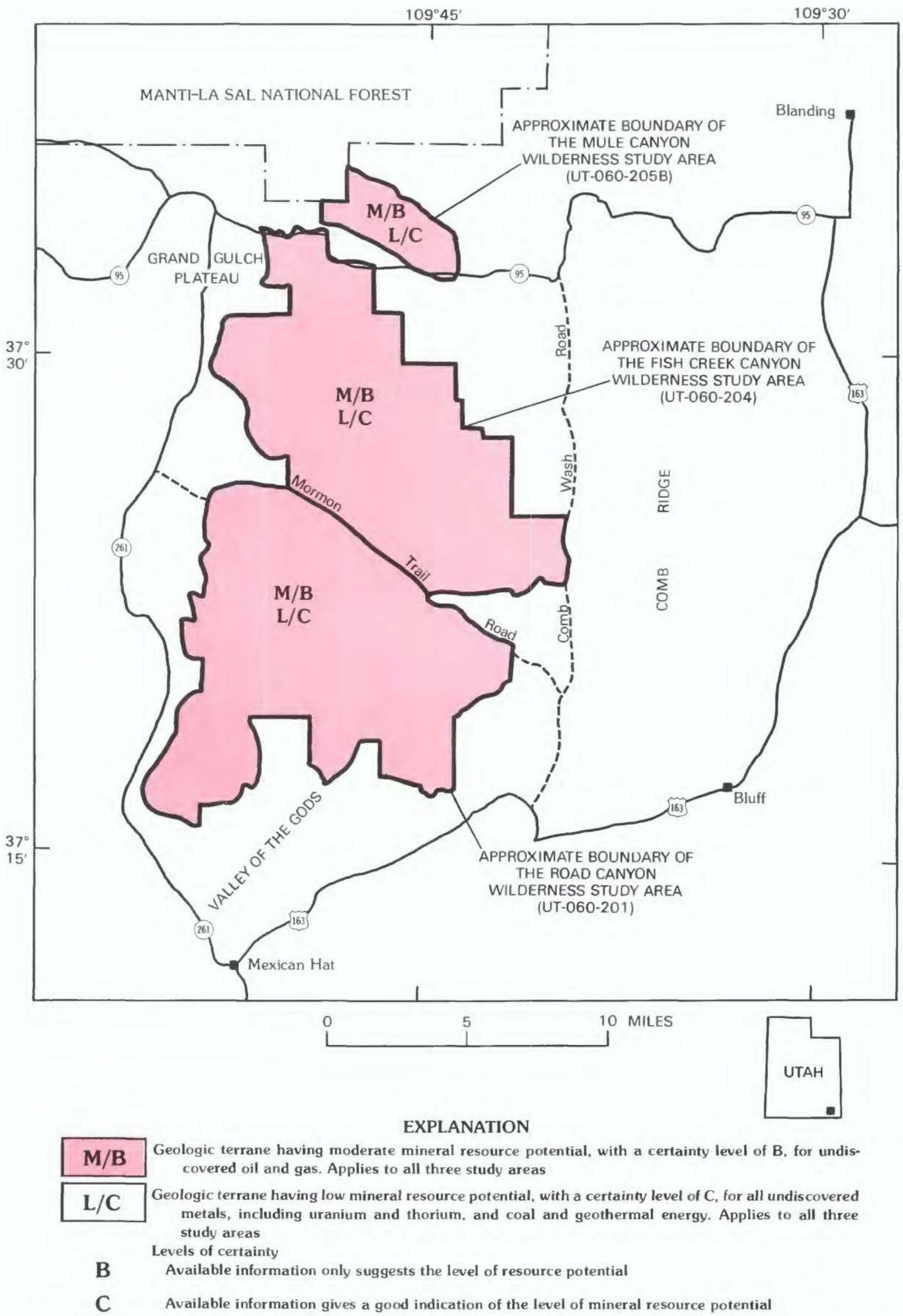


Source: Poole, Desborough, Barton, Hanna, Lee, and Kness 1989.

Fish Creek Canyon, Road Canyon, and Mule Canyon

At the request of the U.S. Bureau of Land Management the Fish Creek Canyon (UT-060-204), Road Canyon (UT-060-201), and Mule Canyon (UT-060-205B) Wilderness Study Areas, which comprise 40,160 acres, 52,420 acres, and 5,990 acres, respectively, were studied for their mineral endowment. A search of federal, state, and county records showed no current or previous mining claim activity, and with the exception of common-variety sand and gravel, no mineral resources were identified during field examination of the study areas. Sandstone and sand and gravel have no unique qualities, but could have limited local use for road metal or other construction purposes. However, similar materials are abundant outside the study areas. The three study areas have moderate resource potential for undiscovered oil and gas and low resource potential for undiscovered metals, including uranium and thorium, coal, and geothermal energy (Figure 8.43). (Bove, Shawe, Lee, Hanna, and Jeske 1989)

Figure 8.43
Mineral Resource Potential of the Fish Creek Canyon, Road Canyon, and Mule Canyon WSAs

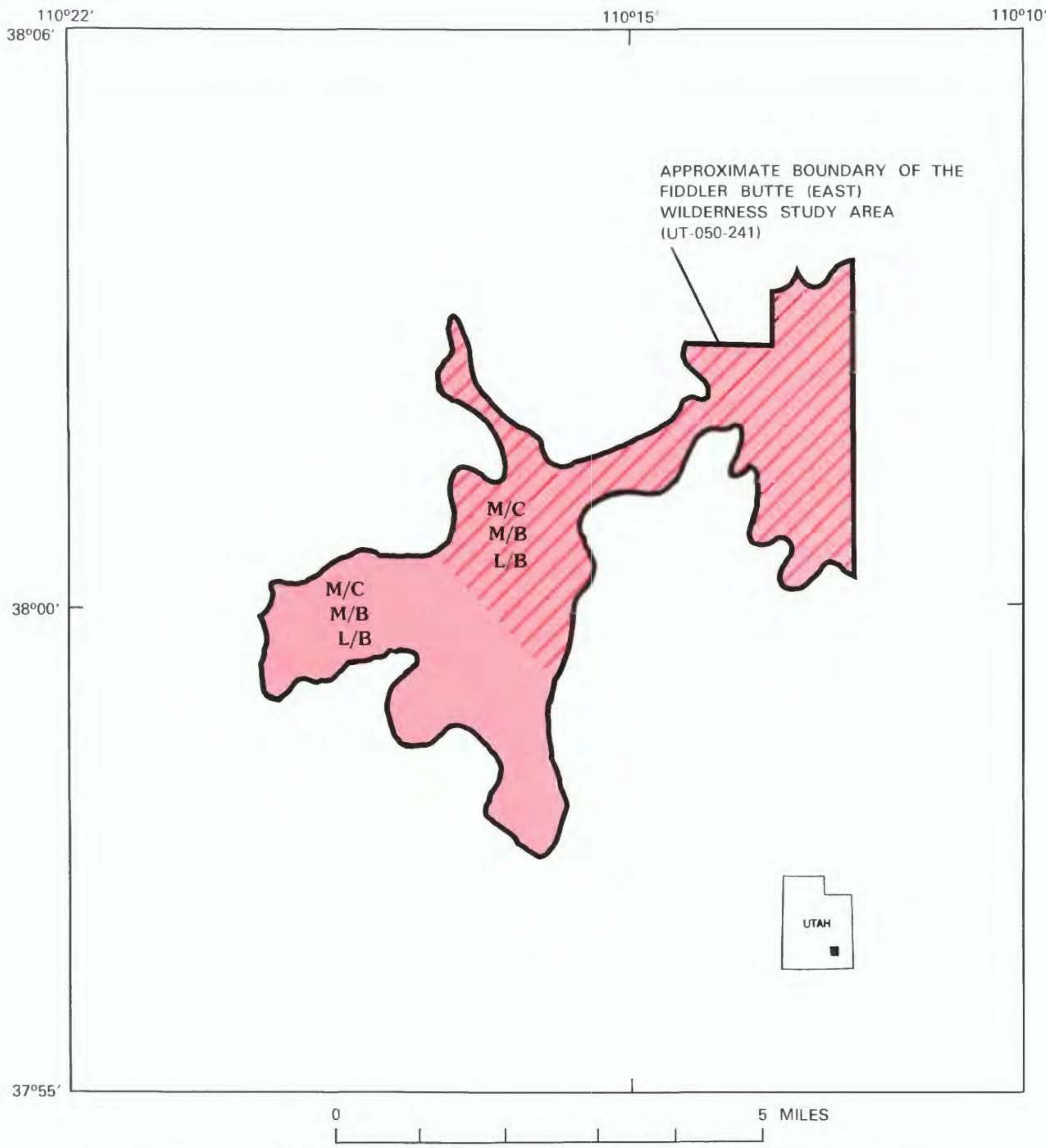


Source: Bove, Shawe, Lee, Hanna, and Jeske 1989.

Fiddler Butte (East)

The Fiddler Butte (East) Wilderness Study Area has inferred subeconomic resources of tar sands (oil-impregnated sandstones) in the northeastern part of the study area with in-place resources estimated to be 375–480 million barrels of oil. High-magnesium dolomite is present within the Navajo Sandstone within the study area. The dolomite would be suitable for various industrial uses, but the remote location of the deposit makes development unlikely. Common sand, gravel, and stone in the study area have no unique qualities and are not likely to be developed. Abundant petrified wood, suitable for collecting and polishing, is present in mudstones of the Chinle Formation within the study area. The southwestern part of the study area has a moderate mineral resource potential for undiscovered tar sands as localized deposits within the White Rim Sandstone. The entire study area has a moderate resource potential for undiscovered uranium and vanadium, for oil and gas, for small isolated occurrences of precious (silver and gold) metals, and a low potential for geothermal resources and other undiscovered metals (Figure 8.44). (Dubiel, Lee, Orkild, and Gese 1989)

Figure 8.44
Mineral Resource Potential of the Fiddler Butte (East) WSA



EXPLANATION OF MINERAL RESOURCE POTENTIAL

Geologic terrane having identified tar sand resources—Applies to the northeastern part of study area

M/C **Geologic terrane having moderate mineral resource potential for tar sand (applies to southwestern part of study area) and uranium and vanadium (applies to entire study area), with certainty level C**

M/B **Geologic terrane having moderate mineral resource potential for oil and gas and precious (gold and silver) metals, with certainty level B**—Applies to entire study area

L/B **Geologic terrane having low resource potential for geothermal energy and all metals other than those noted above, with certainty level B**—Applies to entire study area

Levels of certainty

B **Available information suggests level of resource**

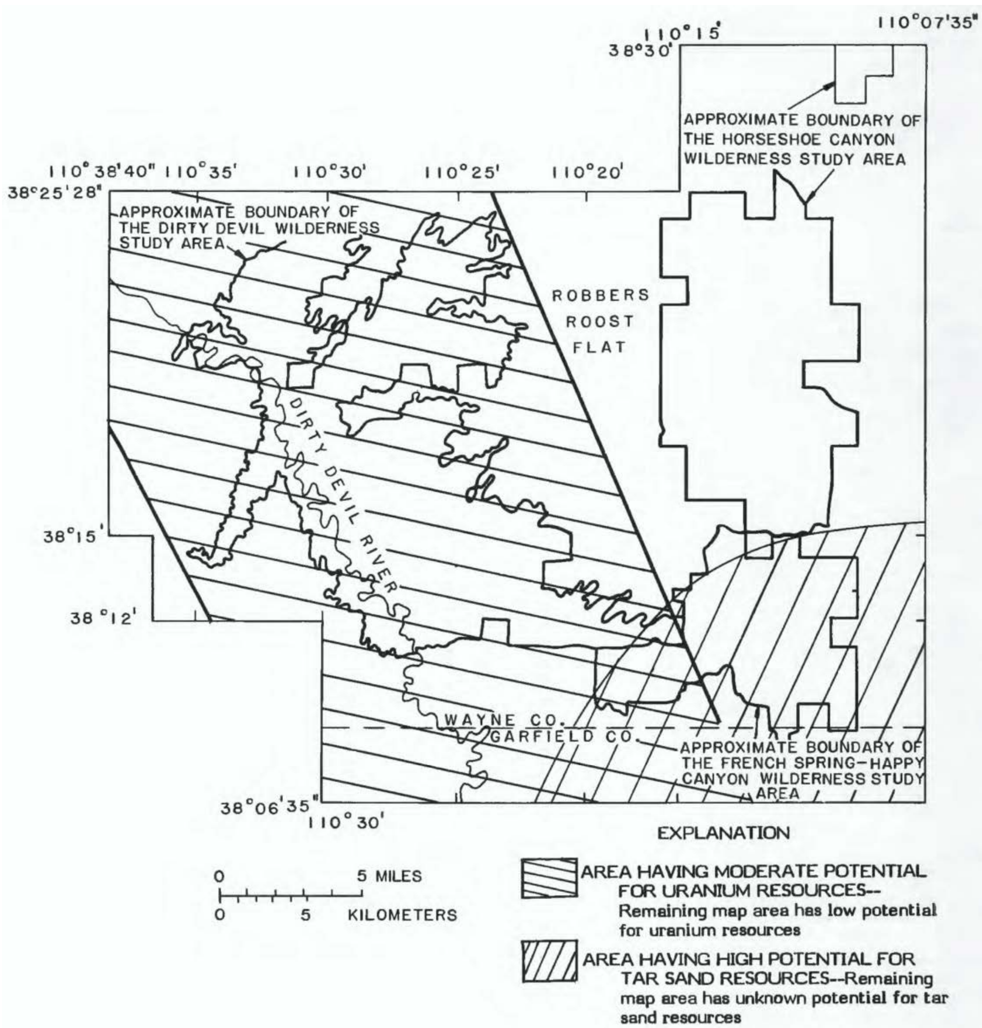
C **Available information gives good indication of level of mineral potential**

Source: Dubiel, Lee, Orkild, and Gese 1989.

Dirty Devil, French Spring–Happy Canyon, and Horseshoe Canyon

Field and laboratory studies of the Dirty Devil, French Spring-Happy Canyon, and Horseshoe Canyon Wilderness Study Areas in Wayne and Garfield Counties, Utah, were conducted to determine the resource potential of these lands. The studies indicate a moderate potential for uranium resources in the Dirty Devil Wilderness Study Area and in the extreme southwestern part of the French Spring–Happy Canyon Wilderness Study Area and a low potential for uranium resources in the northeastern part of the French Spring–Happy Canyon Wilderness Study Area and in the Horseshoe Canyon Wilderness Study Area. All three wilderness study areas have a moderate potential for petroleum resources. The French Spring–Happy Canyon Wilderness Study Area has a high potential for tar sand resources. The potential for tar sand resources in the Dirty Devil and Horseshoe Canyon Wilderness Study Areas is unknown. The studies indicate a low potential for other metallic and nonmetallic resources in the study areas (Figure 8.45). (Dubiel, Larson, Peterson, Willson, and Schreiner 1985)

Figure 8.45
Mineral Resource Potential of the Dirty Devil, French Spring–Happy Canyon, and Horseshoe Canyon WSAs

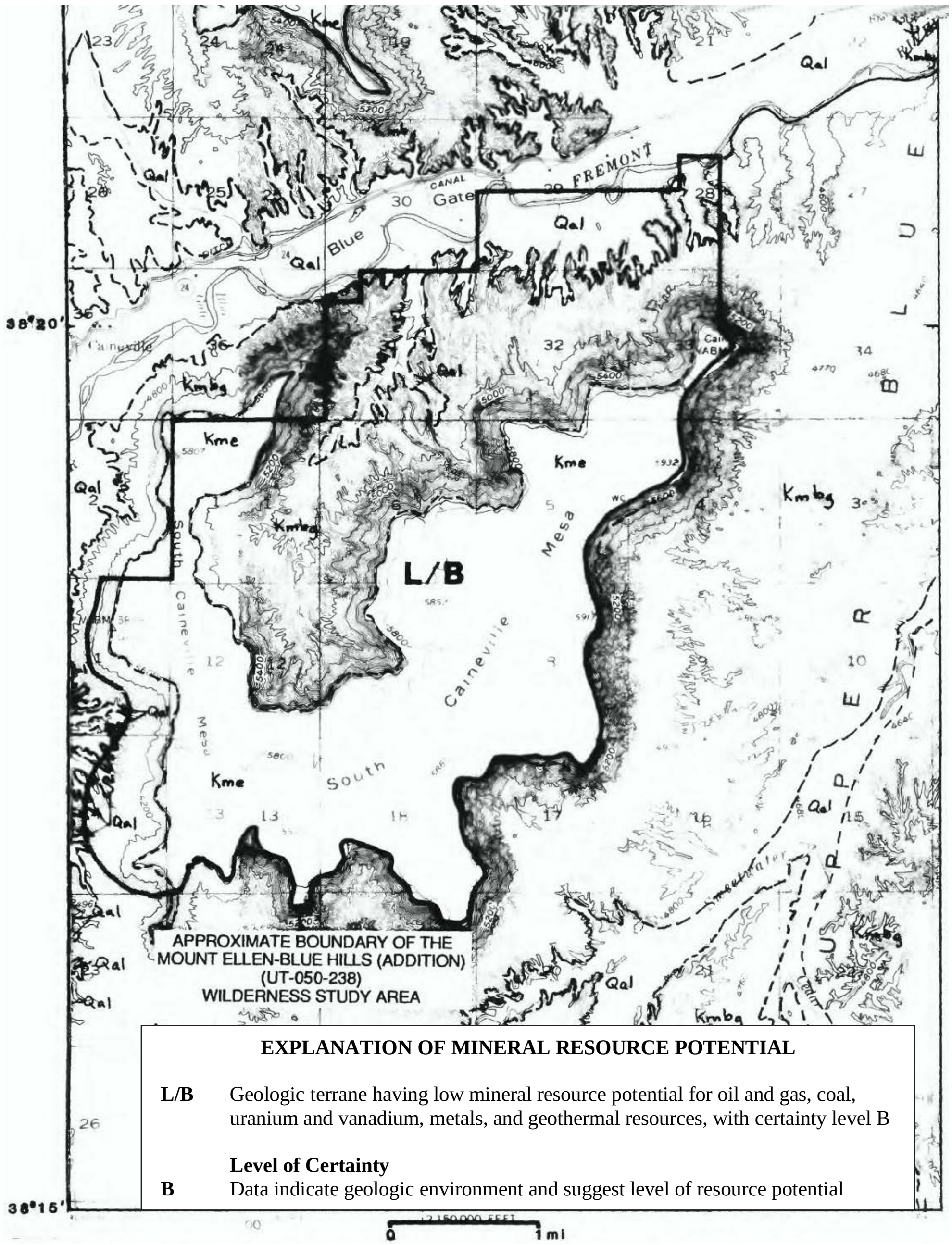


Note: Entire map area has moderate potential for petroleum resources and low potential for both metallic and nonmetallic resources.
Source: Dubiel, Larson, Peterson, Willson, and Schreiner 1985.

Mount Ellen–Blue Hills (Addition)

The Mount Ellen–Blue Hills (Addition) (UT-050-238) Wilderness Study Area comprises 7,324 acres in Wayne County, Utah. Field and laboratory investigations were conducted by the USGS from 1981 to 1985 and by the USBM in 1988. Field investigations disclosed no evidence of mineral occurrences, mining activity, or industrial commodities in the study area. The entire study area has a low mineral resource potential for oil and gas, coal, uranium and vanadium, metals, and geothermal resources (Figure 8.46). (Dubiel and Gese 1990)

Figure 8.46
Mineral Resource Potential and Geology of the Mount Ellen–Blue Hills (Addition) WSA



EXPLANATION OF MINERAL RESOURCE POTENTIAL

L/B Geologic terrane having low mineral resource potential for oil and gas, coal, uranium and vanadium, metals, and geothermal resources, with certainty level B

Level of Certainty

B Data indicate geologic environment and suggest level of resource potential

Source: Dubiel and Gese 1990.

King Top

The energy and mineral resource rating summary is given in Table 8.7. The WSA could contain deposits of beryllium, lead, zinc, and tungsten that are currently listed as strategic and critical materials. Industry evaluation indicates there is a high favorability for the occurrence of oil and gas in the WSA. However, several exploratory oil and gas wells have been drilled in the WSA, but no shows of oil or gas were reported. Based on somewhat favorable geologic structure and permeability, the favorability exists for small pools of oil or gas (f2) (less than 1 O million barrels of oil or 60 billion cubic feet of gas), with a low (c2) degree of certainty. The area has slight (f1) potential for a low temperature geothermal resource with a very low (c1) degree of certainty. About 43 mining claims are in the WSA and cover an area of approximately 860 acres. The geologic favorability for Beryllium is f2 for potential small deposits, with a very low (c1) degree of certainty. The carbonate host rocks along with the Tertiary volcanics and block faulting provide a favorable geologic environment for small deposits of lead and zinc (f2), with a very low (c1) degree of certainty of occurrence. Associated minerals include gold, silver, and copper in minor amounts. Although the genetic source rocks for tungsten deposits are lacking at the surface, they may occur at depth. A very low (c1) degree of certainty is assigned for small (f2) deposits. There is a very low certainty (c1) that a geologic favorability exists for uranium resources within the WSA (f1). Salable minerals (sand, gravel, limestone, etc.) are present in the WSA, but there is no interest due to the abundance of other more easily accessible sources. (US BLM, Utah State Office 1990)

Table 8.7
King Top WSA Mineral and Energy Rating Summary

Resource	Rating Favorabihty[1]	Certainty[2]	Estimated Resource
Oil and Gas	f2	c2	Less than 10 million barrels of oil, less than 60 billion cubic feet of gas
Uranium	f1	c1	Little or none
Geothermal	f2	c1	Low-temperature resource
Beryllium	f2	c1	Less than 10 metric tons[3]
Lead/Zinc	f2	c1	Less than 50,000 metric tons
Tungsten	f2	c1	Less than 500 metric tons

1. Favorability of the WSA's geologic environment for a resource (f1 = lowest, f4 = highest).
2. Degree of certainty that the resource exists within the WSA (c1 = lowest, c4 = highest).
3. One metric ton equals 1,000 kg or 2,204.6 pounds.

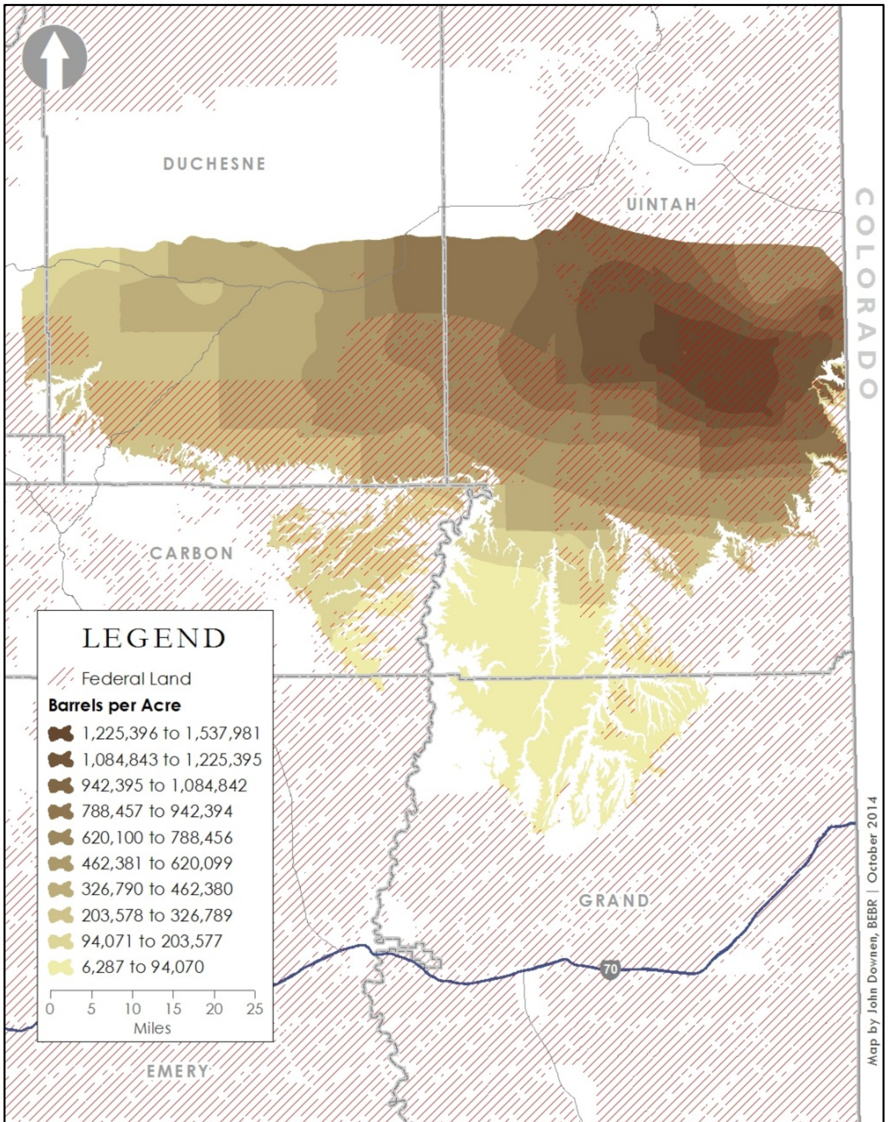
Source: U.S. Bureau of Land Management, Utah State Office 1990.

8.1.7 Unconventional Fuels

Oil Shale

The oil shale in Utah's Uinta Basin may contain the equivalent of 1.3 trillion barrels of oil. A smaller portion of the full deposit has attributes that may eventually allow as much as 77 billion barrels of oil to be produced in an economically viable manner (Boden et al. 2013). Figure 8.47 shows the extent and density of the Basin's oil shale resource.

Figure 8.47
Utah's Oil Shale Resource and Federal Land Ownership



Source: U.S. Geological Survey, Oil Shale Resources of the Uinta Basin, Utah and Colorado; State of Utah, SGID.

The relative magnitude of these numbers may go some way in explaining the persistent allure of oil shale. Consider, for example, that the current rate of conventional oil production in Utah is in the neighborhood of 35 million barrels per year; that only very recently has the cumulative volume of oil ever produced in Utah reached 1.5 billion barrels; and that 77 billion barrels of oil represents 20 to 30 years of U.S. oil production at recent production rates, exceeds the sum volume of all oil produced in Texas since 1935, and would sustain the current rates of oil production seen in North Dakota for about 200 years.

Yet, in spite of the impressive numbers, oil shale has yet to prove itself as an economically viable resource given current technologies, and progress towards economic viability remains unclear. After all, oil shale is not the more-or-less conventional crudes historically produced in Utah and it is not the shale oil of North Dakota.[211] In fact, though in volume the estimated 77 billion barrels of oil-equivalent contained in the most prospective oil shale deposits is roughly equal to one-fourth the reserves of Saudi Arabia, oil producible from oil shale is not considered part of U.S. reserves. "Reserves" is a technical term which connotes that the resource is not only available physically, but economically. Oil shale has not reached this threshold yet.

In recent years, a few prominent oil shale projects have shut down, a few others appear to be pushing ahead, and there may be new projects on the horizon. Chevron and Shell both withdrew from their in-situ oil shale projects on BLM-issued Research, Development and Demonstration (RD&D) leases in Colorado, while another RD&D holder—American Shale Oil Corp.—continues its work.[212, 213] ExxonMobil and Natural Soda Holdings have recently acquired RD&D leases in Colorado, both with plans to investigate proprietary in-situ production processes (Center of the American West 2014a).

In Utah, Enefit has access to over 30,000 acres of mixed federal, state, and private property, and has stated a plan to commence production at rates of 50,000 barrels per day (Enefit 2014). Red Leaf Resources has recently been granted a groundwater permit by the Utah Division of Water Quality that will enable it to move ahead on construction of an exhibition-scale oil shale plant utilizing its EcoShale technology (Red Leaf Resources 2014; Center of the American West 2014b). Another company, TomCo, with almost 3,000 acres on state lands, plans to license Red Leaf's EcoShale technology (TomCo Energy 2014).

Oil Sands

Utah contains the largest oil sands deposits in the U.S., with approximately 32 billion barrels of resources-in-place (Institute for Clean and Secure Energy 2013). Figure 8.48 shows the locations of the major oil sands deposits in Utah.

Although large volumes of oil are currently being produced from oil sands in Canada, there are significant differences between the oil sands of Canada and those of Utah that bear on the relative economics of the two resources. Concerning this point, a 2013 report published by the Institute for Clean and Secure Energy notes:

> Utah oil sands occur in thin layers, so a relatively larger amount of overburden must be removed per unit of oil sands processed compared to Canadian opera-

211 The similarity of the terms "oil shale" and "shale oil" is unfortunate since they are distinctly dissimilar resources (Chidsey 2012). See Appendix B for a comparison of the two resources.

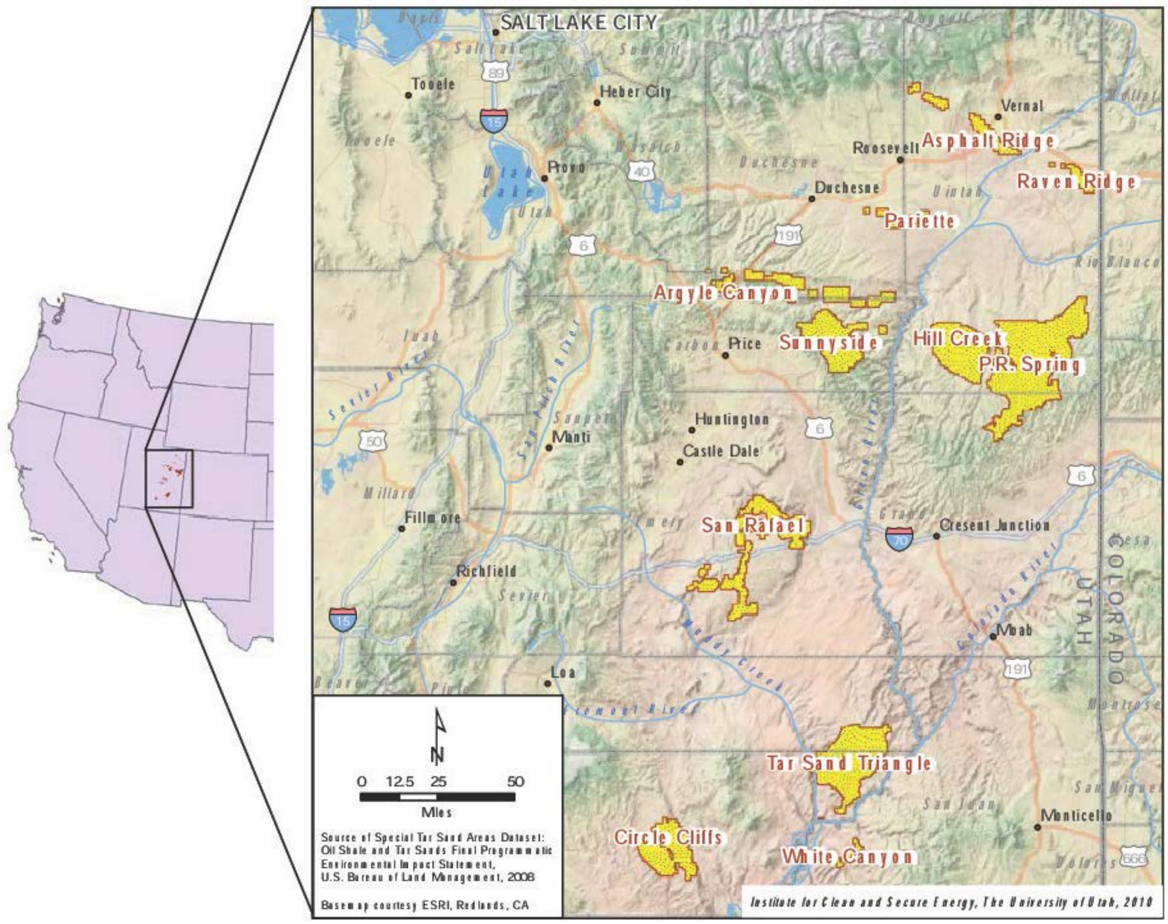
212 The withdrawal of Shell is especially disappointing, as their In-Situ Conversion Process (ICP) has been considered one of the more promising oil shale technologies. In 2005 Shell stated that it expected production from this process to be economically competitive with oil prices in the mid-$20s per barrel (RAND 2005).

213 An in-situ process is one in which the oil shale is not mined, but heated in place, then brought to the surface as (synthetic) crude oil. An ex-situ oil shale technology is one in which the oil shale is mined, then brought to the surface where it is processed in a retort (a heat source that rapidly transforms the oil precursor found in oil shale—kerogen—into a product similar to conventional crude oil).

> tions. These thin layers also mean that the economies of scale achieved by the enormous mining operations in Canada cannot be duplicated in Utah (Institute for Clean and Secure Energy 2013, p.29).

Regarding the prospects for production, the company U.S. Oil Sands has almost 6 thousand acres in the PR Spring Area (Figure 8.48) and has stated a plan to produce 2,000 barrels of bitumen per day, with production commencing in 2015 (U.S. Oil Sands 2014).

Figure 8.48
Major Oil Sands Deposits in Utah



Source: Institute for Clean and Secure Energy 2013, p. 22.

Cost Estimates for Oil Shale and Oil Sands Production

A 2013 report published by the University of Utah's Institute for Clean and Secure Energy provides estimates of the supply price of oil produced from oil shale and oil sands, where the supply price is the oil price necessary to induce investment in oil shale and oil sands under particular production technologies. They represent a complete accounting of the financial costs of production, including royalties, various taxes, and the opportunity cost of capital.

For two particular ex-situ production technologies the supply cost of oil from oil shale ranges from \$77 to \$153 per barrel, as the hurdle rate of investment ranges from 0 percent to 12 percent.[214] An in-situ process was also modeled, but the high estimates they provide for this process may not be reliable. Concerning this scenario, the authors note that, unlike the ex-situ oil shale scenarios, "This scenario is developed using commercially available reservoir simulation tools and equipment that can be purchased 'off-the-shelf' and does not necessarily represent what might be achievable using technologies currently under development." Therefore, although the in-situ oil shale supply costs are provided in the following table, they should be read with caution.[215] Lastly, for oil sands the estimated supply cost ranges from $76 to $122 for an ex-situ process, and from $84 to $161 for an in-situ process, as the hurdle rate ranges from 0 percent to 12 percent[216] (Table 8.8).

Table 8.8
Supply Cost Estimates for Ex Situ and In Situ Oil Shale and Oil Sands Operations
(2012 Dollars)

	Hurdle Rate						
Process	**0%**	**2%**	**4%**	**6%**	**8%**	**10%**	**12%**
Oil Shale (ex situ I)	$77	$86	$95	$107	$120	$135	$152
Oil Shale (ex situ II)	$78	$85	$93	$102	$112	$124	$138
Oil Shale (in situ)	$183	$225	$278	$346	–	–	–
Oil Sands (ex situ)	$76	$80	$86	$93	$102	$111	$122
Oil Sands (in situ)	$84	$93	$103	$114	$128	$143	$161

Source: Institute for Clean and Secure Energy 2013.

Shale Oil

Since 2012 the Utah Geological Survey, in conjunction with the Energy and Geoscience Institute at the University of Utah and Eby Petrology and Consulting, has been conducting "reservoir-specific geological and engineering analyses of the emerging Green River Formation (GRF) tight oil plays in the Uinta Basin and the established, yet understudied Cane Creek shale (and possibly other shale units) of the Paradox Formation in the Paradox Basin. Recently, the USGS assessed the undiscovered shale oil resource in the Cane Creek shale of the Paradox Basin at 103 million barrels at a 95 percent confidence level and the undiscovered shale oil resource of the Gothic, Chimney Rock and Hovenweep formations at 126 million barrels with 95 percent confidence (U.S. Geological Survey Paradox Basin Assessment Team 2012, Utah Geological Survey 2014).

Shale Gas

Since 2010 the Utah Geological Survey had been conducting two studies of potential shale gas plays in Utah. These analyze the Mancos Shale in the Uinta Basin, the Manning Canyon Shale in central Utah, and the Paradox Formation in southeastern Utah. The final reports have not yet been released but a May 2014 *Survey Notes* article reported a potential estimated 6.5 trillion cubic feet of shale gas, as well as potentially more than 250 million barrels of shale oil in the Paradox Formation (Chidsey 2014).

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214 The hurdle rate for an investment is the minimum acceptable rate of return on the investment given its risk/reward profile. For an oil shale or oil sands project the hurdle rate would almost certainly be higher than for investments in more conventional oil projects. A hurdle rate of 10 percent might be a reasonable lower bound.
215 For the in-situ oil shale scenario, supply costs were not provided for hurdle rates above 6 percent.
216 For North Dakota's shale oil, one recent estimate has the break even oil price at $47/barrel (Energy Policy Research Foundation 2011). To the extent this estimate is commensurable with those provided in Table 8.8, it provides a useful comparison of the economics of the two resources.

8.2 Renewable Resources

8.2.1 Renewable Energy

Current Generation

In 2013 Utah generated a total of 1,577.0 Gigawatthours (GWh) of electricity from renewable sources (Table 8.9). This represented a 15 percent decline from 2012 but a 150 percent increase over 2003, when the state generated 624.9 GWh of electricity from renewable sources. Through 2009, geothermal, hydroelectric and biomass were the sole renewable energy sources in the state. Wind power came online in 2010 and the first solar came in 2012. The sources of generation in 2013 were 348.1 GWh of electricity from three geothermal facilities (two on federal land, representing 82 percent of capacity, and one on state land), 633.8 GWh from 64 hydroelectric facilities, 534.9 GWh from 11 wind farms, 57.3 GWh from four biomass facilities, and 2.8 GWh from 135 solar facilities. Note that the latter two cover utility-scale and commercial facilities, and as such include generation from solar panels and windmills installed at businesses, apartment buildings, museums, schools, etc.

Table 8.9
Existing Renewable Energy Generation in Utah by Source, 2003–2013
(Megawatthours)

Year	Geothermal	Hydro	Wind	Solar	Biomass	Total
2003	198,465	421,339	–	–	5,083	624,887
2004	194,876	449,848	–	–	3,821	648,545
2005	184,802	784,463	–	–	3,948	973,213
2006	190,608	746,783	–	–	14,868	952,259
2007	163,925	538,782	–	–	31,030	733,737
2008	254,277	668,084	–	–	23,685	946,046
2009	279,121	835,257	–	–	47,878	1,162,256
2010	276,949	695,512	447,680	–	56,338	1,476,479
2011	330,188	1,230,165	572,790	–	58,007	2,191,150
2012	334,638	747,786	703,911	1,619	59,556	1,847,510
2013	348,093	633,830	534,896	2,822	57,334	1,576,975
Change	75.4%	50.4%	19.5%	74.3%	1027.9%	152.4%

Source: 2003–2012: Utah Geological Survey, Utah Energy and Mineral Statistics, geology.utah.gov/emp/energydata/renewenergydata.htm; 2013: U.S. Energy Information Administration, Electric Power Monthly, www.eia.gov/electricity/data/state/.

The state continues to add geothermal, solar and wind generating capacity. As of January 2014, there were six proposed new solar facilities totaling 301.1 Megawatts (MW) (300 MW of that coming from a single project in Millard County), three proposed wind facilities totaling 239.5 MW (100 MW from Phase III of the Milford Wind Corridor and the remainder from projects in San Juan County), and two proposed geothermal facilities totaling 44.0 MW (30 MW from the Blundell expansion and 14 MW from the Thermo Hot Springs expansion) (Utah Geological Survey nd).

Potential Generation

There have been two recent evaluations of potential renewable energy generating capacity in Utah. The Western Renewable Energy Zones Initiative was a project of the Western Governors' Association in collaboration with the U.S. Departments of Energy, Interior and Agriculture, the Federal Energy Regulatory Commission, and others. Their aim is to "facilitate the construction of new, utility scale renewable energy facilities and any needed transmission to deliver that energy across the Western Interconnect" (Western Governors' Association 2009, p. 2). The Utah Renewable Energy Zones Task Force was a concurrent effort commissioned by then-Governor Huntsman to "identify areas in Utah where utility-scale renewable energy development could occur; assess the electrical generation potential of wind, solar, and geothermal technologies; and identify new and existing transmission needed to bring renewable energy generation sources to market" (Berry et al. 2009, p. 1).

The WREZ Phase I report, released in June 2009, identified only one "qualified resource area" in Utah, spanning Millard, Beaver and Iron counties (Figure 8.49). This was based on "those resources that met a threshold potential for commercial development" (Western Governors' Association 2009, p. 6). Candidate solar areas must receive at least 6.5 kilowatt hours per square meter per day of direct normal insolation[217] (DNI) and have a terrain slope not greater than 5 percent (Western Governors' Association 2009, p. 6). Candidate wind areas must have a National Renewable Energy Laboratory wind power class of 3 or greater at 50 meters above the ground and a terrain slope not greater than 20 percent (Western Governors' Association 2009, p. 7). Given these constraints, the project identified a total of 10.6 GW of renewable renewable energy capacity: 7.2 GW of solar generating capacity, 1.7 GW of geothermal capacity (225 MW discovered, 1.5 GW undiscovered), 1.7 GW of wind capacity, and 91 MW of biomass capacity (Table 8.10).

Table 8.10
WREZ Renewable Energy Generating Capacity

Source	MW
Geothermal	**1,689**
Discovered	225
Undiscovered	1,464
Solar by DNI	**7,201**
6.5–6.75	4,786
6.75–7.0	2,178
7.0–7.25	237
Wind by Power Class	**1,678**
3	1,516
4	133
5+	29
Biomass	**91**
Total	**10,659**

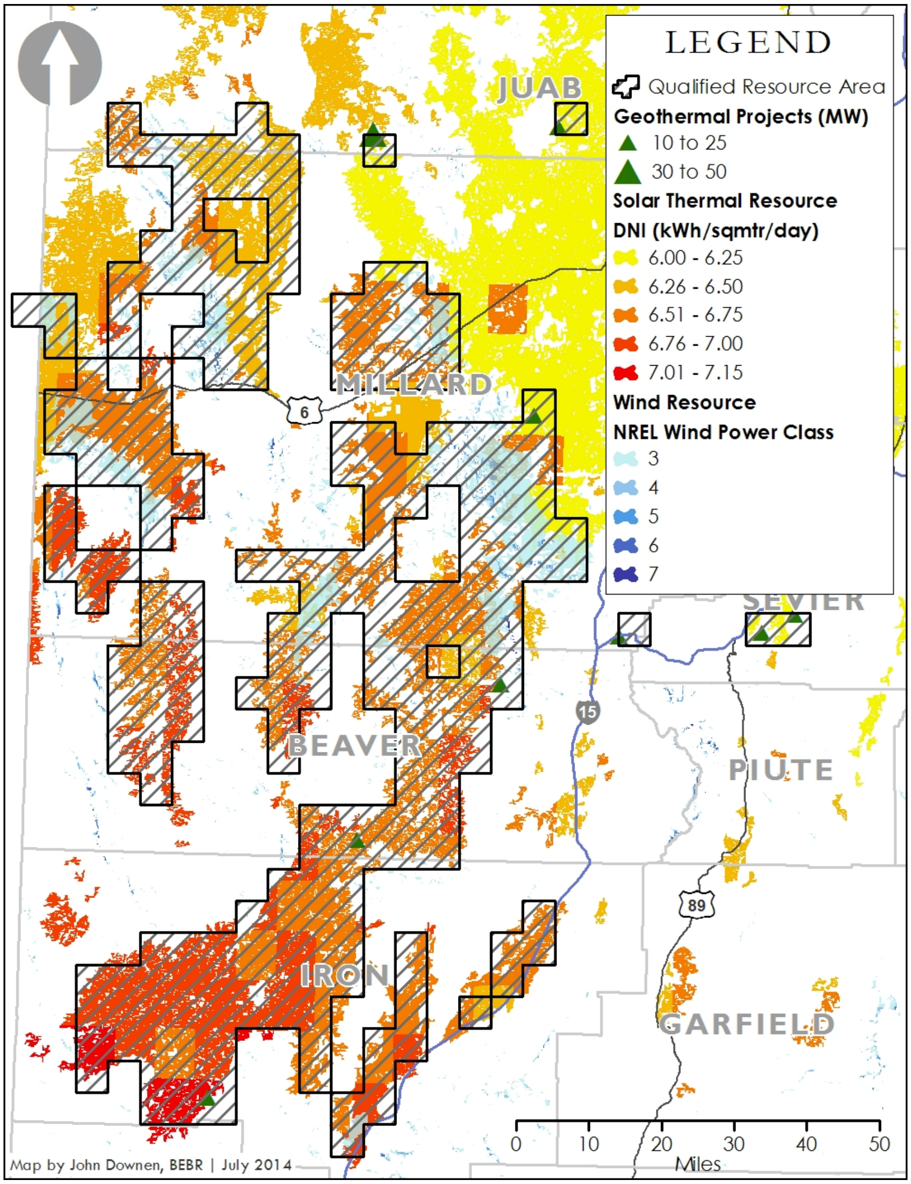
Source: Western Renewable Energy Zones – Phase I Report.

Phase I of the UREZ project identified areas with the theoretical potential to be renewable energy zones. Solar areas must receive a DNI of at least 6.0 $kWh/m^2/day$ and have a slope of not more than 3 percent. Potential wind areas could not be higher than 9,500 feet, could not be within military operating airspace, and could not be on land "too rugged for development." Wind sites were also subject to minimum wind resource requirements: drainage canyon sites must have at least 10 MW potential, other sites must have at least 50 MW potential, and there must be at least a 20 percent gross annual capacity factor.[218] Environmentally sensitive areas such as national parks, wilderness areas and wetlands were excluded from consideration for any resource.

In Phase II, the resource areas identified in Phase I were refined to 27 renewable energy zones (Figure 8.50). In addition to the criteria in Phase I, zones were defined to be large enough to justify the construction of transmission lines to them and such that the resources in them could be feasibly collected and delivered to the transmission system (Black & Veatch 2010). These zones represent 24.0 GW of renewable energy resources: 14.7 GW of solar, 8.9 GW of wind and 437 MW of geothermal (Table 8.11). Whereas the WREZ process identified just one zone in west-central Utah, the 27 UREZ zones span most of the state, though there is a concentration in the western part of the state, from Millard to Iron counties.

[217] The rate of delivery of direct solar radiation per unit of horizontal surface.
[218] Capacity factor is a measure of how often an electric generator runs for a specific period of time. It indicates how much electricity a generator actually produces relative to the maximum it could produce at continuous full power operation during the same period.

Figure 8.49
Utah's Western Renewable Energy Zone Identified Resources



Source: Western Governors' Association, National Renewable Energy Laboratory; www.westgov.org/initiatives/102-articles/initiatives/219-wrez7.

The UREZ Phase II report included five 15-year development scenarios for renewable energy in Utah. These were a reference case, low development, high development, "best projects" development and development timing. Detailed discussions of these scenarios can be found in chapter six of the Phase II report (Black & Veatch 2010).

Note that of the three main renewable energy sources discussed in these projects—geothermal, wind and solar—only geothermal is suitable for base load electricity generation. That is, it provides a constant, consistent supply of electricity. Wind and solar are intermittent sources that generate electricity only when the wind is blowing or the sun is shining. And the amount of energy they provide depends on how fast the wind is blowing and how intensely the sun is shining. As such, they are generally suitable only for contributing to daily peak load power provision.

Figure 8.50
Utah Renewable Energy Zones and Identified Resources

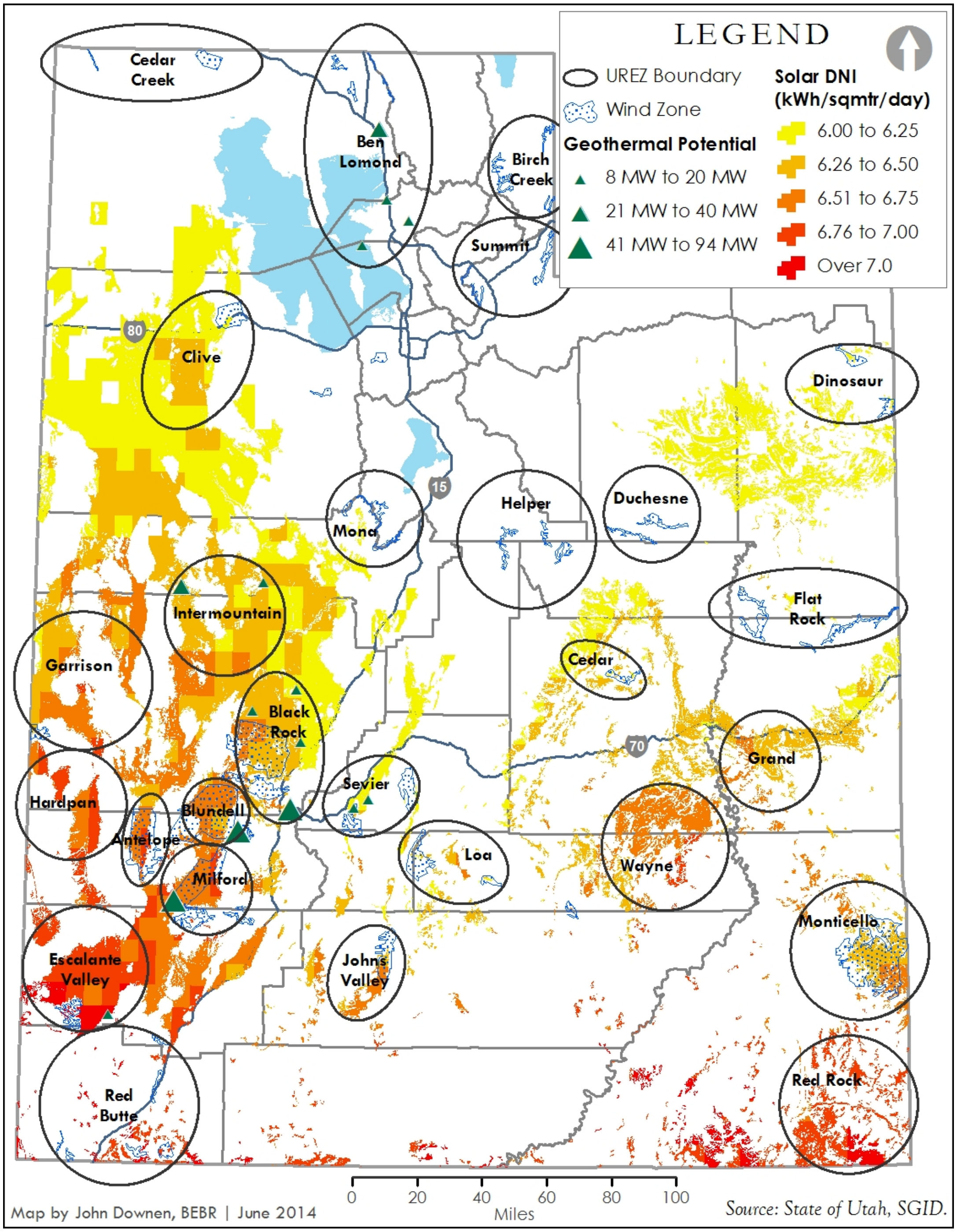


Table 8.11
Renewable Energy Resources by UREZ Zone
(MW)

Zone	Geothermal	Solar	Wind	Total
Antelope		357	500	857
Ben Lomond	48		255	303
Birch Creek			405	405
Black Rock	124	1,394	700	2,218
Blundell	81	676	600	1,357
Cedar			250	250
Cedar Creek			315	315
Clive		1,876	250	2,126
Dinosaur			300	300
Duchesne			320	320
Escalante Valley	12	2,133	230	2,375
Flat Rock			500	500
Garrison		1,508	120	1,628
Grand		226		226
Hardpan		776		776
Helper			480	480
Intermountain	50	1,564		1,614
Johns Valley		233	400	633
Loa		48	300	348
Milford	94	805	860	1,759
Mona			420	420
Monticello		356	500	856
Red Butte		261	520	781
Red Rock		1,164		1,164
Sevier	28	115	260	403
Summit			390	390
Wayne		1,204		1,204
Grand Total	**437**	**14,696**	**8,875**	**24,008**

Source: Utah Renewable Energy Zone (UREZ) Task Force, Phase II Final Report, pg. ES-4; available at energy.utah.gov/wp-content/uploads/UREZ-Phase-II.pdf.

8.2.2 Timber

Forests cover one-third of Utah. Among other values, they offer wildlife habitat, recreation opportunities, scenic landscapes, natural resources and watershed protection. The presence of commercially viable species varies by county, concentrated in mountainous areas. National forests contain 76 percent of the state's timberland, including valuable Engelmann spruce, aspen, lodgepole pine and Douglas-fir.

Public and Private Forests by Ownership

Of Utah's 54.3 million surface acres, 18.3 million acres are forested, 33.7 percent of the state. The Bureau of Land Management (BLM) and U.S. Forest Service each steward more than a third of the state's forests. Most forests in Utah are not harvested. Tree species may not be suitable, the land may be managed for other priorities, or road access may be lacking.

Timberland, commercially viable forest, covers 3.8 million acres, which is one-fifth of the forest land and 7.0 percent of all land area in Utah. Very little of BLM's forest land is classified as timberland. Otherwise, ownership patterns are analogous for forest land and timberland in Utah.

All landowners listed in Table 8.12 have at least a small amount of forest land, and all owners except the National Park Service, Fish and Wildlife Service, Department of Defense and Department of Energy have timberland. Of the 8.1 million acres of Forest Service lands, 6.3 million acres (78 percent) are forested and 2.9 million acres (35 percent) are timberland. As suggested earlier, 32 percent of BLM's 22.6 million acres in Utah is forested and 0.5 percent is timberland.

Table 8.12
Utah Forest Land and Timberland by Ownership
(Millions of Acres)

	All Land		Forest Land		Timberland	
Ownership	Acres	Share	Acres	Share	Acres	Share
Federal	34.7	64%	13.9	76%	3.0	78%
Forest Service	8.1	15%	6.3	35%	2.9	76%
National Park Service	2.0	4%	0.4	2%	0.0	0%
BLM[1]	22.6	42%	7.2	39%	0.1	3%
Fish and Wildlife Service	0.1	0%	0.0	0%	0.0	0%
Defense, Energy[1]	1.8	3%	0.0	0%	0.0	0%
State & Local	6.0	11%	1.5	8%	0.2	5%
State[2]	5.9	11%	1.5	8%	0.2	5%
Local[3]	0.0	0%	0.0	0%	0.0	1%
Private[4]	13.6	25%	2.8	15%	0.6	16%
Total[5]	54.3	100%	18.3	100%	3.8	100%

1. Bureau of Land Management, Department of Defense, Department of Energy
2. State includes School and Institutional Trust Land Administration (SITLA), Forestry, Fire and State Lands (FFSL), Division of Wildlife Resources (DWR) and the Division of State Parks and Recreation.
3. Local ownership includes lands owned by municipalities and counties, about 49,320 acres, of which 36,725 are forested and 20,515 are timberland.
4. Private includes 7,309 forested acres of "other non-federal lands," of which none is timberland, as well as tribal lands not itemized in the FIDO source, but given as 535,872 acres of forest land per the 2010 survey of the National Association of State Foresters (NASF).
5. Forest land and timberland percentages do not add to 100% due to rounding.

Source: U.S. Forest Service, Forest Inventory and Analysis Program.

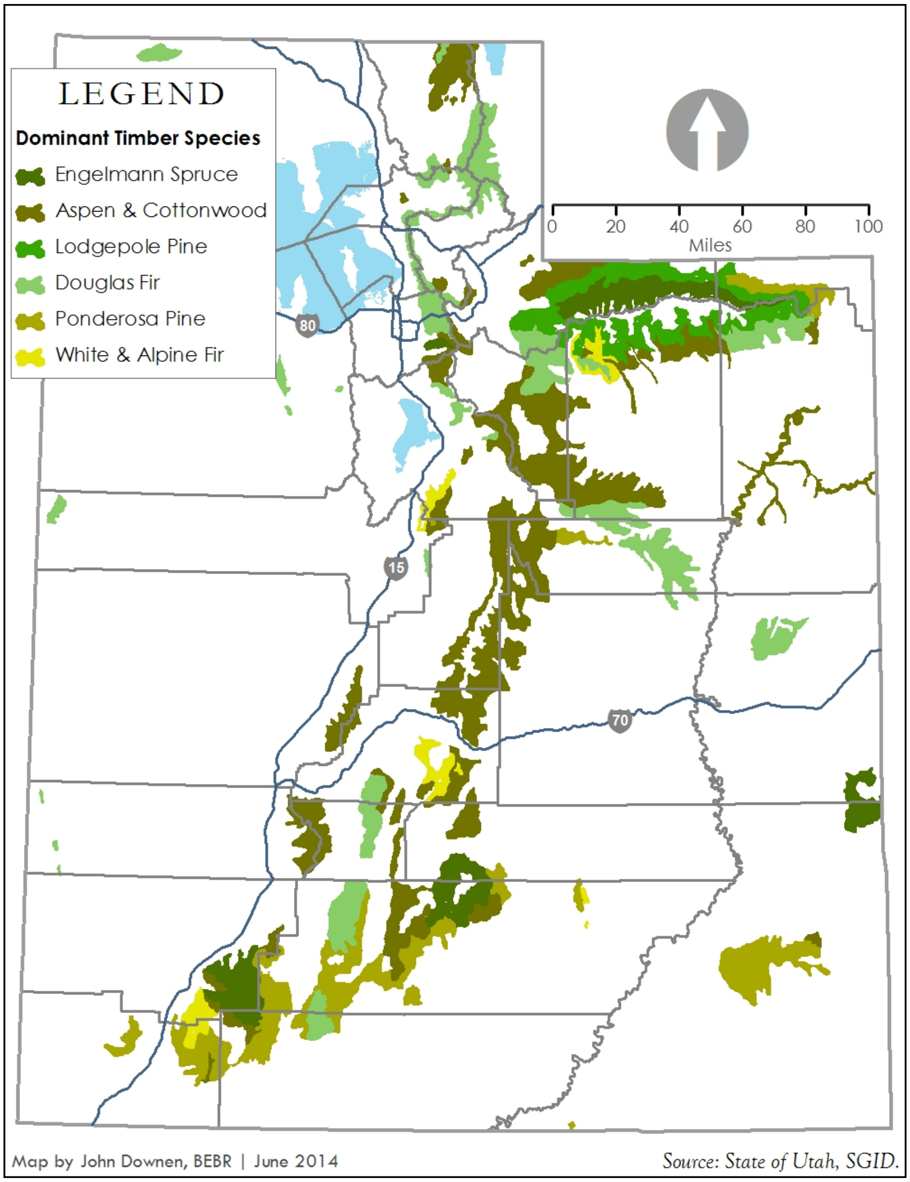
Only a small portion of federal timberlands are within national parks and wildernesses or otherwise officially closed to multiple-use access. Yet budget constraints, federal policy, timber prices, sawmill proximity and other factors limit access to federal timberland designated for multiple use, often precluding regular commercial harvests and active management for forest health objectives.

Forest Types

Figure 8.51 maps forest types contributing at least 1 percent of Utah's timber harvest in recent years.[219] Engelmann spruce, Douglas-fir, lodgepole pine and ponderosa pine are commonly used for conventional lumber or as logs for homes. Specialty wood, posts, firewood and excelsior are derived from a variety of forest types.

[219] The map shows where Utah's commonly harvested tree species were the dominant vegetation in 2001, the most recent year available. Forests commonly host a dominant tree species mixed with other varieties of trees and undergrowth.

Figure 8.51
Dominant Timber Species in Utah, 2001



Two noncommercial forest types shown in Table 8.13, pinyon-juniper and woodland hardwoods, make up 72.3 percent of Utah's forests (Keyes, et al. 2003).

Utah's pinyon-juniper forests thrive in dry conditions. They have encroached on lands that previously sustained sagebrush, grasses and other native plants (Keyes, et al. 2003, 12). Aspen forests are in decline (O'Brien 1999, 13). The leading causes are wildlife and livestock grazing and excessive fire suppression (Keyes, et al. 2003, 11). In addition, over the past few decades the health of most forest types in Utah has deteriorated due to drought, wildfire and beetle infestation in the absence of a vigorous and timely response by forest managers in most areas (Cottam and McNaughton 2014).

Table 8.13
Utah Forest Types by Land Area, 2012
(Thousands of Acres)

Forest Type Group	Acres	Share
Pinyon-juniper	10,748	58.7%
Woodland hardwoods[1]	2,482	13.6%
Aspen and birch	1,574	8.6%
Spruce, fir and mountain hemlock	1,472	8.0%
Nonstocked[2]	574	3.1%
Douglas-fir	553	3.0%
Lodgepole pine	427	2.3%
Ponderosa pine	347	1.9%
Cottonwood, elm and ash	62	0.3%
Other western softwoods	62	0.3%
Total	18,299	100%

1. Woodland hardwoods mainly consist of gambel oak.
2. Nonstocked forest is temporarily without tree cover from causes such as wildfire, harvests and disease.

Source: U.S. Forest Service, Forest Inventory and Analysis Program.

Five tree species, most notably Engelmann spruce, constituted 94 percent of Utah's 2007 timber harvest received by sawmills, with scarcely any pinyon, juniper or woodland hardwoods (Table 8.14).

Table 8.14
Utah Harvest Volume by Tree Type, 2007
(Thousands of Board Feet)

Tree Species	Volume	Share
Engelmann spruce	12,607	41.6%
Aspen and cottonwood	8,730	28.8%
Lodgepole pine	3,989	13.2%
Douglas-fir	3,260	10.8%
Ponderosa pine	1,080	3.6%
True firs[1]	648	2.1%
Other species[2]	6	0.02%
Total	30,321	100%

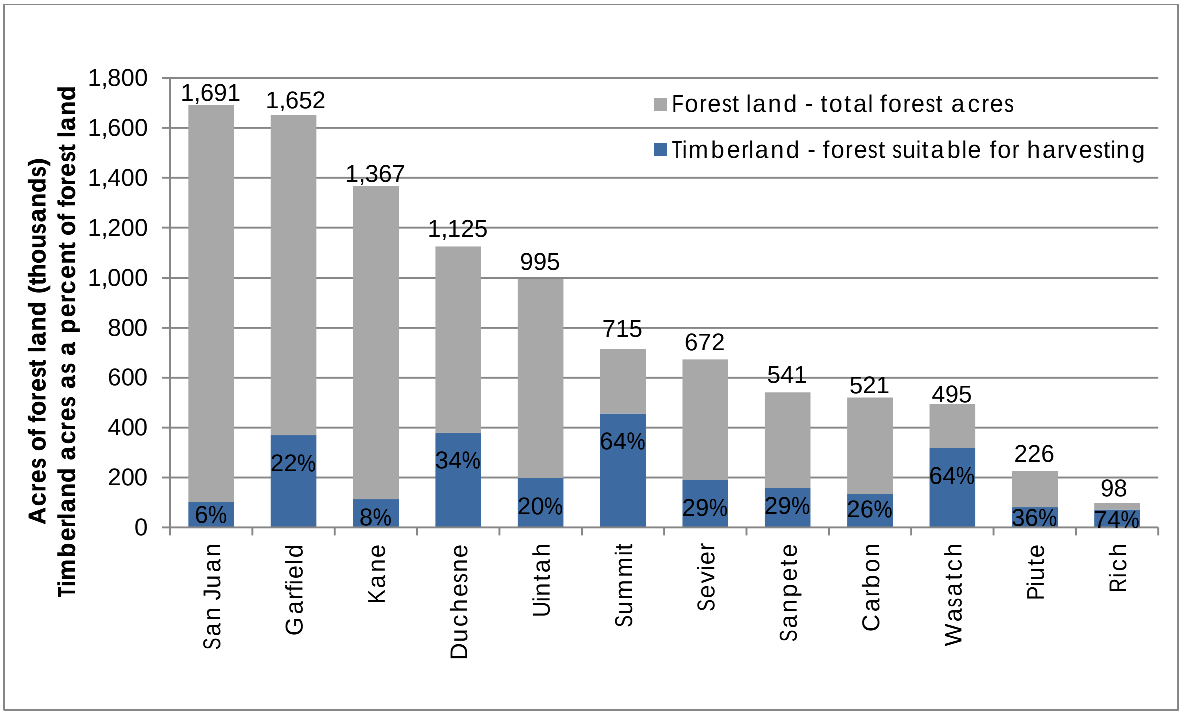
1. True firs include white, supalpine, and corkbark fir.
2. Other species include juniper and hardwoods.

Source: Hayes et al. 2007, Table U5.

Forests and Timberland by County

Timber resources are spread unevenly throughout the state. Figure 8.52 shows forest land acres and the percentage of forest that is timberland for the twelve counties with the largest timber harvest volumes in 2002 and 2007. These counties yielded more than 1.5 million board feet (MMBF) in average harvest for those two years. Wasatch County had just over 4 MMBF, followed by Summit and Garfield counties. Only three counties—Box Elder, Tooele and Juab—did not report any timber harvest in 2002 or 2007.

Figure 8.52
Forest Land and Timberland by County in Utah



Note: These are the twelve counties with the largest timber harvest volume in Utah during 2002 and 2007.
Source: U.S. Forest Service, Forest Inventory and Analysis Program

Counties with the most timberland in Utah are located between Salt Lake County and the Colorado border. These include Summit, Wasatch and Duchesne. Counties in central and southern Utah also have considerable timber resources, for example, Sevier and Garfield. Counties with 5 percent or more of Utah's 3.7 million acres of timberland are Summit (12 percent), Duchesne (10 percent), Garfield (10 percent), Wasatch (8 percent), Uintah (5 percent) and Sevier (5 percent). While San Juan and Kane are among the top three counties in terms of forest land area, with over one million acres each, their timberland acreages are near the county average of 130,000 acres (Table 8.15).

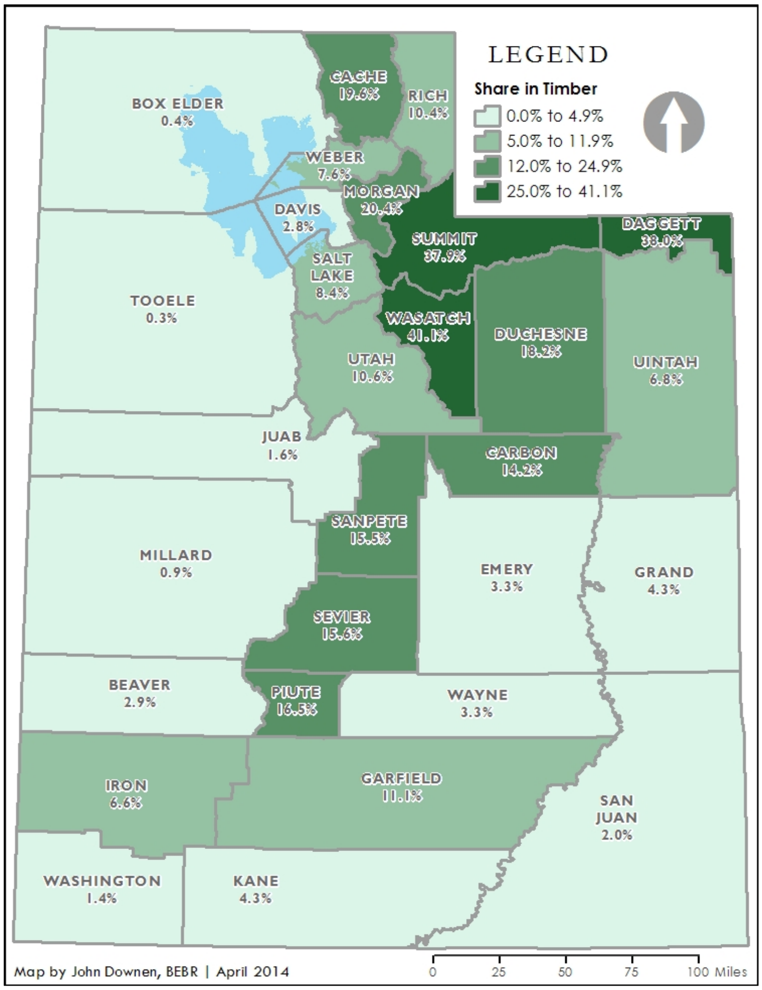
Table 8.15
Utah's Timberland and Forest Land by County, 2012

County	Thousands of Acres Timberland	Thousands of Acres Forest Land	Thousands of Acres All Land	Share of State Totals Timberland	Share of State Totals Forest Land	Rank of 29 Counties Timberland	Rank of 29 Counties Forest Land
Beaver	48	785	1,659	1.3%	4.3%	21	8
Box Elder	16	373	4,307	0.4%	2.0%	27	20
Cache	147	313	751	3.9%	1.7%	9	22
Carbon	135	521	950	3.6%	2.8%	12	16
Daggett	176	314	463	4.7%	1.7%	7	21
Davis	11	25	406	0.3%	0.1%	29	29
Duchesne	380	1,125	2,084	10.1%	6.1%	2	4
Emery	95	667	2,855	2.5%	3.6%	16	14
Garfield	370	1,652	3,333	9.8%	9.0%	3	2
Grand	103	951	2,364	2.7%	5.2%	15	6
Iron	139	913	2,113	3.7%	5.0%	11	7
Juab	36	483	2,180	0.9%	2.6%	24	18
Kane	113	1,367	2,629	3.0%	7.5%	13	3
Millard	38	693	4,370	1.0%	3.8%	23	11
Morgan	80	184	391	2.1%	1.0%	18	25
Piute	81	226	490	2.1%	1.2%	17	24
Rich	73	98	695	1.9%	0.5%	19	28
Salt Lake	44	171	517	1.2%	0.9%	22	26
San Juan	103	1,691	5,077	2.7%	9.2%	14	1
Sanpete	159	541	1,026	4.2%	3.0%	8	15
Sevier	192	672	1,228	5.1%	3.7%	6	13
Summit	456	715	1,205	12.1%	3.9%	1	10
Tooele	16	473	4,664	0.4%	2.6%	28	19
Uintah	197	995	2,879	5.2%	5.4%	5	5
Utah	145	685	1,370	3.8%	3.7%	10	12
Wasatch	318	495	774	8.4%	2.7%	4	17
Washington	22	751	1,555	0.6%	4.1%	26	9
Wayne	53	292	1,579	1.4%	1.6%	20	23
Weber	32	126	422	0.9%	0.7%	25	27
Total	3,779	18,299	54,335	100%	100%		

Source: U.S. Forest Service, Forest Inventory and Analysis Program.

One way to express which counties of any size rely heavily on timber resources, or at least which have greater timber industry potential, is to note the percentage of county land area covered by forest or timberland. In Wasatch, Daggett and Summit counties, between one-third and one-half of the county is timberland (Figure 8.53 and Table 8.16), and more than half of the land area is forested (Table 8.16). In contrast, Box Elder, Millard and Tooele counties are less than 1 percent timberland and less than 20 percent forest land.

Figure 8.53
Share of County Acreage in Timberland



Source: U.S. Forest Service, Forest Inventory and Analysis Program.

Table 8.16
Timberland and Forest Shares of County Acreage in Utah, 2012

County	Forest Land	Timberland
Beaver	47.3%	2.9%
Box Elder	8.7%	0.4%
Cache	41.7%	19.6%
Carbon	54.8%	14.2%
Daggett	67.9%	38.0%
Davis	6.0%	2.8%
Duchesne	54.0%	18.2%
Emery	23.3%	3.3%
Garfield	49.5%	11.1%
Grand	40.2%	4.3%
Iron	43.2%	6.6%
Juab	22.2%	1.6%
Kane	52.0%	4.3%
Millard	15.9%	0.9%
Morgan	47.2%	20.4%
Piute	46.1%	16.5%
Rich	14.1%	10.4%
Salt Lake	33.1%	8.4%
San Juan	33.3%	2.0%
Sanpete	52.8%	15.5%
Sevier	54.8%	15.6%
Summit	59.4%	37.9%
Tooele	10.1%	0.3%
Uintah	34.6%	6.8%
Utah	50.0%	10.6%
Wasatch	64.0%	41.1%
Washington	48.3%	1.4%
Wayne	18.5%	3.3%
Weber	30.0%	7.6%
State of Utah	33.7%	7.0%

Source: U.S. Forest Service, FIA Program.

Common forest types in each county can be compared with harvested species in Utah: spruce, aspen, cottonwood, lodgepole pine, Douglas-fir, ponderosa pine and other firs (Table 8.17). For example, Wasatch County has the most aspen or birch forest land. Over 200 acres each of Duchesne and Summit counties are forests primarily containing spruce, true firs or western hemlock. Duchesne, Garfield, Cache and Uintah are leading counties for Douglas-fir forests. Few counties have lodgepole pine forests, 46 percent of which are located in Summit County. Ponderosa pine is distributed somewhat more widely, with Garfield County growing 35 percent of the state total. Of Utah's nonstocked forest lands, 13.2 percent normally carry commercially harvested species that were depopulated or in early stages of recovery when surveyed during 2003–2012.

Table 8.17
Utah Forest Types by County
(Thousands of Acres)

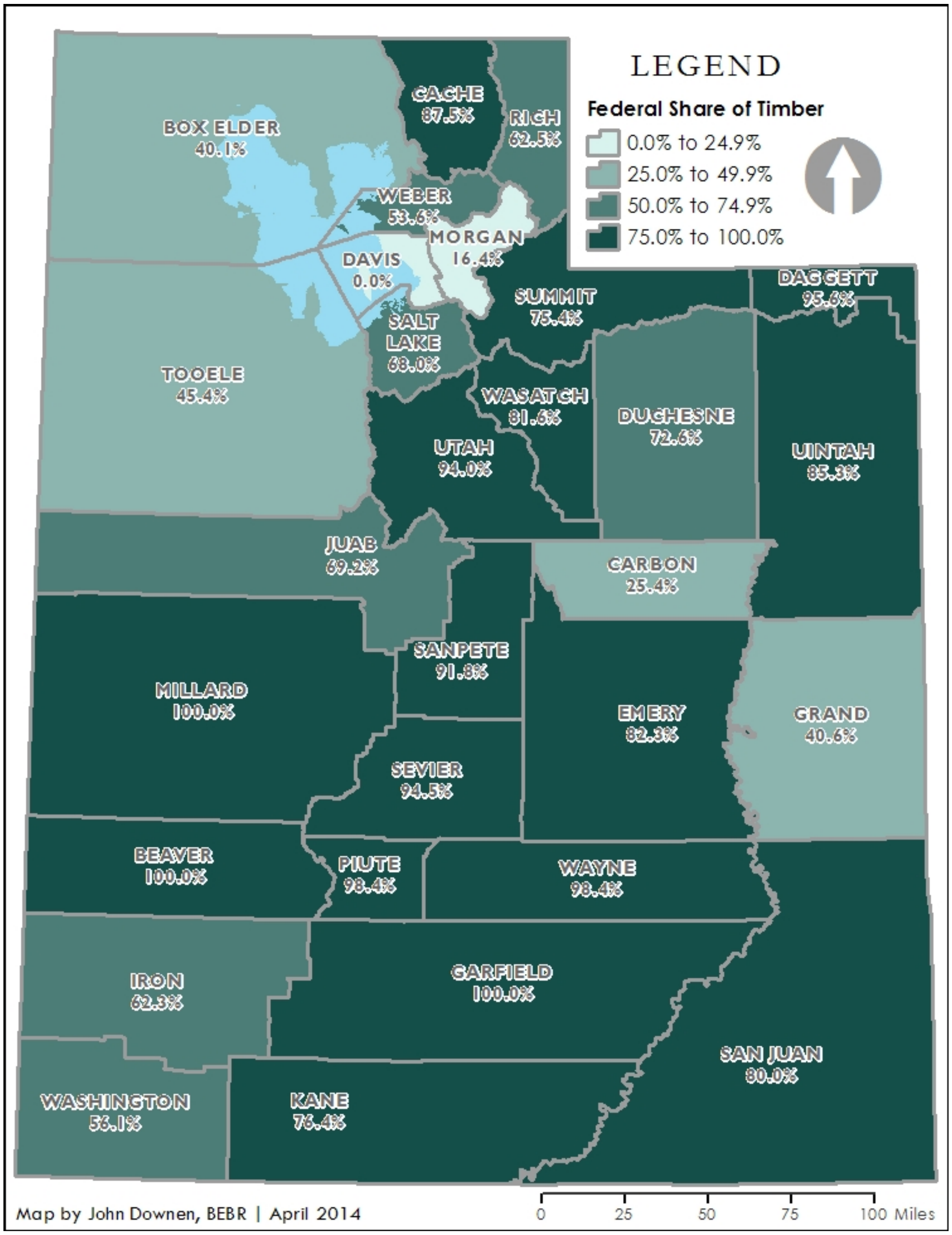
County	Pinyon juniper	Woodland hardwoods	Aspen, birch	Spruce, fir...	Non-stocked	Douglas-fir	Lodgepole pine	Ponderosa pine	Other softwoods	Cottonwood ...
Beaver	606	91	21	27	34	–	–	5	–	–
Box Elder	288	47	5	–	17	15	–	–	–	1
Cache	33	93	88	23	10	49	6	–	11	–
Carbon	314	39	76	38	2	30	–	–	8	14
Daggett	66	30	15	38	32	37	57	40	–	–
Davis	–	13	–	11	–	–	–	–	–	–
Duchesne	503	8	140	254	14	75	95	29	7	–
Emery	555	7	26	49	12	11	–	–	6	–
Garfield	1,107	46	132	120	53	50	–	120	10	13
Grand	644	185	42	3	18	35	–	24	–	–
Iron	671	61	63	78	30	8	–	2	–	–
Juab	294	80	–	17	68	19	–	–	6	–
Kane	1,143	72	19	39	22	16	–	56	–	–
Millard	402	202	19	24	45	2	–	–	–	–
Morgan	–	81	56	11	6	29	–	–	–	–
Piute	119	22	56	18	5	6	–	–	–	–
Rich	21	5	48	18	–	–	6	–	–	–
Salt Lake	7	108	16	33	–	–	–	–	–	7
San Juan	1,406	138	30	19	31	6	–	52	–	9
Sanpete	236	137	68	100	–	–	–	–	–	–
Sevier	356	116	100	78	11	11	–	–	–	1
Summit	16	109	155	209	15	10	197	–	2	3
Tooele	371	34	6	18	34	10	–	–	–	–
Uintah	694	68	35	48	27	48	66	2	–	8
Utah	162	324	74	74	14	35	–	–	–	2
Wasatch	13	120	227	75	11	43	–	–	7	–
Washington	487	163	8	18	63	–	–	12	–	–
Wayne	233	–	22	20	–	–	–	7	7	4
Weber	–	81	27	11	1	6	–	–	–	–
Total	10,748	2,482	1,574	1,472	574	553	427	347	62	62

Notes: Several forest type groups merit clarification. “Woodland hardwoods” consist of gambel oak primarily, along with shrub oaks. The “spruce, fir...” forest type includes Engelmann and blue spruce, true firs (which Douglas-fir is not), as well as western hemlocks. “Nonstocked” indicates forest with less than 10% of its usual live tree stocking, usually a temporary condition due to fire, cuts, or disease. “Other softwoods” are western softwoods, such as bristlecone and limber pines. “Cottonwood...” includes elm and ash.

Source: U.S. Forest Service, Forest Inventory and Analysis Program.

In several counties more than 95 percent of the timberland is federally owned: Beaver, Garfield, Millard, Piute, Wayne and Daggett. The possibility of a timber industry in these areas depends greatly on federal forest management approaches. In six other counties—Tooele, Grand, Box Elder, Carbon, Morgan and Davis—at least half of timberland is in private or state ownership (Figure 8.54 and Table 8.18).

Figure 8.54
Federal Share of Timberland Acreage by County in Utah



Source: U.S. Forest Service, Forest Inventory and Analysis Program.

Table 8.18
County Timberland by Ownership, Utah, 2012
(Share of County Land Area)

County	Federal Government	State and Local Government	Private	Total Acres
Beaver	100%	0%	0%	48,449
Box Elder	40%	0%	60%	16,458
Cache	87%	0%	13%	147,305
Carbon	25%	19%	55%	134,756
Daggett	96%	3%	1%	175,783
Davis	0%	100%	0%	11,447
Duchesne	73%	7%	20%	379,966
Emery	82%	0%	18%	95,108
Garfield	100%	0%	0%	369,845
Grand	41%	58%	2%	102,640
Iron	62%	5%	33%	138,750
Juab	69%	0%	31%	35,848
Kane	76%	0%	24%	113,351
Millard	100%	0%	0%	37,986
Morgan	16%	0%	84%	79,713
Piute	98%	2%	0%	81,033
Rich	63%	2%	35%	72,641
Salt Lake	68%	32%	0%	43,668
San Juan	80%	6%	14%	102,971
Sanpete	92%	0%	8%	159,458
Sevier	95%	0%	5%	191,699
Summit	75%	2%	23%	456,020
Tooele	45%	18%	36%	16,320
Uintah	85%	3%	11%	197,166
Utah	94%	5%	1%	145,024
Wasatch	82%	8%	11%	317,998
Washington	56%	0%	44%	22,417
Wayne	98%	0%	2%	52,728
Weber	54%	0%	46%	32,201
State of Utah	78%	5%	16%	3,778,749

Source: U.S. Forest Service, Forest Inventory and Analysis Program

Utah Timber Harvest

The current timber harvest level suggests the available quantity of this renewable resource under present public land management policies. The Forest Service, BLM and SITLA reported 39.5 MMBF in harvested timber in Utah during FY2012, which should capture all activity on public lands.[220] From private and tribal lands, Utah sawmills received 11.6 MMBF in harvested timber in 2007, 42.2 percent of the total received by mills that year, the most recent year for which data are available (Hayes, et al. 2012, 51).[221]

The Forest Service accounts for most of Utah's timber harvest. In FY2012 its harvest was 31.4 MMBF, valued at $854,000, the lowest value since FY1980, except for FY2010 and 2011

220 For BLM and the Forest Service, federal fiscal year 2012 ended September 30, while the state fiscal year used by SITLA ended June 30. *Sources:* Headwaters (2014) for Forest Service harvest, BLM 2012 Public Land Statistics, email communication from SITLA October 1, 2013.
221 The 11.6 MMBF estimate is conservative for two reasons. Some wood harvested from private and tribal lands, for example firewood, would not go to any mill. Also, as a net exporter of wood, more timber from Utah forests was likely sent to sawmills in other states than was processed by Utah mills.

(Headwaters 2014). By comparison, the 30.1 MMBF Forest Service harvest in FY2007 was worth $2.7 million in inflation-adjusted FY2012 dollars.

From all sources, sawmills in Utah received 30.3 MMBF in newly harvested timber in 2007, the most recent year of the mill census that documents the milled portion of harvests across all private and public land ownership (Hayes, et al. 2012, 50). Not all harvested timber is shipped to sawmills, depending on the intended final product. The counties with the highest timber harvest volumes in 2007 were Wasatch (4.3 MMBF), Sanpete (3.8 MMBF), Garfield (3.1 MMBF) and Summit (2.7 MMBF) (Hayes, et al. 2012, 49).

In 2002, on all types of land, sawlogs (conventional lumber) were 62 percent of the timber received by Utah sawmills, while house logs were 30 percent and fiber logs, wood for furniture, posts and poles amounted to 8 percent (DeBlander, et al. 2010).

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9 Wildfire in Utah

Wildfire is a significant issue in Utah, with a total of 2.2 million acres burned during the ten-year period 2003–2012. The incidence and destructiveness of fire is highly variable. Annual suppression costs averaged $33.4 million over the same period; non-suppression costs are generally higher.[222] The total cost of wildland fire to society includes property losses, poor air quality, disruptive evacuations, and habitat impacts. The large-scale land transfer proposed in H.B. 148 would likely increase annual state wildfire-related spending by $76.7 million, about six times current state expenditures.[223]

Some wildfire is normal. Increasing wildfire activity in Utah is largely driven by climate, forest health, and invasive plant species. Fire is part of the ecosystem, and regular, periodic fires help prevent high-intensity fires later. A major factor in the cost of providing wildfire protection is the proliferation of structures near undeveloped lands at risk of wildfire, the wildland-urban interface (WUI).

The cost of fire suppression can be managed to protect life, property and nature in an efficient manner. While wildfire is largely an act of nature, human action has some bearing on fire ignition and spread. For example, land managers can actively manage forests and rangelands and regulate the WUI to make them less vulnerable to dangerous fires. Governments can engage in a range of preparedness and mitigation efforts.

This section will discuss wildfire and land transfer, analyze wildfire trends in Utah and the West, explore leading causes of fire, present suppression and other wildfire-related costs, identify impacts on air quality and the environment, and evaluate opportunities for hazardous fuels reduction.

9.1 Wildfire and Land Transfer

During FY2008 to 2012, Utah's Division of Forestry, Fire and State Lands (FFSL) supported as much as 16.8 percent of the cost of wildland fire suppression in Utah.[224] FFSL paid for just 8.0 percent of all wildfire-related expenses during those years. In the event of a land transfer as envisioned by H.B. 148, the state of Utah could expect to need an estimated $76.7 million in additional state funding to address wildfire under current management practices.[225] A less aggressive approach to suppression, mild fire seasons, and investments in preparedness and mitigation may

[222] This amount includes Utah spending by BLM, the Forest Service and the state's Division of Forestry, Fire and State Lands (FFSL), the three principal agencies for fire suppression in Utah, with amounts adjusted for inflation to 2013 dollars.
[223] This figure is based on federal and state spending related to wildfire during FY2008 to 2012.
[224] The numbers in this chapter account for state, private, BLM, and Forest Service lands in Utah, 99.2 percent of the 36.7 million acres either under state management or proposed for state management in H.B. 148. Utah's share of suppression costs would be slightly lower than 16.8 percent if suppression costs for other federal lands in Utah were included. Still, during 2003 to 2012, the three agencies were responsible for managing 97.4 percent of Utah fires and 97.2 percent of acres burned (NICC 2014, AGRC 2014).
[225] The estimate of $76.7 million is equal to average annual spending for wildfire by BLM and Forest Service combined during FY2008 to 2012, adjusted for inflation to 2013 dollars (Table 9.8).

allow adequate wildfire management at a lower cost. On the other hand, growing fire risks from the spread of invasive cheatgrass, the bark beetle epidemic, trends towards a drier climate, and development in the WUI may result in future wildfire costs under state or federal management in excess of current levels. The potential reduction in federal aviation support for fighting fires and the use of privately contracted aircraft would likely raise state costs above current levels.

During 2008 to 2012, BLM and Forest Service funded firefighting responses for an average of 603 fires per year, 51.8 percent of non-prescribed wildfires in Utah. These fires on BLM and Forest Service lands burned an average of 92,682 acres each year, 67.7 percent of all acres burned in the state during the period. In order to protect lives, property and natural resources from wildfire during the five-year period, the two federal land managers spent $25.9 million per year in suppression costs and $50.8 million annually for wildfire prevention, burned area rehabilitation and other fire-related activities.

Nationwide, wildfire consumes a rising share of federal land managers' limited budgets (Lian et al. 2008, p. 650). Budgetary pressures in Washington could jeopardize federal spending for wildfire in Utah or displace other land management activities to make room for wildfire costs. Post-transfer, federal funding for wildfire in Utah is likely to be constrained. Increased revenue from state management of minerals, forests and rangeland may help offset additional costs to the state of Utah. Potential revenue from timber sales in coming years would be limited by the condition of Utah forests and its timber industry.

FFSL relies entirely on federal land managers for aviation support essential to its fire suppression efforts. Large-scale land transfer in Utah would result in FFSL losing access to nearby federal aircraft suitable for initial attack fire suppression. The state's alternatives would be more expensive than the current arrangement, since FFSL does not bear the full costs of an aviation program. FFSL also relies on federal agencies for some ground equipment, such as engines and water tenders, but FFSL could access non-aircraft equipment from other sources without the same difficulty in the absence of federal assistance. Finally, federal agencies own most facilities and communication systems associated with five dispatch centers used to coordinate wildfire management and resources in Utah.

From FY2003 to 2012, FFSL spent $11.44 per acre burned for fire suppression, a rate that is higher than BLM costs of $8.95 per acre but significantly lower than Forest Service costs of $44.62 per acre.[226] These amounts do not include fire prevention and preparedness or burned area rehabilitation, which collectively were more expensive than suppression in Utah during the five years. One reason for relatively high Forest Service suppression expenditures is that the two federal agencies, BLM and the Forest Service, do not cross-bill each other for shared equipment, particularly aircraft, for which the Forest Service bears disproportionate costs. Joint federal suppression costs in Utah during the ten-year period were $17.79 per acre burned in 2013 dollars.

Land characteristics are important factors in suppression cost differences between state and federal agencies. For example, private lands, which make up about 63.9 percent of the lands FFSL protects, are less remote than federal lands, making them easier to protect. However, populations and property values are generally much higher on private lands than on public lands, making private lands, and in many cases adjacent public lands, more expensive to manage. Finally, Forest Service lands generally carry larger fuel loads, which tend to produce more destructive

[226] These amounts are adjusted for inflation to 2013 dollars.

fires, and woodland fires are more difficult to contain than those on the grasslands, sagebrush and pinyon-juniper forests commonly found on BLM, state and private lands.

The wildfire literature suggests several ways to address wildfire to reduce danger to people, lost property, suppression costs, and environmental damage. These are discussed in more detail in other sections: prescribed burns, wildland fire use rather than aggressive suppression, mechanical fuels reduction, rehabilitation of forests and rangelands, and WUI education and regulations. The state could consider implementing these more fully than federal managers have to help reduce the dangers and costs of wildfire on transferred lands and existing state lands. Some of these efforts require substantial and consistent investments before wildfire savings begin to accumulate.

9.2 Wildfire Trends in Western States

The 11 western states experienced an increase in the number and size of wildfires from 1984 to 2011 (Dennison et al. 2014, pp. 3–4).[227] Comparing 1970–1986 to 1987–2003, the frequency of large wildfires in the West increased fourfold, and the area burned increased about sixfold (Westerling et al. 2006, 941). Nationwide, the total burned area each year decreased substantially from the 1960s through the 1980s, but a marked upward trend followed from 1990 to 2012, rising to higher levels than those seen since 1960 (Blackham 2013).[228]

As shown in Table 9.1, California had the most fires from 2003 to 2012, 77,748 fires, while Idaho had the most land area burned at 6.5 million acres. Fire size ranged from 59 acres per fire in Colorado to 554 acres per fire in Nevada. In terms of acres burned, Idaho was most affected by large fires of at least 100,000 acres each, followed by Nevada and California. The western states least affected by wildfire by these three measures were Colorado, Wyoming and Washington.

With a total of 13,484 wildfires from 2003 to 2012, Utah ranked seventh of the 11 western states. In terms of acres burned, Utah was eighth with 2.2 million acres, well below the average of 3.4 million acres. Averaging 160 acres each, Utah fires during the ten years were smaller than those in most western states.

[227] During this period, an average of 87,722 acres more burned each year, and there were almost seven more large fires each year. Both increases were statistically significant ($p<0.05$).

[228] In the U.S., an average of 4.6 million acres were burned by wildfire each year during the 1960s, falling to 3.2 million acres in the 1970s and 3.0 million the following decade. Annual acres burned rose to 3.3 million in the 1990s and then jumped to 6.8 million in the 2000s, falling slightly to 6.4 million for the three years 2010–2012.

Table 9.1
Wildfire in Western States, 2003–2012

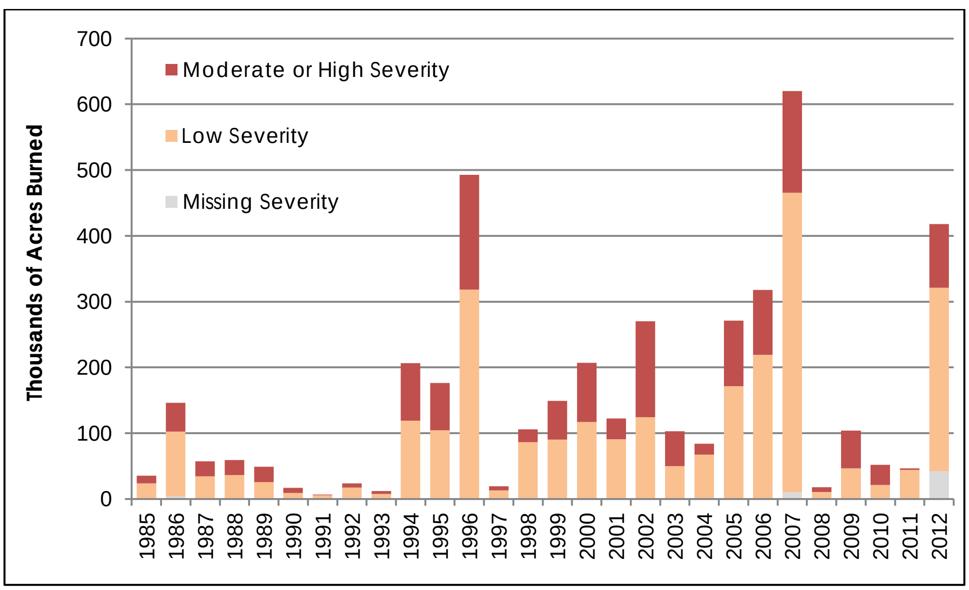
	All Fires					Fires 100,000 Acres or More		
State	Number	Share	Acres Burned	Share	Average Size	Number	Acres Burned	Share
Arizona	24,505	11.1%	3,325,329	8.9%	136	4	1,128,813	4.6%
California	77,748	35.3%	5,891,590	15.7%	76	11	2,019,678	8.3%
Colorado	14,329	6.5%	839,315	2.2%	59	0	0	0.0%
Idaho	12,767	5.8%	6,517,635	17.4%	511	17	3,722,655	15.3%
Montana	17,033	7.7%	4,343,862	11.6%	255	8	1,255,001	5.1%
Nevada	8,108	3.7%	4,495,388	12.0%	554	11	2,384,810	9.8%
New Mexico	14,377	6.5%	3,739,527	10.0%	260	3	556,001	2.3%
Oregon	19,180	8.7%	3,412,188	9.1%	178	7	1,356,571	5.6%
Utah	13,484	6.1%	2,151,956	5.8%	160	2	470,898	1.9%
Washington	13,376	6.1%	1,662,207	4.4%	124	2	326,011	1.3%
Wyoming	5,309	2.4%	1,039,201	2.8%	196	0	0	0.0%
Total	220,216	100%	37,418,198	100%	170	108	24,384,411	100%
Average	20,020	9.1%	3,401,654	9.1%	228	6	1,201,858	4.9%

Note: The number of fires and acres burned are total amounts for the ten-year period, excluding prescribed burns.
Source: National Interagency Coordination Center.

9.3 WILDFIRE TRENDS IN UTAH

The land area affected by fires in Utah rose markedly from 1985 to 2012, while 2008 to 2011 brought a reprieve with uncharacteristically mild fire seasons (Figure 9.1).[229] A high degree of variability is evident in the land area affected by wildfire each year in Utah. Acreage burned is strongly correlated with fire suppression costs, whether wildfires occur near human development or in remote areas (Rowdabaugh 2007, p. 4).

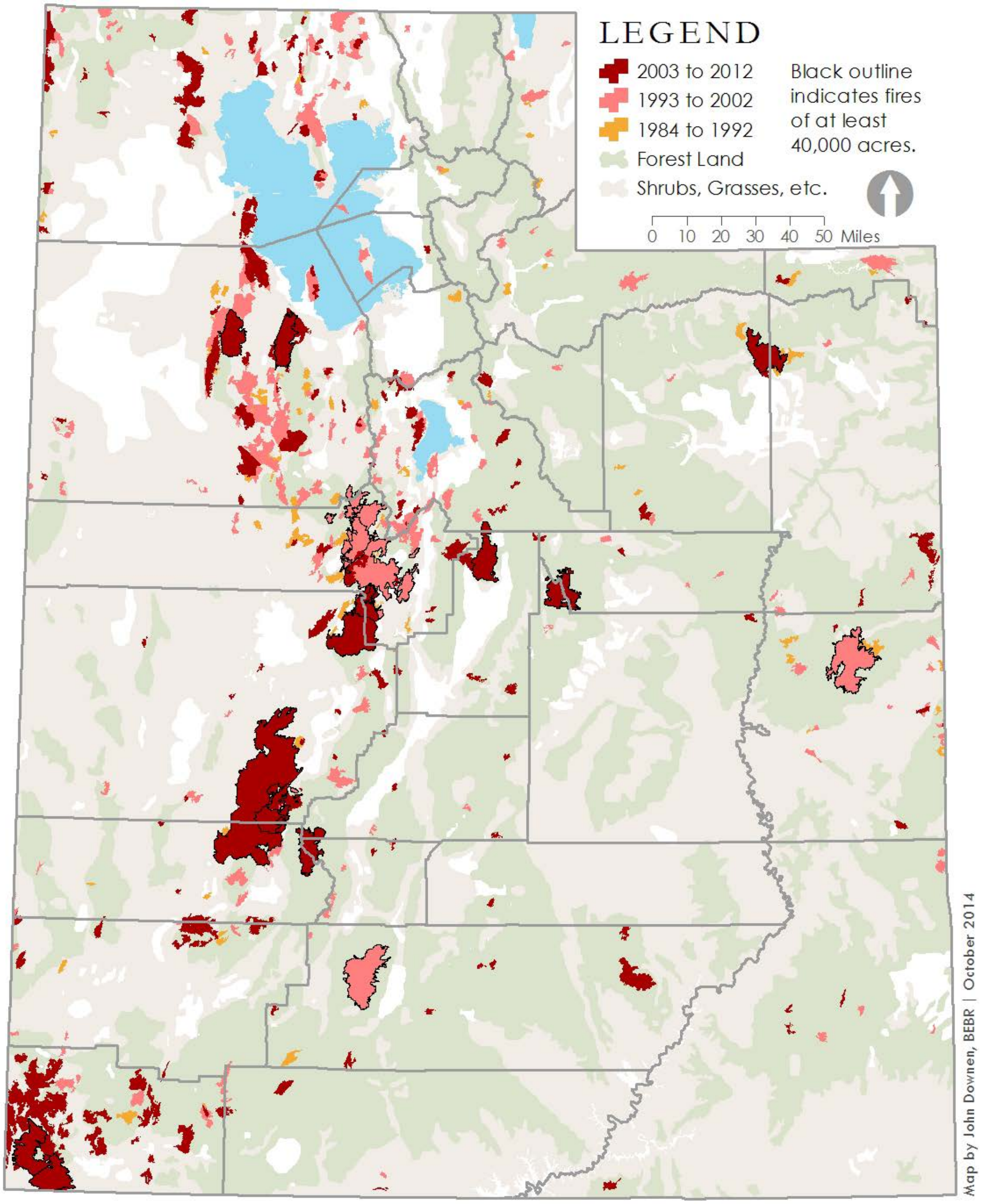
Figure 9.1
Acres Burned in Utah by Severity, 1985–2012



Source: Monitoring Trends in Burn Severity (MTBS) project, U.S. Geological Survey and Forest Service.

229 Acres burned and classification by severity in Figure 9.1 is based on analysis of satellite imagery by the Monitoring Trends in Burn Severity (MTBS) project. Severity could not be determined for 65,952 acres burned, 1.6 percent of the total, due to gaps in satellite imaging data from causes such as cloud cover.

Figure 9.2
Area Burned by Wildfires in Utah, 1984–2012[230]



Source: *MTBS Project (U.S. Forest Service, U.S. Geological Survey); State of Utah, SGID.*

[230] The large fires outlined in Figure 9.2 appear in Table 9.6. MTBS source data from remote sensing images includes wildfires of about 1,000 acres or more in size. By missing many small fires, Figure 9.2's representation of the Utah land area affected by wildfire during 1984 to 2012 understates somewhat the impact of fire on the landscape. For lands visited more than once by fire within the period, the most recent fires show on top. The map omits prescribed burns.

9.3.1 Wildfire by Landowner and Severity

During the ten-year period 2003 to 2012, wildfires burned a total of 2.2 million acres in Utah, of which 8.2 percent or 175,613 acres were visited by high-severity fires (Table 9.2).[231] Fires were relatively uncommon on private lands, which make up 21.0 percent of Utah, including urban areas, but account for only 10.1 percent of acres burned in the state during 2003–2012. Most acres burned in Utah during this period were on BLM land, 54.1 percent or 1.2 million acres.

Compared with lower-severity burns, high-severity fires are known to be more destructive to the human and natural environment and more costly to contain. On the other hand, a variety of natural fire regimes prevail in Utah, and high-intensity, stand-replacing fires are within the normal range for some forest types in the state (Jain et al. 2012, p. 47, Mueller 2014). While severe fires play a role in the landscape, they can also be dangerous to life, property and natural resources. The state of Utah has undertaken planning efforts to reduce the intensity and size of wildfires in the state (Blackham 2013, p. 2).

For high-severity fires, which were quite rare on state lands, Forest Service land bears the brunt of the impact with 77,290 acres burned, 44.0 percent of Utah's high-severity wildfire acreage during 2003 to 2012 (Table 9.2). The incidence of high-severity fires varied considerably across different types of public lands. For example, 20.1 percent of Forest Service acres burned in Utah during this period were from wildfires classified as high severity, while 5.7 percent of BLM acres burned were from high-severity fires, and only 0.2 percent of state acres burned were high-severity fires. This may be attributed to differences in vegetation, land characteristics and fire-suppression choices.

Table 9.2
Utah Wildfires by Landowner and Fire Severity, 2003–2012

	Land Area		All Wildfire		High-Severity Fire		
Land Ownership	**Acres**	**Share**	**Acres Burned**	**Share**	**Acres Burned**	**Share**	**Percent Severe**[2]
Federal Agencies	35,030,813	64.5%	1,603,399	73.9%	158,206	90.1%	9.7%
Bureau of Land Management	22,809,046	42.0%	1,164,749	53.7%	66,572	37.9%	6.7%
Forest Service	8,179,722	15.1%	384,201	17.7%	77,290	44.0%	19.4%
National Park Service	2,098,048	3.9%	23,903	1.1%	3,819	2.2%	13.1%
U.S. Fish & Wildlife	129,525	0.2%	1,421	0.1%	–	0.0%	0.0%
Defense and Other[1]	1,814,472	3.3%	29,125	1.3%	10,525	6.0%	5.2%
State[3]	5,421,171	10.0%	159,110	7.3%	554	0.3%	4.7%
Private[3]	11,432,852	21.0%	348,008	16.0%	11,850	6.7%	17.7%
Tribal	2,449,807	4.5%	60,428	2.8%	5,003	2.8%	1.5%
Total	54,334,643	100%	2,170,945	100%	175,613	100%	8.6%

1. Comprises Department of Defense, Bureau of Reclamation and Department of Energy.
2. Percent severe is calculated from Monitoring Trends in Burn Severity (MTBS) total wildfire acres burned, not shown. MTBS data includes 26,228 acres burned from prescribed fires during 2003–2012.
3. For 2003 and 2004, NICC did not report state and private fire data separately. Acres burned were allocated based on the state and private shares during 2005–2012. Also, wildfire on private land is known to be underreported in NICC data.

Sources: National Interagency Coordination Center; Monitoring Trends in Burn Severity; and State of Utah, SGID.

Table 9.3 shows 11-year totals for acres burned by landowner in Utah during the period 2003 to 2013. FFSL was responsible for 23.5 percent of total acres burned. Private lands composed

[231] Acres burned are measured by satellite images that are considered reliable for fire of 1,000 acres or more (Eidenshink et al. 2007, p. 3). Burn severity is the "degree to which a site has been altered or disrupted by fire" (p. 5).

more than two-thirds of the 526,430 state and private acres burned for which FFSL led suppression. In any year, firefighting responsibilities may rest upon a given agency more heavily than usual without advance notice. In 5 of the 11 years, Utah's share was between 20 and 30 percent, but atypical years also arose with a high of 34.8 percent in 2008 followed by a low of 6.2 percent the following year.

Federal agencies were responsible for 73.8 percent of acres burned during 2003 to 2013, 1.7 million acres. In 2005, fully two-thirds of Utah's acres burned were on BLM lands, whereas BLM's share was only 9.3 percent in 2010. Between those extremes were five years when BLM's share ranged from 30 to 55 percent. For the Forest Service's Utah wildfire staff, the most trying year by this metric was 2010, when 79.7 percent of the state's acres burned were in the national forests, the only year the agency's share rose above half. With an average of 37,118 acres burned per year, the Forest Service was responsible for 18.2 percent of acres burned from 2003 to 2013. Finally, tribal lands generally were visited by 2.7 percent of acres burned, but in 2003 the share was triple that.

Table 9.3
Acres Burned by Land Owner in Utah, 2003–2013[1]

	Federal							Grand
Year	BLM	USFS	Other[2]	Total	State	Private	Tribal	Total
2003	70,778	11,830	979	83,587	14,273	29,284	13,426	140,570
2004	34,897	33,177	61	68,135	4,996	4,850	467	78,448
2005	217,823	16,402	21,643	255,868	24,109	35,649	6,236	321,862
2006	216,434	41,897	10,804	269,135	18,995	53,910	8,559	350,599
2007	414,781	27,520	6,270	448,571	50,519	127,998	22,205	649,293
2008	5,766	10,662	1,091	17,519	4,590	4,775	45	26,929
2009	39,252	45,827	10,700	95,779	1,076	5,269	48	102,172
2010	5,624	48,445	1,000	55,069	860	4,837	20	60,786
2011	33,741	1,968	250	35,959	2,567	11,505	2,037	52,068
2012	125,653	146,473	1,651	273,777	37,126	69,931	7,385	388,219
2013	24,394	24,094	65	48,553	4,558	14,754	213	68,078
Total	1,189,143	408,295	54,514	1,651,952	163,668	362,762	60,641	2,239,023
Average	108,104	37,118	4,956	150,177	14,879	32,978	5,513	203,548
Share	53.1%	18.2%	2.4%	73.8%	7.3%	16.2%	2.7%	100.0%

1. Acres burned do not include prescribed fire. Federal and tribal acres burned are from NICC, while state and private acres burned are from FFSL. NICC fire data is given by protection agency responsible for wildfire, which in some areas differs from the landowner.
2. Other federal agencies reporting wildfires included the Department of Defense (29,125 acres, 2003–2013 total), National Park Service (23,968 acres), and U.S. Fish and Wildlife Service (1,421 acres).
Source: National Interagency Coordination Center, Utah Division of Forestry, Fire and State Lands.

Federal lands were the most common point of origin for wildfires during this period, with an average of 764 fires per year, of which 59 percent were from BLM lands and just over one-third started on Forest Service lands (Table 9.4). Nearly half of Utah's wildfires during 2003 to 2013, 48.0 percent, an average of 745 fires per year, either started on state or private lands or burned from federal or tribal lands onto state or private lands. The most fires on state and private lands in a single year during this period was 2012 with 1,010 fires, 53.7 percent of the total.

The number of fires given by the National Interagency Coordination Center (NICC) for each agency is based on where wildfires ignited. For a fire that burned across multiple jurisdictions, the agency reporting the fire should divide acres burned appropriately among protection agencies for every jurisdiction affected, although that is not always the case (Stringer 2014). A protection agency is the agency responsible for fire in a given place and may be different from the agency that is the landowner (Peterson 2014). For example, BLM and the Forest Service may have an agreement for a certain area, such that BLM is the protection agency for Forest Service lands. If a fire started in that area, NICC would consider it a BLM fire.

Table 9.4
Number of Fires by Land Owner in Utah, 2003–2013[1]

Year	Federal BLM	Federal USFS	Federal Other[2]	Federal Total	State & Private[3]	Tribal	Grand Total[3]
2003	541	501	31	1,073	644	44	1,761
2004	640	363	42	1,045	680	50	1,775
2005	438	242	27	707	726	35	1,468
2006	692	336	36	1,064	935	68	2,067
2007	384	270	28	682	899	40	1,621
2008	331	184	27	542	612	32	1,186
2009	358	227	24	609	652	41	1,302
2010	332	199	18	549	618	30	1,197
2011	372	209	18	599	659	30	1,288
2012	489	313	21	823	1,010	47	1,880
2013	417	264	26	707	758	62	1,527
Total	4,994	3,108	298	8,400	8,193	479	17,072
Average	454	283	27	764	745	44	1,552
Share	29.3%	18.2%	1.7%	49.2%	48.0%	2.8%	100.0%

1. Fire counts do not include prescribed fire. Federal and tribal numbers are from NICC. NICC fire data is given by protection agency responsible for wildfire, which in some areas differs from the land owner. Counts for state and private lands from FFSL are not available for each separately.
2. Other federal agencies reporting wildfires included the Department of Defense (23 fires, 2003–2013 total), National Park Service (240 fires), and U.S. Fish and Wildlife Service (9 fires).
3. Federal and tribal fire counts are based on point of origin of the fire. Numbers of fires on state and private lands is overstated in this table, since they include those with a state or private point of origin, as well as those that reached state or private lands but started elsewhere. State and private fires that burned across jurisdictions to federal or tribal lands are double-counted in the totals.

Source: National Interagency Coordination Center, Utah Division of Forestry, Fire and State Lands.

NICC is one of two prominent sources for Utah wildfire data, both of which are based on collaborations between the U.S. Forest Service, U.S. Geological Survey, and other agencies. The other is the Monitoring Trends in Burn Severity (MTBS) project, which provides a longer time series than NICC, reaching back to 1985. MTBS data are based on automated comparisons of satellite images before and after fires occurred. For our purposes, the MTBS project is most valuable for giving acres burned by severity and vegetation type (Figure 9.1 and Table 9.5). NICC is generally considered the most authoritative source for wildfire data (Dunford 2014). As of September 2014, NICC data were only available for 2002 to 2012. They are accumulated from ongoing reports submitted online by fire agencies and processed by NICC dispatch centers (Fletcher 2014). During 2002 to 2012, total acres burned according to MTBS were 3.6 percent lower than acres burned according to NICC. On an annual basis MTBS was as much as 36.8 percent lower (2008) and as much as 13.8 percent higher (2002) than NICC during this period. The most accurate source for acres burned on state and private lands in Utah is FFSL (Monroe 2014). For federal and tribal acres burned, NICC data is preferred, unless the topic relates to severity or vegetation.

9.3.2 Wildfire by Vegetation Type

During the period 2003 to 2012, wildfire in Utah mainly affected shrubland, accounting for 54.7 percent of total acres burned (Table 9.5). An estimated 2.0 percent of the shrubland acres burned were from high-severity fires, compared with 21.4 percent for forest lands. Wildfire affected less land area in forests than on shrublands—just over one-third of acres burned were forested—but 85.4 percent of high-severity fires occurred in forests. As for other vegetation types, 9.3 percent of acres burned had other natural vegetation, such as grasslands, labelled "herbaceous natural" in the table. Finally, a collective 1.6 percent of the acres visited by wildfire during these ten years were developed property, planted for agriculture, wetlands, sparsely vegetated or barren.

Table 9.5
Acres Burned in Utah by Vegetation and Fire Severity, 2003–2012

Vegetation Type	All Wildfire Acres Burned[2]	All Wildfire Share	High-Severity Fire[1] Acres Burned[2]	High-Severity Fire[1] Share	High-Severity Fire[1] Percent Severe
Shrubland	1,111,307	54.7%	22,661	12.9%	2.0%
Forest	700,912	34.5%	149,966	85.4%	21.4%
Herbaceous Natural	189,224	9.3%	2,086	1.2%	1.1%
Developed	10,935	0.5%	225	0.1%	2.1%
Herbaceous Planted/Agriculture	10,720	0.5%	288	0.2%	2.7%
Wetlands	5,350	0.3%	345	0.2%	6.4%
Barren/Sparsely Vegetated	4,702	0.2%	38	0.0%	0.8%
Other	253	0.0%	6	0.0%	2.4%
Total[3]	2,033,403	100%	175,615	100%	8.6%

1. Severity reflects landscape alteration or disruption caused by wildfire intensity and duration. The severity of 65,925 acres burned could not be determined due to gaps in satellite imaging data from causes such as cloud cover.
2. Acres burned are totals from the ten-year period for all types of wildfire, including prescribed burns.
3. This 2.0 million total for all wildfire acres burned is 5.5 percent lower than the corresponding total from Table 9.2, 2.2 million acres. The MTBS project provides vegetation and severity details not available in the data from the National Interagency Coordination Center used in Table 9.2. Total acres burned in high severity fires do not quite match the total in Table 9.2, 175,613 acres, due to rounding in publicly released MTBS data.

Source: U.S. Forest Service and U.S. Geological Survey, Monitoring Trends in Burn Severity project.

9.3.3 Large Fires

Nationwide from 1980 to 2012, only 1.4 percent of wildfires were at least 300 acres in size (Rowdabaugh 2007, p. 4). Yet these fires consumed 93.8 percent of all Forest Service fire suppression dollars. At least for a 100-fire sample from this important subset of wildfires, larger fire size was a strong predictor of higher suppression expenditures (Liang et al. 2008, p. 653).[232]

From 1985 to 2012, Utah witnessed 15 fires that burned at least 40,000 acres (Figure 9.2), of which three reached 100,000 acres or more in size (Table 9.6).[233] Of these 15 large wildfires, 11 occurred during just the last ten years. Beaver, Juab, Millard, Tooele and Washington counties

[232] Forest conditions, the presence of private property, real estate values, fire perimeter-to-area ratios, the abundance of fuels, and other land characteristics were also considered in the analysis (p. 652). The wildfires included in the sample occurred in Idaho or Montana between 1996 and 2005 (p. 651).
[233] Besides the fires in Table 9.6, three fires of at least 40,000 acres in size spread to Utah from neighboring states, but less than 40,000 Utah acres were burned in these multi-state fires.

were visited more than once by a wildfire of at least 40,000 acres during the period. Utah fires of this size accounted for just over one-fifth of acres burned from 1985 to 2012, and three such fires since 2003 accounted for fully one-fourth of acres burned in the state.

The share of high-severity acres varied widely from none at the Wood Hollow Fire in 2010 to 40.6 percent at the Twitchell Canyon Fire two years earlier. The fires with the largest area affected by severe burns were not necessarily the largest fires. For example, the Milford Flat Fire had the most area burned, but only 2.4 percent of it was from severe fire, 8,893 acres. Of the 15 fires in Table 9.6, Milford Flat was ninth for high-severity acreage, less than the severe burn acreage of the smallest of these large fires, Big Pole Fire. The State of Utah has undertaken planning efforts to address large-scale, high-intensity fires (Blackham 2013, p. 2).

Table 9.6
Very Large Fires in Utah, 1985–2012[1]

Year	Fire Name	Counties	Acres Burned Total	Acres Burned High Severity[2]
1996	Leamington Complex[3]	Juab, Millard, Tooele	209,832	7.0%
1999	Railroad	Juab	64,585	9.1%
2002	Rattle Complex	Grand	87,388	21.5%
2002	Sanford	Garfield	81,851	18.0%
2005	Westside Complex	Washington	58,771	19.1%
2006	Jarvis	Washington	49,643	<0.1%
2006	Sorenson Complex	Beaver, Millard	46,576	7.0%
2007	Neola North	Duchesne, Uintah	46,906	11.2%
2007	Milford Flat[4]	Beaver, Millard	348,757	2.4%
2009	Big Pole	Tooele	41,575	21.4%
2010	Twitchell Canyon	Beaver, Piute, Sevier	42,951	40.6%
2012	Wood Hollow	Sanpete, Utah	46,767	0.0%
2012	Seeley	Carbon, Emery	44,628	33.5%
2012	Clay Springs	Juab, Millard	107,390	8.1%
2012	Dallas Canyon	Tooele	43,391	0.0%
Total	15 fires	15 of 29 counties	1,321,011	8.6%

1. This table identifies in chronological order all fires estimated to have burned 40,000 acres or more in Utah. MTBS reports none of these during 1985–1995.
2. Severity reflects landscape alteration or disruption caused by wildfire intensity and duration. Severity was high for 82,486 acres or 8.6 percent of acres burned in these seven fires.
3. The Leamington Complex fire, which burned mainly in Juab County, included four portions, East Sage, Leamington, Turkey and Wash, all of which are included in the burned acreage given here.
4. The severity of 8,419 acres burned in the Milford Flat fire could not be determined due to gaps in satellite imaging data.
Source: U.S. Forest Service and U.S. Geological Survey, Monitoring Trends in Burn Severity.

Two of the three largest fires occurred after 2006. The 1996 Leamington Complex Fire burned 209,832 acres southwest of Utah Lake. As previously noted, the largest of the three in terms of geographic expanse was the Milford Flat Fire in 2007 with 348,757 acres burned in Millard and Beaver counties. In 2012, Clay Springs Fire devastated 107,390 acres in the same area as the 1996 blaze.

The Milford Flat Fire burned on lands with cheatgrass, sagebrush and pinyon-juniper vegetation (BLM 2007). Land rehabilitation efforts were needed on 202,000 acres, 57.9 percent of the total burn area. Extensive land restoration interventions were needed on land affected by low- or moderate-severity burns. The cost of reseeding alone was about $17 million using traditional and aerial methods. Hundreds of sediment basins were called for, and 74 miles of burned fence were to be replaced. Grazing was suspended for about two years to allow vegetation to become established. The fire resulted in dust storms for three years, dispersing fine soil and degrading air quality (Karmazyn 2014).

9.4 WILDFIRE CAUSES

Wildfire is largely an act of nature. On the other hand, many fires are ignited by humans, and some land conditions can be improved by human intervention. This section will discuss climate, beetle infestation, land management and development patterns as contributors to fire.

9.4.1 Climate

Over several decades, average temperatures have risen somewhat in Utah. Recurring drought and early snowmelt have caused fire seasons to start sooner and last longer. Climate affects wildfire ignition, spread, severity, duration and cost.

The Utah fire season is officially from June 1 to October 1.[234] However, wildfires commonly burn in May, and they can happen earlier in the year and through October (Dunford 2014). The length of the average fire season in western U.S. forests increased by 78 days from 1970–1986 to 1987–2003 (Westerling et al. 2006, p. 941). In addition, fires between 1987 and 2003 burned longer than fires between 1970 and 1986, 37.1 days compared with 7.5 days.

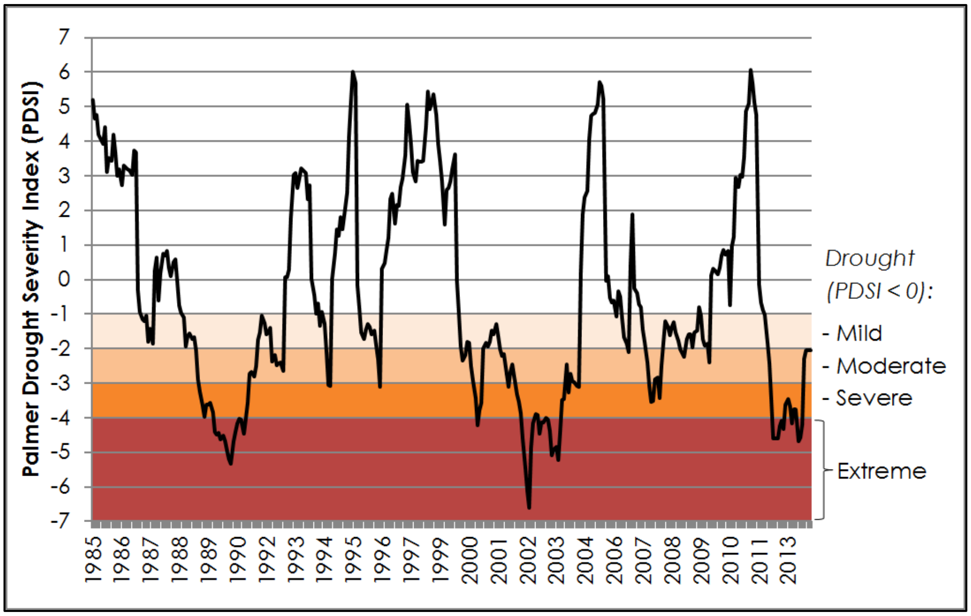
An arid state, Utah experienced moderate to extreme drought during 36.8 percent of the months over the period 1985 to 2013. A long time series of the Palmer Drought Severity Index (PDSI) is available for Utah (Figure 9.3). The PDSI is a well-established measurement, although it has some drawbacks.[235] PDSI values below zero indicate dry months, and values of –1 and below indicate mild, moderate, severe or extreme drought. Months with PDSI values greater than zero are relatively wet.[236] From 1985 to 2013, Utah experienced moderate drought during 13.2 percent of the intervening months, severe drought during 10.7 percent of them, and extreme drought during 12.9 percent.

[234] UCA 65A-8-211 (1)(a)

[235] The PDSI was created for agricultural lands in the Midwest. Alternatives and adjustments have been suggested, but funding and drought response decisions continue to be based on this measure (Fuchs 2014).

[236] PDSI values are as follows: extremely wet (4 or more), very wet (3 to 3.99), moderately wet (2 to 2.99), slightly wet (1 to 1.99), incipient wet spell (0.5 to 0.99), near normal (0.49 to –0.49), incipient dry spell (–0.5 to –0.99), mild drought (–1 to –1.99), moderate drought (–2 to –2.99), severe drought (–3 to –3.99) and extreme drought (–4 or less) (National Drought Mitigation Center nd).

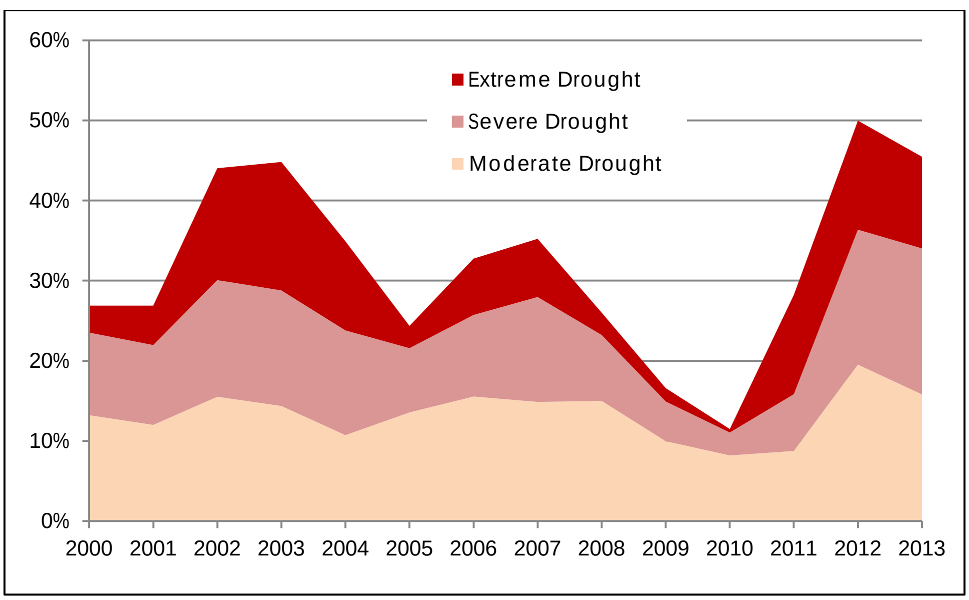
Figure 9.3
Drought Index, 1985–2013



Source: National Climate Data Center.

The National Drought Mitigation Center estimates the percentage of land area experiencing drought conditions based on some 30 indicators, making it arguably more representative of land conditions in Utah than the PDSI (Fuchs 2014). Due to Utah's arid climate and variable weather patterns, severe or extreme drought conditions were experienced in 18.6 percent of the state on average from 2000 to 2013 (Figure 9.4 and Table 9.7). During that period, the share of the sate experiencing severe or extreme drought conditions by land area dropped below 10 percent during 2009 and 2010. Meanwhile, the share rose above 30 percent twice, in 2003 and 2012.

Figure 9.4
Share of Utah Land Area in Drought Conditions, 2000–2013



Source: United States Drought Monitor.

Drought conditions are associated with burned acreage and wildfire suppression spending in Utah from 2003 to 2012. For example, during a very dry 2012, the number of acres burned reached its second highest level during the period (Table 9.3), and suppression spending reached its highest level in ten years (Figure 9.8). During another year when Utah experienced serious drought, 2003, suppression expenditures reached their second highest level, while acres burned were at the median level for the period.

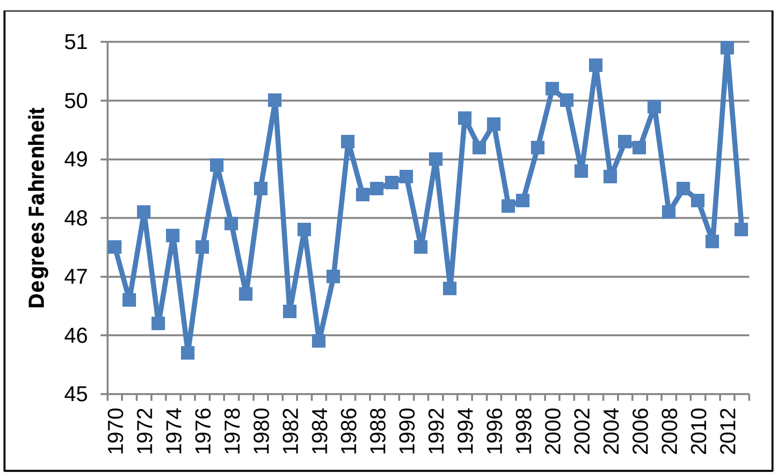
Table 9.7
Share of Utah Land Area in Drought Conditions, 2000–2013

Year	Moderate[1]	Severe or Extreme[2]	Total
2000	13.2%	13.7%	26.9%
2001	12.0%	14.9%	26.9%
2002	15.5%	28.5%	44.0%
2003	14.4%	30.5%	44.8%
2004	10.7%	24.2%	34.9%
2005	13.6%	10.8%	24.4%
2006	15.5%	17.2%	32.8%
2007	14.9%	20.4%	35.2%
2008	15.0%	11.0%	26.0%
2009	10.0%	6.6%	16.6%
2010	8.2%	3.3%	11.5%
2011	8.8%	19.5%	28.2%
2012	19.5%	30.4%	50.0%
2013	15.8%	29.7%	45.5%
Average 2000–2013	13.4%	18.6%	32.0%

Shares are based on an average of weekly data.
1. Moderate drought conditions involve some water shortages and some damage to crops and pastures.
2. Severe or extreme drought conditions include areas where crop or pasture losses are likely and water shortages are common.
Source: United States Drought Monitor.

In recent decades, there has been a trend towards a hotter climate in Utah. The temperature rose from an average of 47.7 degrees Fahrenheit during the 1970s and 1980s to an average of 48.9 degrees Fahrenheit during the period 1990–2013 (Figure 9.5).[237] Analysis of 33 wildfires in Oregon from 2006 to 2010 showed that an increase in the average summer temperature of one degree Fahrenheit was associated with a 23.3 percent increase in the number of wildfires per fire season (Gude et al. 2012). The frequency of large wildfires in western states from 1970 to 2003 has been found to be strongly associated with spring and summer temperatures there (Westerling et al. 2006, p. 941). Warmer temperatures, at least in the eastern and southern parts of Utah, are likely to persist in the long term (USGS 2011). Rising average temperatures are likely a factor in increased wildfire activity in Utah, and future drought conditions are expected to contribute to rising wildfire costs in the state.

Figure 9.5
Average Temperature in Utah, 1970–2013

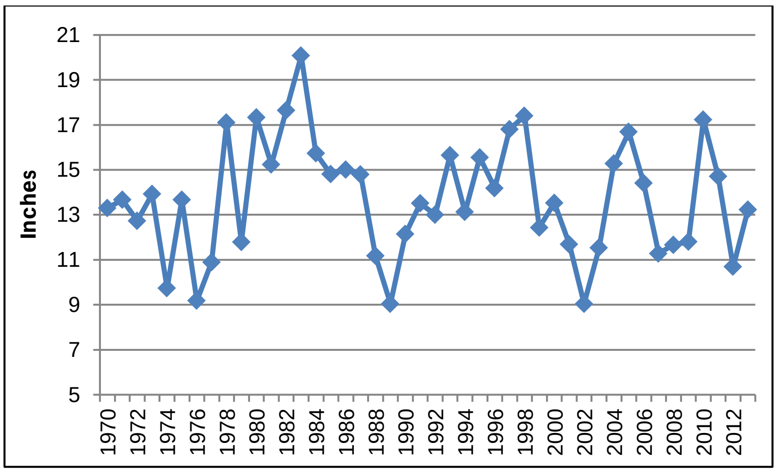


Source: National Climate Data Center.

[237] Averages for Utah in degrees Fahrenheit are as follows: 1970s 47.3, 1980s 48.0, 1990s 48.6, 2000s 49.3, 2010–2013 48.7. *Source:* "National Climate Data Center: Time Series," *National Oceanic and Atmospheric Administration*, www.ncdc.noaa.gov/cag/.

While the amount of precipitation in Utah varied considerably over recent decades, reaching its highest levels in 1982 and 1983, there is no obvious long-term trend (Figure 9.6). In the 1970s and 1980s, average annual precipitation in Utah was 13.8 inches, compared with 13.6 inches during the period 1990 to 2013. Precipitation is one measure of moisture available to reduce wildfire risk. Amounts of surface water runoff in the Colorado River Basin, which covers about half of Utah, are predicted to decline in future decades based on historic climate trends (USGS 2011). Local conditions, timing of precipitation, and precipitation extremes in local areas may be more important measures than year-long averages for the state. Precipitation and temperature are incorporated in the drought measures discussed previously with regards to wildfire.

Figure 9.6
Annual Precipitation in Utah, 1970–2013



Source: National Climate Data Center.

9.4.2 Bark Beetles

Drought stresses trees and may make them more susceptible to insect infestation such as bark beetles (Gorte 2013, p. 3; Keyes et al. 2003, p. 16). Bark beetles are a very visible symptom of poor forest health resulting mainly from drought and inadequate response by land managers (McNaughton 2014). In sufficient numbers they can inhabit and kill healthy trees, spreading throughout a forest and destroying valuable natural resources. High tree mortality can contribute to excess fuel loads that increase wildfire severity. Extremely hot fires can kill shrubs that could normally re-sprout, and can bake the soil and make tree regeneration difficult (McNaughton 2014, Wilcox 2014).

Like wildfire, beetle epidemics are natural processes that periodically rejuvenate forests. Utah's last epidemic in the early 1980s was much less severe than the recent wave (Gorte 2013, p. 3). Climate conditions, forest health, ecological cycles and other factors that affect these insects' proliferation are at least partially beyond human control. However, aggressive fire suppression, insufficient fire mitigation (e.g. prescribed burns and mechanical treatments), and inadequate thinning and harvesting can exacerbate beetle infestations and are within the domain of land managers.[238]

[238] "Beetle Activity on the Uinta-Wasatch-Cache National Forest," U.S. Forest Service, accessed September 29, 2014, www.fs.usda.gov/detail/uwcnf/home/?cid=STELPRDB5145143.

The mountain pine beetle, western pine beetle, Douglas-fir beetle and spruce beetle are four types of common bark beetles in Utah (O'Brien 1999, p. 12). They threaten the types of forests that have the highest commercial value in Utah and account for most of the state's timber harvest—spruce, Douglas-fir, lodgepole pine, and ponderosa pine (see Section 7.8 Timber Harvests). Recently killed trees with dry needles are susceptible to hot crown fires but become less of a threat once the needles fall off. However, these dead trees become a ready source of fuel for the next wildfire once they fall to the ground. Natural decomposition is very slow in Utah, often taking several decades, leaving wildfire as the more likely rejuvenation agent.

As of mid-2014, 25.2 percent of Uinta-Wasatch-Cache National Forest was affected by bark beetle, resulting in mortality rates as high as 90 percent in some of the affected areas.[239] As of 2014, detailed statewide forest inventories that address issues like beetle infestation are fairly dated (Cottam 2014). In 1993, an estimated 73 percent of ponderosa pine and Douglas-fir forests in Utah experienced a moderate to high risk of attack by bark beetles, while 48 percent of spruce and spruce-fir stands and 77 percent of lodgepole pine forests were similarly at risk (O'Brien 1999, p. 12–13).[240] At that time, forests in many parts of the state were known to be at risk of substantial losses from bark beetle infestation, particularly in Cache, Summit, Duchesne, Daggett, Uintah, Sanpete, Garfield and San Juan counties (Keyes et al. 2003, p. 17). Landowners did not respond in a timely and aggressive manner in most areas, and environmental conditions related to forest health, such as drought, were problematic. By 2014, unusual mortality and hazardous fuels buildup associated with poor forest health and beetle infestation had become widespread in Utah. Nationwide, the mountain pine beetle alone caused an estimated 59 percent of tree mortality in 2011 (USFS 2012b, p. 1).

Forest management can address the challenge posed by bark beetles. On the other hand, Utah's warm, dry climate favors continued infestation.

9.4.3 Invasive Species

Many areas in Utah are affected by the aggressive spread of fire-prone plant species (Keyes et al. 2003, p. 15). While the state has at least 18 noxious weeds, cheatgrass has been the foremost threat (p. 23). The spread of cheatgrass into many pinyon-juniper forests has directly contributed to more frequent and more intense wildfires there (p. 13). Cheatgrass is largely responsible for increases in acres burned at lower elevations in Utah, particularly in the west desert areas (Dunford 2014).

9.4.4 Fire Ignition

From 2001 to 2013, human causes were responsible for an estimated one-fifth of the acres burned in a region that includes Utah. Most wildfires ignited from natural causes, primarily lightning. In the Eastern Great Basin region, which includes Utah and parts of Idaho and Wyoming, an average of 935 fires per year, 38.2 percent of the total, were caused by humans between 2001 and 2013 (NICC 2014).[241] The human-caused share generally ranged between 23 and 50 percent, with no clear trend over time. In terms of acres burned, human causes were responsible for 20.3 percent of the 10.1 million acres burned in the region during the same period.

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[239] Ibid.

[240] Collectively, 2.2 million acres of forest were at risk in Utah (O'Brien 1999, p. 39).

[241] As defined by NICC, the Eastern Great Basin geographic area includes Utah, Southern Idaho (roughly south of the Washington-Oregon border) and Western Wyoming (roughly west of the Utah-Colorado border).

9.4.5 Land Management Practices

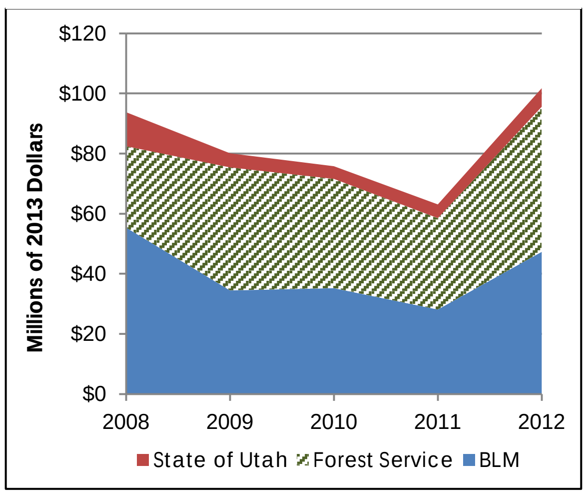
Historically, overgrazing on federal lands nationwide displaced native vegetation and disrupted low-intensity fire regimes (Gorte 2013, p. 2). Changes in vegetation contributed to catastrophic fires, as did excessive suppression (Headwaters 2009, p. 6). Aggressive fire prevention and suppression led to the accumulation of fuels in forests and rangeland. Without ongoing hazardous fuels reduction from low-intensity fires and removals, the risk of large-scale, catastrophic fires increased.

Sustainable management of resource uses such as timber harvesting and livestock grazing is compatible with healthy vegetation and normal wildfire activity. Harvesting, prescribed burns, and preparedness can reduce the severity and cost of wildfire. These are seen as ways to proactively address wildfire beyond merely sustaining suppression costs once fires occur (Blackham 2013, p. 11).

9.5 WILDFIRE EXPENDITURES IN UTAH

The three main participants in Utah's wildfire response are the Bureau of Land Management (BLM), U.S. Forest Service, and Utah Division of Forestry, Fire and State Lands (FFSL). Four other federal agencies have minor roles.[242] Total spending by BLM, Forest Service and FFSL on wildfire, adjusted for inflation, averaged $83.3 million during FY2008 to 2012, and ranged from a low of $63.3 million in FY2011 to a high of $101.9 million the following year (Figure 9.7).[243] The main source of variability was in suppression spending to contain active wildfires, but non-suppression wildfire activities by these three agencies were more expensive than direct fire-fighting. Wildfire spending besides suppression included preparedness and training, coordination and management, equipment maintenance, prescribed burns, preventative mechanical treatments, and restoration of burned areas.

Figure 9.7
Wildfire-Related Spending in Utah, FY2008–FY2012



Sources: Utah Division of Forestry, Fire and State Lands; Utah Office of the Legislative Fiscal Analyst; U.S. Forest Service; Bureau of Land Management

Wildfire-related expenditures vary widely across different types of lands managed by different government agencies (Table 9.8). At $4.48 per acre managed in annual expenditures during FY2008 to 2012, Forest Service spending for wildfire was 2.5 times greater than BLM spend-

[242] This analysis omits wildfire-related spending in Utah by the National Park Service (NPS), U.S. Fish and Wildlife Service (FWS), Bureau of Indian Affairs (BIA), and Department of Defense (DOD). The largest of these, NPS, averaged $273,455 in annual suppression costs during FY2003–2012, expressed in inflation-adjusted 2013 dollars. FWS spent an average of $1,356 per year on fire suppression during FY2007–2011, also given in 2013 dollars. BIA and DOD amounts were not obtained for this study. Wildfire responses from these four federal agencies are unlikely to be affected by land transfer, except for FWS, which had very low levels of spending relative to the three main agencies for wildfire in Utah.
[243] Fire suppression spending for these agencies is available in this study since FY2003, but other wildfire expenses are documented here only since FY2008.

ing and 10.1 times larger than FFSL spending on a per acre basis, with expenditures adjusted for inflation to 2013 dollars. There are important reasons for these differences.

Table 9.8
Utah Wildfire Spending per Acre, FY2008–FY2012
(Constant 2013 Dollars)

Agency	Annual Spending[1]	Acres Managed	Cost per Acre
BLM	$40,096,839	22,809,046	$1.76
Forest Service	$36,610,878	8,179,722	$4.48
Utah FFSL	$6,640,618	15,000,000	$0.44
All Three	$83,348,335	45,988,768	$1.81

1. Five-year average annual wildfire-related expenditures: BLM and Forest Service amounts are for federal fiscal years ending September 30. Utah FFSL amounts are for state fiscal years ending June 30.

Source: Bureau of Land Management; U.S. Forest Service; Utah Division of Forestry, Fire and State Lands; Utah Office of the Legislative Fiscal Analyst; State of Utah, SGID.

Broadly speaking, collaboration between agencies, operational differences, and characteristics of the lands they protect largely account for their disparate costs per acre for wildfire. First, FFSL is not a land management agency like BLM and the Forest Service (Cottam 2014).[244] Mitigation and restoration work on state and private lands for which FFSL provides wildfire protection is funded largely by federal land management agencies, primarily the Forest Service, other state agencies, and private landowners (Dunford 2014). The three agencies have vastly different land management missions and approaches. Second, spending levels reflect differences in vegetation. National forests in Utah have different, and often more, biomass fuels than lands BLM and FFSL protect. Third, private lands constitute 9.6 million acres, 63.9 percent of the lands FFSL protects, and none of the lands BLM and the Forest Service protect. Private lands throughout Utah are generally in closer proximity to infrastructure and urban areas than public lands. In this regard, remote state and federal lands would be more expensive to access for fire prevention, protection and rehabilitation. On the other hand, lands closer to urban areas have more human-caused ignitions and more privately owned WUI areas. The WUI generally has much higher property values and populations requiring protection than do public lands. Compared to public lands that are not adjacent to the WUI, mitigation, suppression and post-fire restorations are considerably more expensive in the privately owned WUI. Fourth, based on where their lands are located and what infrastructure is on them, agencies' efforts may be supported to varying extents by local firefighting authorities. Finally, the Forest Service bears a disproportionate financial burden for supplying firefighting aircraft. BLM, to a large extent, and FFSL entirely, rely on the Forest Service's fleet to carry out their suppression strategies in Utah. The Forest Service does not cross-bill BLM for aircraft use, and both agencies charge FFSL below the cost it would have to bear to gain access independently to such aircraft suitable for wildfire suppression.

Total wildfire-related spending in Utah during FY2008 to 2012 averaged $83.3 million per year, adjusted for inflation to 2013 dollars. At $40.1 million annually, BLM spent more than the Forest Service and FFSL on wildfire in Utah during this period (Table 9.9). FFSL spent $6.6 million, and the Forest Service spent $35.6 million. BLM devoted 76.2 percent of its wildfire spending to preparedness, fuels treatments, and other non-suppression activities. In contrast, Utah's FFSL

[244] FFSL's forestry program primarily provides technical assistance to private forestland owners and other state agencies; it does not directly manage any state forestland.

devoted just over one-fifth of its wildfire budget, 21.2 percent, to non-suppression activities. The Forest Service was more moderate, with 44.7 percent of its wildfire expenditures going to suppress fires, and 55.3 percent reserved for non-suppression spending.

Table 9.9
Utah Wildfire Spending, FY2008–FY2012
(Average Annual Expenditures in Constant 2013 Dollars)[1]

Agency	Expenditures Suppression	Other[2]	Total	Share of Total Suppression	Other[2]
BLM	$9,558,790	$30,538,049	$40,096,839	23.8%	76.2%
Forest Service	$16,348,072	$20,262,806	$36,610,878	44.7%	55.3%
Utah FFSL	$5,234,519	$1,406,100	$6,640,618	78.8%	21.2%
All Three	$31,141,381	$52,206,955	$83,348,335	37.4%	62.6%

1. BLM and Forest Service amounts are for federal fiscal years ending September 30. Utah FFSL amounts are for state fiscal years ending June 30.
2. Other wildfire spending includes preparedness, fuels treatments, burned area rehabilitation, and other non-suppression expenses related to wildfire.
Source: Bureau of Land Management, U.S. Forest Service, Utah Legislative Fiscal Analyst

The state of Utah covered 8.0 percent of total wildfire expenditures in the state during FY2008 to 2012 (Table 9.10). For suppression, Utah spent 16.8 percent of the total, and for wildfire management besides emergency suppression, Utah contributed 2.7 percent of total expenditures. The Forest Service provided 52.5 percent of these agencies' suppression spending. The BLM was the largest contributor to wildfire preparedness, mitigation, rehabilitation and other non-suppression efforts.

Table 9.10
Agency Shares of Wildfire Spending in Utah, FY2008–FY2012

Agency[1]	Suppression	Other[2]	Total
BLM	30.7%	58.5%	48.1%
Forest Service	52.5%	38.8%	43.9%
Utah FFSL	16.8%	2.7%	8.0%
Total	100.0%	100.0%	100.0%

1. BLM and Forest Service amounts are for federal fiscal years ending September 30. Utah FFSL amounts are for state fiscal years ending June 30.
2. Other wildfire spending includes preparedness, fuels treatments, burned area rehabilitation, and other non-suppression expenses related to wildfire.
Sources: Bureau of Land Management, U.S. Forest Service, Utah Office of the Legislative Fiscal Analyst

Wildfire consumed a significant share of Utah public land managers' budgets during FY2008 to 2012 (Table 9.11). Collectively, suppression alone accounted for 10.8 percent of BLM and Forest Service expenditures in Utah, $25.9 million per year for fire suppression of $239.9 million in total annual expenditures. FFSL, the agency responsible for wildfire on state and private lands, devoted a larger share of its budget to suppression than the federal agencies, 21.7 percent. Including wildfire suppression and other spending, such as preparedness and post-fire restoration, the federal agencies both spent about 32 percent of their budgets on wildfire, compared with 27.5 percent for FFSL.

Table 9.11
Utah Wildfire Share of Agency Expenditures, FY2008–FY2012

Agency	Wildfire Share of Utah Expenditures[1] Suppression	Other[2]	Total	Average Annual Expenditures[3]
BLM	7.7%	24.5%	32.1%	$124,826,081
Forest Service	14.2%	17.6%	31.8%	$115,099,624
FFSL	21.7%	5.8%	27.5%	$24,148,308
Total	11.8%	19.8%	31.6%	$264,074,013

1. Percentages equal average wildfire expenditures for the five-year period divided by five-year averages for total expenditures.
2. Other wildfire spending includes preparedness, fuels treatments, burned area rehabilitation, and other non-suppression expenses related to wildfire.
3. BLM and Forest Service amounts are for federal fiscal years ending September 30. The Utah FFSL amount is for state fiscal years ending June 30. All amounts are adjusted for inflation to calendar year 2013 values.

Source: Bureau of Land Management, U.S. Forest Service, Utah Office of the Legislative Fiscal Analyst.

In the event of land transfer, the State of Utah may require an estimated $25.9 million increase in state funding for fire suppression for an additional 31.3 million acres of federal lands (Table 9.9). The $25.9 million amount is based on fire conditions during FY2008 to 2012 and assumes the state continues the recent wildfire management practices of BLM and the Forest Service. Furthermore, for wildfire-related expenses besides suppression, state costs may rise an additional $50.8 million for a total estimated $76.7 million in new wildfire management costs. Less severe fire seasons, more prevention and preparedness work, and efficiency improvements could allow the state to address wildfire for these 31.3 million acres for less than the amounts given. However, if current climatological and ecological trends persist, along with increased development in the WUI, future state costs may rise above federal costs realized during FY2008 to 2012.

9.5.1 Fire Suppression Expenditures

The Division of Forestry, Fire and State Lands (FFSL) is responsible for wildfire control on approximately 15 million acres of state and private lands, whereas the Forest Service and BLM are responsible for 31 million acres, the vast majority of federal lands in Utah (Dunford 2014).[245] The three agencies together are responsible for protecting 84.6 percent of Utah's 54.3 million acres. These agencies' domains contain 97.2 percent of acres burned during 2003 to 2012 (AGRC 2014). Much of the 15.4 percent outside of BLM, Forest Service and FFSL management is urban, underwater or otherwise not susceptible to wildfire.

During 2003 to 2012, BLM and Forest Service funded the firefighting response for an average of 742 fires per year, 55.0 percent of non-prescribed wildfires in Utah (NICC 2014). These fires on BLM and Forest Service lands burned an average of 147,382 acres per year, 72.0 percent of all acres burned in the state during the period.

Besides BLM and the Forest Service, three other federal agencies bear some suppression costs from wildfire in Utah: U.S. Fish and Wildlife Service (FWS), National Park Service (NPS) and

[245] Private ownership accounts for about 63.9 percent of the lands where FFSL addresses wildfire, 9.6 million acres. FFSL's responsibility for wildfire on 15 million acres is an estimate consistent with 16.9 million acres of state and private lands minus private lands located in urban areas where wildfire is not a threat, and local fire departments are responsible for suppression. While acreage of private lands in urban areas is not readily available, the implied estimate is 1.9 million acres. *Source:* "Utah Division of Forestry, Fire and State Lands," Great Salt Lake Advisory Council, accessed October 19, 2014, www.gslcouncil.utah.gov/docs/2010/Aug/Division%20Presentation.pdf.

Bureau of Indian Affairs (BIA). FWS fire suppression costs were available for FY2007 to 2011 only, during which period annual costs ranged from $41 to $2,179.[246] Data on acres burned suggest that FWS suppression costs for other years during FY2003–2012 would also be very low.[247] As for NPS lands, these are not part of the land transfer outlined in Utah H.B. 148. NPS fire suppression costs amounted to an average of $242,513 per year during FY2003–2012 (Turner 2014). Finally, management of tribal lands in Utah is not addressed in this chapter. Data on BIA fire suppression costs for these areas are not readily available.

As of 2014, federal land managers paid about 80 percent of Utah's $2.5 million annual assessment for the services of the National Interagency Coordination Center (NICC) (Dunford 2014). NICC is responsible for wildfire reporting, coordinated management, and resource mobilization. BLM and the Forest Service also own most of the facilities and communication infrastructure for the five NICC dispatch centers in Utah.

During the ten-year period FY2003–2012, federal wildfire suppression costs in Utah averaged $27.6 million per year in 2013 dollars, while state costs were $5.8 million annually (Table 9.12). Average public spending for fire suppression by BLM, the Forest Service and FFSL amounted to $33.4 million, not counting substantial ongoing fire prevention and management efforts that are not included in fire suppression expenditures.[248] Amounts committed by each agency varied considerably during this period (Figure 9.8).

Differences among the agencies in fire suppression spending per acre are insightful. On all public lands statewide, fire suppression costs averaged $0.73 per acre of land managed (Table 9.12). Costs per acre burned, a more common metric, averaged $16.23. For several reasons, fire suppression by the Forest Service ($44.62 per acre burned) was much more expensive than efforts by BLM ($8.95 per acre burned) or FFSL ($11.44 per acre burned). Three reasons include higher fuel loads in national forests compared with lands with less

Table 9.12
Wildfire Suppression Expenditures in Utah, FY2003–FY2012
(Millions of 2013 Dollars)

Fiscal Year[1]	BLM	Forest Service	FFSL	Total
2003	$10.3	$24.6	$10.9	$45.9
2004	$8.8	$18.9	$2.8	$30.5
2005	$11.8	$16.1	$5.4	$33.3
2006	$8.9	$25.8	$6.2	$40.9
2007	$16.5	$4.3	$6.5	$27.3
2008	$4.2	$7.6	$11.7	$23.6
2009	$8.8	$18.2	$4.2	$31.2
2010	$8.0	$14.7	$3.6	$26.3
2011	$5.6	$9.5	$3.6	$18.7
2012	$21.2	$31.7	$3.1	$55.9
Average	$10.4	$17.1	$5.8	$33.4
Acres Burned[2]	1,164,749	384,201	507,118	2,056,068
Cost per Acre Burned	$8.95	$44.62	$11.44	$16.23
Acres Managed	22,809,046	8,179,722	15,000,000	45,988,768
Cost per Acre Managed	$0.46	$2.10	$0.39	$0.73

Note: Fire suppression excludes most prescribed burns, personnel training, preventative removal of fuels, other ongoing preparedness work, and post-fire land rehabilitation. During CY 2003 to 2012, BLM, Forest Service and FFSL were responsible for fire suppression for 97.4 percent of Utah fires and 97.2 percent of acres burned.
1. Bureau of Land Management (BLM) and Forest Service expenditures are for federal fiscal years ending September 30. FFSL expenditures are given by state fiscal year ending June 30.
2. Acres burned are the total for calendar years 2003 to 2012 from NICC and FFSL (Table 3).
Sources: U.S. Forest Service; Bureau of Land Management; Utah Division of Forestry, Fire and State Lands; National Interagency Coordination Center; Utah Office of the Legislative Fiscal Analyst; State of Utah, SGID.

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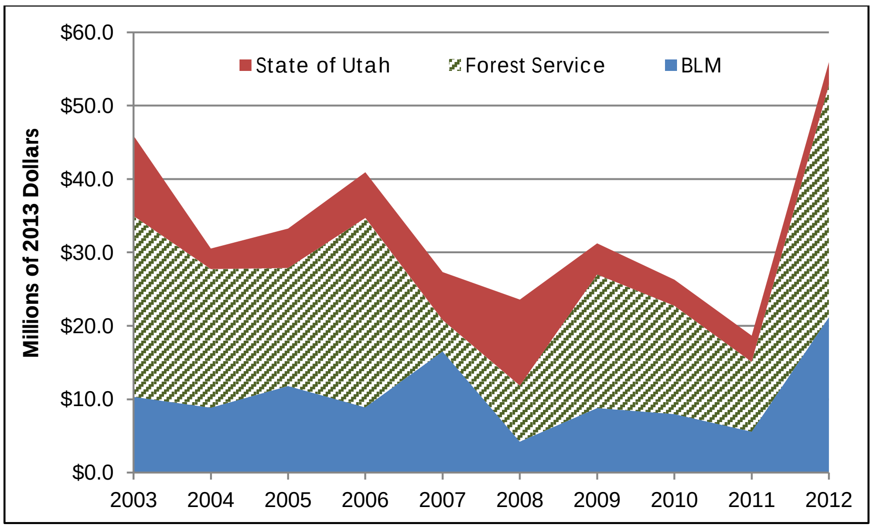
246 U.S. FWS response to a July 18, 2014 FOIA request from BEBR.
247 An estimated 0.1 percent of acres burned in Utah during the period 2003–2012 was on FWS lands (Table 9.2).
248 The federal and total amounts omit spending by the National Park Service on parks and recreation areas; U.S. Fish and Wildlife Service on refuges and fisheries; the Department of Defense on military installations, testing ranges and proving grounds; and the Bureau of Indian Affairs on tribal lands.

biomass that BLM and FFSL protect, the remoteness of federal lands compared to the private lands FFSL protects, and the disproportionate burden the Forest Service bears for firefighting aircraft. State suppression costs are remarkably low considering FFSL protects the private lands where the WUI is located with its significant human presence and improvements. The resulting costs affect both FFSL and federal agencies responsible for public lands adjacent to these privately-owned WUI areas.

Adjusting for inflation, wildfire suppression spending declined in Utah from $45.9 million in 2003 to $18.7 million in 2011 (Table 9.12 and Figure 9.8). However, the ten-year high spending level in 2012, $55.9 million, did not fit the downward trend.

Figure 9.8
Wildfire Suppression Spending in Utah, FY2003–FY2012



Sources: Utah Division of Forestry, Fire and State Lands; Utah Office of the Legislative Fiscal Analyst; U.S. Forest Service; Bureau of Land Management.

County and Federal Funding for State Wildfire Suppression

As noted, the Division of Forestry, Fire and State Lands (FFSL) is responsible for all fire suppression expenditures on state lands and unincorporated private lands throughout Utah (Dunford 2014). The vast majority of these expenses are funded by state appropriations to FFSL. In addition, counties regularly contribute, and the federal government and judicial system assist FFSL under certain circumstances.

Counties share the cost of fire suppression for private lands at risk for wildfire and not covered by city or county fire departments (Dunford 2014). Counties pay annual assessments into the Wildland Fire Suppression Fund (WFSF), which operates as fire insurance for counties that opt in. Assessment amounts are based on the unincorporated land area at risk for wildfire in each county and an estimated value of that area. Counties not participating in the WFSF insurance program must have wildfire budgets approved by the State (Fiscal Analyst 2014). Those counties pay up to their budgeted amounts plus half of FFSL suppression costs beyond these amounts.

Through its Federal Management Assistance Grants (FMAG), the Federal Emergency Management Agency (FEMA) reimburses 75 percent of certain suppression costs on state lands for fires that meet specific criteria.[249] Utah received five FMAG disbursements in 2012 and one in 2014 as of mid-September. Utah eligibility for FMAGs would likely not be affected by the land transfer described in H.B. 148. The number and size of FMAGs has increased nationwide since the 1950s, but this source of funding is likely to remain limited and periodic in Utah. Nationwide, just 19 fires were eligible for FEMA funding between 2000 and 2012 (Gorte 2013, p. 6). FEMA fire grants are most valuable to Utah as a resource during years like 2012, with extraordinary wildfire activity.

In the case of human-caused fires, some suppression costs are recovered by the judicial system.

Aircraft and Other Equipment

Aircraft are a large component of wildfire expenses and a key element of firefighting strategy.[250] As of 2011, the Forest Service owned a fleet of 11 aircraft dedicated to firefighting nationwide and paid two principal contractors for the use of an additional 40 aircraft (USFS 2012a, pp. 2 and 6).

In 2011, the cost to operate large airtankers, each capable of carrying 2,000 to 4,000 gallons of retardant, was estimated at $5,800 to $12,000 per flight hour, plus $9,400 to $28,000 per day for availability, depending on the model (USFS 2012a, pp. 9–11).[251] These expenses are likely in between those associated with smaller airtankers and very large airtankers with capacities less than 1,800 gallons and 8,000 gallons, respectively (Ingalsbee 2010, p. 15).

BLM has a few small aircraft for fire suppression, as well as two helicopters (Dunford 2014). The State of Utah relies entirely on the Forest Service and BLM for aerial support during fire suppression efforts.

For large wildfires in the West during 2004 to 2008, 54.7 percent of Forest Service fire suppression spending was paid to contractors for aircraft or firefighting services (Ellison et al. 2012).[252] Likewise, estimates from 1999 and 2003 suggest that, for large wildfires, more than half of suppression spending is allocated to contractors who supply crews of firefighters, large airtankers, helicopters, water scoopers, water tenders, bulldozers, and other equipment (Ingalsbee 2010, p.

[249] FEMA considerations for FMAG determinations include, among others, whether the wildfire is considered a major disaster, the extent of threat to life and improved property, the availability of state and local firefighting resources, the potential economic impact, and how suppression costs compare with FEMA threshold levels (between roughly $100,000 and $600,000 as of 2013, based on the state population and whether there are multiple fires). Further instructions are provided regarding eligible expenses. *Sources:* Ibid., "Fire Management Assistance Grant Program," Federal Emergency Management Agency, accessed September 29, 2014, www.fema.gov/fire-management-assistance-grant-program.

[250] FFSL, Forest Service and BLM arrangements for aircraft to be used in fire suppression in Utah are discussed below in Section 9.6 Aviation Support for Utah Wildfires.

[251] The Forest Service provided cost estimates for two Type 1 airtankers in use for firefighting and proposed for more extensive use in the agency's contracted fleet: British Airway's BAe-146 with a 3,000-gallon capacity cost $9,983 per flight hour plus $19,646–$22,000 per day of availability, while Lockheed Martin's C-130J with a 4,000-gallon capacity cost $6,660 per flight hour and $13,740 per day. Forest Service cost estimates for two Type 2 airtankers are given as examples. The Bombardier Q400 has a 2,600-gallon capacity and costs an estimated $8,000 per flight hour and $28,000 per day of availability. The slower Lockheed Martin P-2V Neptune carries 2,082 gallons at $5,800 per hour and $9,400 per day. The Q400 was proposed for use, while the P-2V is a legacy model the Forest Service has relied on for decades.

[252] The share of spending is based on 135 fires for which the Forest Service spent at least $1 million and an average of $8.8 million. Four of the fires were in Utah.

15). Contracting is intended to reduce firefighting costs by avoiding purchases and by maintaining a smaller year-round workforce.

Payments for contracted personnel, aircraft and other firefighting equipment are large components of fire suppression costs on federal lands in Utah. In the event of land transfer, the state could choose how to manage these wildfire resources for an additional 31 million acres.

Suppression Versus Prevention and Preparedness

Wildfire suppression costs outstripped federal budget allocations in 7 of 12 years from 2002 to 2013 (USFS 2014). In response, the Forest Service and Department of the Interior redirected funds from accounts for forest restoration, mechanical thinning, controlled burns, recreation and other activities. Increased wildfire suppression funding at the Forest Service from the mid-1980s to 2014 doubled the number of firefighters while cutting 30 percent or more from positions in other departments.

Like their counterparts in federal agencies and many states, Utah policymakers have traditionally been more amenable to funding fire suppression than fire prevention (Cottam 2014). Since 2000, federal and Western wildfire planning efforts have transitioned from an emphasis on reactive suppression to an integrated, long-term approach that more fully incorporates prevention and restoration efforts (Steelman, Kunkel and Bell 2004, p. 21 and 26). This transition is difficult because concerted and costly up-front investments in mitigation and preparedness are required to generate long-term suppression savings. Suppression needs are more urgent and easier to prioritize politically.

Yet non-suppression approaches also protect life, property and natural resources from wildfire, and research shows that preparedness can be more cost-effective than suppression (McNaughton 2014). At the state level, during 2003 to 2013, approximately 12.5 percent of FFSL's spending on wildfire was for mitigation and preparation, as opposed to suppression emergencies (Fiscal Analyst 2014). Other state entities also funded mitigation and restoration projects, for example the Division of Wildlife Resources and Utah School and Institutional Trust Lands Administration (Canning 2014, Carter 2014).

9.5.2 Wildfire Costs Besides Suppression

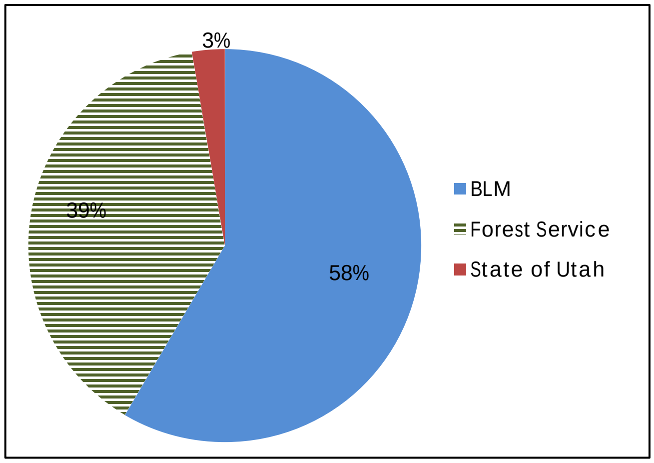
Government agencies in Utah sustain wildfire-related expenditures far in excess of fire suppression costs. Nearly all wildfire spending in Utah for mitigation, preparedness and rehabilitation came from federal land managers, 97.3 percent of $52.2 million per year during FY2008 to 2012 (in inflation-adjusted 2013 dollars) (Figure 9.9). The state's contribution through FFSL was $1.4 million annually.[253]

Preparedness includes planning, training staff and volunteers, acquiring and maintaining equipment, administration and other costs. Mitigation involves making structures and landscaping fire-safe and performing fuels reduction, such as prescribed burns and mechanical treatments. As for rehabilitation, burned areas may recover without human interference. In many cases, stabilization and restoration are required to restore natural vegetation and keep soil intact.

[253] Data used in this section did not account for wildfire-related activities of state agencies besides FFSL. The work of other agencies in this regard merits further consideration.

The federal agencies spend more than FFSL for preparedness, mitigation and restoration, largely because they are land management agencies in a broad sense (Dunford 2014). In virtually all cases, FFSL does not own the lands for which it manages wildfire, and FFSL's role is thus limited.[254] FFSL carries out some preventative treatments, mainly assisting owners on private lands using federal funding. Other state agencies, including SITLA and DWR, contribute to rehabilitation and mitigation on state lands. The Watershed Restoration Initiative, which receives federal and state funding, is a major undertaking of this variety. While state spending for wildfire suppression in Utah is virtually all funded through FFSL, state spending for wildfire-related activities besides suppression are spread among various agencies and private owners that manage the 15 million acres for which FFSL provides suppression.

Figure 9.9
Non-Suppression Wildfire Spending in Utah, FY2008–FY2012



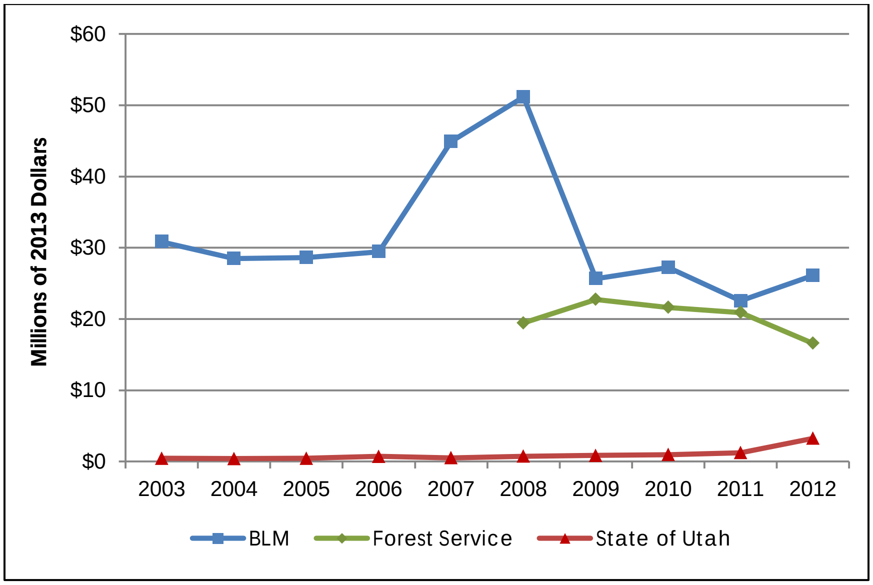
Sources: Utah Division of Forestry, Fire and State Lands; Utah Office of the Legislative Fiscal Analyst; U.S. Forest Service; Bureau of Land Management

Figure 9.10 shows BLM, Forest Service and FFSL contributions to preparedness, fuels treatments, burned area rehabilitation, and other non-suppression expenses related to wildfire. FFSL's spending in these areas increased substantially from FY2003 to 2012, although it remained relatively small compared with federal spending for these purposes. In 2013 dollars, FFSL non-suppression spending rose from $444,274 in FY2003 to $729,235 five years later, then jumped to $3.2 million in FY2012 (Table 9.13). BLM's wildfire-related spending in Utah besides suppression seems to be on a downward trend other than the noteworthy anomaly in 2007 and 2008. Forest Service wildfire-related expenditures besides suppression were not available before FY2008 for Utah. BLM's annual non-suppression spending in Utah averaged $27.4 million during FY2003 to 2006 and FY2009 to 2012 combined (in real 2013 dollars). The spike to $48.0 million per year during FY2007 and 2008 can be attributed to burned area stabilization efforts following the historic 363,052-acre Milford Flat fire of July 2007.[255]

As with suppression, at $2.48 per acre managed the Forest Service had the highest expenditures per acre of the three agencies with regards to non-suppression wildfire costs (Table 9.13). BLM followed at $1.38 per acre, and FFSL spent a mere $0.06 per acre. Again, the Forest Service manages a larger share of forests with abundant vegetation and fuels compared with the lands BLM and FFSL administer. Also FFSL does not own the lands for which it provides wildfire suppression. For this reason, FFSL has limited responsibility for managing wildfire risks and restoring burned areas.

[254] Sovereign lands, which are mostly underwater, are not at risk of wildfire.
[255] BLM emergency stabilization spending averaged $24.0 million each year for FY2007 and 2008, 5.5 times the average spending for this item during the other eight years from FY2003 to 2012.

Figure 9.10
Non-Suppression Wildfire Spending in Utah, FY2003–FY2012



Sources: Utah Division of Forestry, Fire and State Lands; Utah Office of the Legislative Fiscal Analyst; U.S. Forest Service; Bureau of Land Management

Table 9.13
Non-Suppression Wildfire-Related Expenditures in Utah, FY2003–FY2012
(Millions of 2013 Dollars)

Fiscal Year[1]	BLM	Forest Service	FFSL	Total
2003	$30.8	n/a	$0.4	n/a
2004	$28.5	n/a	$0.4	n/a
2005	$28.6	n/a	$0.5	n/a
2006	$29.4	n/a	$0.7	n/a
2007	$44.9	n/a	$0.5	n/a
2008	$51.2	$19.4	$0.7	$71.3
2009	$25.7	$22.7	$0.9	$49.3
2010	$27.2	$21.6	$1.0	$49.8
2011	$22.5	$20.9	$1.2	$44.7
2012	$26.1	$16.6	$3.2	$46.0
Average	$31.5	$20.3	$1.0	$52.7
Acres Managed	22,809,046	8,179,722	15,000,000	45,988,768
Cost per Acre Managed	$1.38	$2.48	$0.06	$1.15

Note: These amounts exclude emergency suppression to contain active wildfires. Non-suppression expenditures above include all other wildfire expenditures reported by the agencies, such as prescribed burns, personnel training, preventative removal of fuels, other ongoing preparedness work, and post-fire land rehabilitation.
1. Bureau of Land Management (BLM) and Forest Service expenditures are for federal fiscal years ending September 30. FFSL expenditures are given by state fiscal year ending June 30.
Sources: U.S. Forest Service; Bureau of Land Management; Utah Division of Forestry, Fire and State Lands; National Interagency Coordination Center; State of Utah, SGID.

This section identified wildfire-related costs borne by BLM, Forest Service and FFSL in Utah. However, wildfire may create significant costs besides government spending for suppression and non-suppression activities. Property owners may sustain insured and uninsured losses. Wildfire may affect worker productivity and business revenue. Transportation may be disrupted, tourism may suffer, and valuable timber may be consumed (Morton et al. 2003). Government agencies unrelated to firefighting may be called upon to protect drinking water, arrange necessary evacuations, repair roads, and inform the public (Lynch 2004). Many important fire impacts are difficult to estimate, such as health care costs, personal injury and death, loss of scenic values, watershed degradation, damage to cultural and historical sites, and harm to wildlife and their habitats (Morton et al. 2003). The full breadth of wildfire impacts must be considered when policy makers and public land managers decide how to address wildfire and what resources to devote to a range of wildfire-related measures.

9.5.3 Wildfire Cost Details by Agency

State of Utah, Division of Forestry, Fire and State Lands

During FY2003 to 2013, FFSL suppression expenditures on state and private lands in Utah averaged $6.1 million per year and ranged from $2.8 million to $11.7 million in inflation-adjusted 2013 dollars (Table 9.14). Wildfire management, averaging $0.9 million annually, rose from 8.4 percent of total wildfire spending during the five years from FY2003 to 2007, to 24.6 percent of the total during FY2009 to 2013, a share of non-suppression spending more consistent with that of federal land managers in Utah (Dunford 2014).[256]

Dollar amounts in this section are adjusted for inflation to 2013 dollars. FFSL operations are discussed in further detail in Section 2.2.3.

Table 9.14
Utah Forestry, Fire & State Lands
Wildfire Expenditures, FY2003–FY2013
(Constant 2013 Dollars)

Fiscal Year	Suppression[1]	Management[2]	Total
2003	$10,927,382	$444,274	$11,371,656
2004	$2,799,844	$410,103	$3,209,947
2005	$5,374,206	$451,108	$5,825,314
2006	$6,227,437	$723,953	$6,951,390
2007	$6,532,701	$512,388	$7,045,089
2008	$11,722,264	$729,235	$12,451,499
2009	$4,235,933	$856,153	$5,092,086
2010	$3,560,922	$972,091	$4,533,014
2011	$3,577,974	$1,225,756	$4,803,730
2012	$3,075,500	$3,247,264	$6,322,764
2013	$9,298,771	$783,188	$10,081,959
Average	$6,121,176	$941,410	$7,062,586

1. Suppression includes emergency fire suppression expenses for state and private lands in Utah, including independent work by FFSL and payments to BLM and Forest Service for assistance. Suppression does not include FFSL assistance on out-of-state fires or fires on federal lands in Utah.
2. Fire management includes preparedness, mitigation and other non-suppression expenditures related to wildfire on private and state lands in Utah.
Source: Utah Division of Forestry, Fire and State Lands; Utah Office of the Legislative Fiscal Analyst

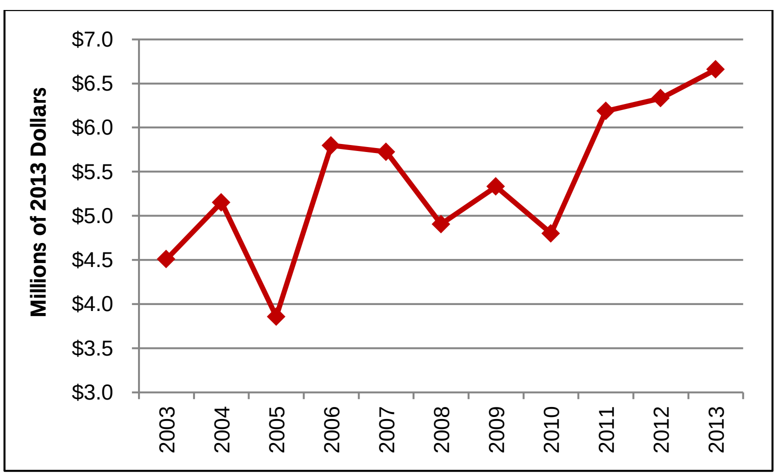
256 FFSL fire suppression costs are for unplanned wildfire events, whereas "fire management" includes prescribed fire, prevention, training, etc.

FFSL addresses fire with a variety of programs: suppression, prevention, forest health, mitigation and training (Ault 2014). Prevention is the attempt stop an ignition before it starts. FFSL programs that manage or manipulate vegetation include forest stewardship programs that help private landowners maintain healthy forests and hazardous fuel mitigation projects that involve fuels reduction and firebreaks. These greatly reduce fire intensity and rate of spread and make a wildfire easier to suppress. Training prepares FFSL and local crews to respond to a variety of situations.

As wildfire emergencies arise on a large scale or across multiple jurisdictions in Utah, a collaborative, all-hands-on-deck culture prevails. Suppression amounts in Table 9.14 include unspecified payments to federal agencies, almost exclusively BLM and Forest Service, for equipment and personnel utilized to contain fires on state and private lands. On the other hand, dedicated credits revenues accrue to FFSL for assisting federal agencies and other western states' firefighting agencies.

Dedicated credits averaged $5.4 million annually from FY2003 to 2013 and rose somewhat over the period, even when adjusted for inflation (Figure 9.11). The largest amount was $6.7 million in FY2013. The presence of FFSL resources to assist with additional fire suppression work when not occupied on Utah's private and state lands suggests the agency could assume responsibility for wildfire on additional lands in the event of land transfer, although current resources at FFSL naturally are not adequate to the scale of the H.B. 148 transfer.[257] In particular, FFSL's Lone Peak Conservation Center expended an average of $5.0 million per year from FY2003 to 2013 to assist other states and federal agencies for compensation, mostly on wildfire suppression, along with some mitigation and rehabilitation work. These expenses were paid by the agencies that received the Center's services.

Figure 9.11
FFSL Revenue from Dedicated Credits, FY2003–FY2013



Source: Utah Office of the Legislative Fiscal Analyst.

257 Federal suppression spending in Utah averaged $27.6 million per year during this period.

Bureau of Land Management

BLM operates considerable programs for suppression, preparedness, fuels treatments and burned area rehabilitation in Utah (Table 9.15). BLM activities are discussed in detail in Section 2.1.1.

Table 9.15
BLM Expenditures for Wildfire, FY2003–FY2012
(Constant 2013 Dollars)

Fiscal Year	Suppression	Preparedness[1]	Fuels Treatments[2]	Burned Area Rehabilitation[3]	Other[4]	Total
2003	$10,336,595	$11,084,365	$12,699,228	$7,054,690	$0	$41,174,878
2004	$8,848,325	$10,704,743	$11,209,457	$5,567,659	$1,000,963	$37,331,146
2005	$11,795,420	$10,428,111	$10,215,830	$7,107,478	$884,837	$40,431,676
2006	$8,908,065	$10,210,539	$9,704,074	$8,645,004	$874,314	$38,341,997
2007	$16,515,456	$10,424,401	$10,862,825	$23,648,583	$0	$61,451,266
2008	$4,225,493	$10,223,002	$11,911,160	$28,265,042	$754,801	$55,379,499
2009	$8,803,187	$10,037,622	$11,431,469	$3,296,045	$894,604	$34,462,928
2010	$7,986,481	$10,226,085	$11,924,660	$4,206,161	$868,620	$35,212,008
2011	$5,585,232	$9,442,860	$10,536,478	$762,895	$1,793,267	$28,120,732
2012	$21,193,558	$9,566,898	$10,844,698	$4,690,984	$1,012,891	$47,309,030
Average	$10,419,781	$10,234,863	$11,133,988	$9,324,454	$808,430	$41,921,516

1. Preparedness includes some spending to assist other agencies, particularly the state, with preparedness. Assistance amounted to 3.6 percent of fire preparedness spending during FY2003-2012, between $9,000 and $587,000 annually.
2. Fuels treatments include prescribed burns, mechanical removals, vegetation modification, and other methods to reduce fire risks from hazardous fuels (flammable materials).
3. Burned area rehabilitation includes emergency stabilization work within a year of fire containment to prevent further resource loss or degradation, as well as rehabilitation efforts undertaken within three years to help restore lands not likely to recover on their own. Emergency stabilization is 88 percent of the total for the ten-year period.
4. Other includes four accounts covering deferred maintenance and capital improvements to fire facilities, as well as reimbursable wildfire assistance to other agencies.
Source: Bureau of Land Management, U.S. Department of the Interior.

U.S. Forest Service

The Forest Service carries out extensive support for wildfire suppression, fire preparedness, fuels treatments and burned area rehabilitation in Utah (Table 9.16). Forest Service operations are discussed extensively in Section 2.1.2.

Table 9.16
Forest Service Expenditures for Wildfire, FY2003–FY2012
(Constant 2013 Dollars)[1]

Fiscal Year	Suppression	Preparedness	Fuels Treatments[1]	Burned Area Rehabilitation	Total
2003	$24,640,703	n/a	n/a	n/a	n/a
2004	$18,884,289	n/a	n/a	n/a	n/a
2005	$16,083,515	n/a	n/a	n/a	n/a
2006	$25,795,423	n/a	n/a	n/a	n/a
2007	$4,276,417	n/a	n/a	n/a	n/a
2008	$7,629,403	$12,804,283	$6,277,324	$359,594	$27,070,603
2009	$18,199,945	$13,025,865	$9,333,544	$380,999	$40,940,354
2010	$14,741,248	$13,076,998	$7,411,369	$1,134,441	$36,364,056
2011	$9,499,495	$11,724,370	$8,168,438	$1,021,374	$30,413,678
2012	$31,670,267	$10,652,492	$5,870,639	$72,300	$48,265,699
Average	$17,142,070	$12,256,802	$7,412,263	$593,742	$36,610,878

Note: These expenditures may include wildfire-related spending on the 8.3 percent out-of-state portion of the land area of Ashley, Manti-LaSal, Uinta and Wasatch-Cache National Forests located in Idaho or Wyoming. Amounts omit any wildfire-related spending on the 2.8 percent of Caribou and Sawtooth National Forests' acreage located in Utah.
1. Fuels treatments include prescribed burns, mechanical removals, vegetation modification, and other methods to reduce fire risks from hazardous fuels (flammable materials).
Source: U.S. Forest Service.

9.6 The Cost of Large Fires

State and federal agencies' expenses for individual fires in Utah are not available. To discuss these types of events as directly as possible, this section presents three noteworthy wildfires in Colorado and New Mexico. The wildfire literature analyzes their costs in good detail. These case studies show the potential for unexpected and costly wildfire events and illustrate the types of costs that arise from wildfire, far beyond suppression costs. The years, sizes, and some costs for the Hayman, Cerro Grande and Bobcat Gulch fires are summarized in Table 9.17. Costs are adjusted for inflation to 2013 dollars to make them more comparable.

Table 9.17
Costs for Three Catastrophic Wildfires
(Dollar Amounts in Constant 2013 Dollars)

		Acres	Cost (millions)			Cost Per Acre Burned[1]		
Wildfire	**Year**	**Burned**	**Suppression**	**Rehabilitation[1]**	**Total**	**Suppression**	**Rehabilitation[2]**	**Total**
Hayman	2002	138,114	$50.6	$90.3	$140.9	$367	$654	$1,020
Cerro Grande	2000	42,875	$45.3	$169.5	$214.8	$1,057	$3,954	$5,011
Bobcat Gulch	2000	10,599	$5.2	$1.1	$6.3	$490	$105	$595

1. Rehabilitation costs cover emergency stabilization and short-term and longer-term land restoration.
Source: Kent et al. (2003), Lynch (2004), Morton et al. (2003).

The Hayman Fire burned 138,114 acres southwest of Denver, Colorado in June and July of 2002 (Kent et al. 2003, p. 319; Lynch 2004, p. 46). This was the largest area burned by a single wildfire in the state's history, although it was only 39.6 percent of the size of Utah's Milford Flat Fire five years later. At $50.6 million in 2013 inflation-adjusted dollars, Hayman Fire suppression costs were $367 per acre burned. Short-term stabilization and restoration work, the most costly of which was aerial mulching to prevent erosion and other problems, amounted to $42.4 million (Morton et al. 2003, p. 31-33). Longer-term land rehabilitation efforts cost an additional $47.9 million (Kent et al. 2003, p. 319). Documented spending for suppression and burned area rehabilitation in these three categories totaled $140.9 million in 2013 dollars, $1,020 per acre burned, 35.9 percent of which were for suppression.

These amounts omit spending for rehabilitation on private lands, damage to structures, natural resources destroyed, water treatment, public and private evacuation spending, tourism impacts, and lost productivity and business revenue.[258] A more inclusive study estimated the total cost of the Hayman Fire at $269.0 million or more, at least $1,947 per acre burned in 2013 dollars and 91 percent higher than the costs in the previous paragraph and Table 9.17 (Lynch 2004, p. 46). While economic activity from the Hayman Fire generated some local spending and employment from out-of-state funding, such large unplanned expenditures placed heavy burdens on government agencies and taxpayers.

The Cerro Grande Fire in New Mexico in 2000 cost $45.3 million (in 2013 dollars) for suppression and containment of a 42,875-acre conflagration, $1,057 per acre burned (Morton et al. 2003, p. 19). This was the most expensive wildfire in U.S. history at the time, with unusually high

[258] For rehabilitation of private lands, $10 million in federal funding was proposed via matching grants from the National Resource Conservation Service's Emergency Watershed Protection program (Morton et al. 2003, p. 33). The Hayman Fire destroyed 133 homes and 466 other structures (p. 34). Natural resource losses on Forest Service lands were at least $47 million (Lynch 2004, p. 46). Water treatment costs in the Denver area cost $87,967 during July, August and September of 2002 (Morton et al. 2003, p. 32).

spending for suppression, rehabilitation, and property damage. At $169.5 million, land stabilization, restoration and rehabilitation costs were 3.7 times the amount for suppression. The principal federal agencies supporting this effort were the U.S. Forest Service, Federal Emergency Management Agency (FEMA), and National Resource Conservation Service. Total costs for suppression and rehabilitation were $214.8 million in 2013 dollars, $5,011 per acre burned, of which 78.9 percent was non-suppression spending. These losses are exceptional, even compared with other large, catastrophic fires that have visited the West since 2000.

Apart from these typical wildfire cost categories, FEMA and additional special appropriations under the Cerro Grande Fire Assistance Act paid county and private claimants $615.5 million for fire damages.[259] FEMA also spent another $169.1 million. Furthermore, equipment, building and landscape repair at Los Alamos National Laboratory cost $462.0 million. These three items totaled $1.2 billion in additional federal spending for Cerro Grande Fire.[260]

A final, more moderate example of a catastrophic fire is the Bobcat Gulch Fire, also in 2000, which consumed 10,599 acres in Colorado at an estimated cost of $6.3 million in inflation-adjusted 2013 dollars (Lynch 2004, p. 45). The cost per acre burned was $595, 82.4 percent of which was for suppression. Costs included in the total are $5.2 million for suppression ($490 per acre burned) and $1.1 million for land restoration and rehabilitation ($105 per acre burned). Separate private and public expenses, primarily property losses, were estimated at $7.4 million.[261]

Depending on the situation, costs for land stabilization, restoration and rehabilitation can be relatively low, or they can far exceed suppression costs, as seen from the Hayman, Cerro Grande, and Bobcat Gulch cases. The cost of suppression alone can vary widely on a per-acre basis, from $367 to $1,057 here. Property damage can be very expensive, depending on the residential, business and government improvements that are in the path of fire. Besides costs borne by owners and their contracted insurers, governments may pay for some property losses.

9.7 AVIATION SUPPORT FOR UTAH WILDFIRES

FFSL relies heavily on federal land managers for aviation support essential to its fire suppression efforts in Utah. Large-scale land transfer would likely result in FFSL losing access to nearby federal aircraft suitable for initial attack fire suppression. Alternatives would be more expensive. FFSL also relies on federal agencies for ground equipment, such as engines and water tenders, but the state could access non-aircraft equipment from other sources without difficulty in the absence of federal assistance.

FFSL does not have its own aviation capacity.[262] The state does not operate a fleet of aircraft like California or lease private contracted aircraft like Oregon. In allowing FFSL to use their aircraft for a reasonable fee, BLM and the Forest Service intend to be good partners. They also share the

[259] Some 260 homes and 120 other structures were destroyed, among other impacts to land and improvements owned by businesses, individuals and Los Alamos County.
[260] The amounts discussed here for Cerro Grande Fire do not include private and public costs to evacuate 18,000 people for a week or the lost value at 671 cultural sites affected by the fire.
[261] These other expenses included homeowner losses (for 22 insured homes and other structures, not including uninsured losses), additional law enforcement, road repairs, special water treatment, Red Cross assistance and other documented costs (Lynch 2004, p. 45).
[262] This section on aviation support is informed primarily by Dunford (2014).

state's interest in timely and adequate wildfire containment on private and state lands, which may also protect adjacent federal lands.

BLM Utah provides FFSL access to single-engine and initial attack planes, as well as initial attack helicopters. The Forest Service also keeps initial attack aircraft locally and can call in heavy air tankers and helicopters from Boise based on its nationwide contract (USFS 2012a). The larger aircraft are allocated by NICC based on national priorities and may be located throughout the U.S. before being assigned to Utah. BLM and Forest Service charges are based on usage and are more favorable than other arrangements the state could expect to make.

Figure 9.12
Aerial Firefighting

Photo credit: National Interagency Fire Center

Without federal partners for firefighting aircraft, the state could create an aviation program by maintaining a fleet internally or by leasing. Either represents a substantial undertaking. Assembling and maintaining a fleet of airplanes would likely be the more costly and involved of the two alternatives. Some aircraft could come from military excess, retrofitted for fire suppression with significant investments. Other requirements would be pilots, mechanics, hangers, and retardant batch plants. There may be some opportunity to recoup costs by leasing state aircraft to other states and federal agencies when they are not occupied with Utah fires. However, federal agency protocol generally does not permit the use of outside aircraft unless they meet federal certification requirements. The depth and variety of the fleet of aircraft the state could afford to build, maintain and operate would likely be more limited than the range of options federal agencies have at their disposal. Ownership is likely more appropriate to the scale of wildfire threats in California than in Utah.

Private contracts represent a more moderate option for replacing federal aircraft support in Utah. Most companies require a daily rate to ensure availability of private aircraft during the fire season, plus charges for aircraft operation and retardant. Additional training and state capacity would be needed to manage and staff the variety of aircraft required to replace the loss of federal aviation resources. Private rates would likely be significantly more expensive than what FFSL currently pays BLM and the Forest Service for the use of their aircraft. Under the current system the state pays only when aircraft is used. Leasing our own aircraft would transfer the entire cost of the lease to the state.

Two options exist besides creating a Utah aviation program for wildfire response. The National Guard is one resource. It can offer the use of its aircraft for wildfire suppression only when that does not interfere with military missions. During the severe 2012 season, the agency committed four or five aircraft to fighting fires short-term in Utah. Its priority is to maintain aviation resources available for initial attack on Camp Williams.

Finally, the state could still request support from federal and state agencies through the National Interagency Coordination Center (NICC) post-transfer. The Eastern Great Basin Geographic Area Coordination Center of NICC could mobilize federal aircraft from BLM field offices or national forests in neighboring states to meet Utah needs, as well as other hired equipment and personnel. Incidentally, following land transfer the state would become responsible for most of Utah's annual assessment for NICC support, which is currently about $2.5 million. As of 2014, federal agencies paid about 80 percent of that amount.

As for equipment on the ground, FFSL relies on BLM and the Forest Service somewhat for engines and other vehicles. FFSL often requires wildland fire engines of different sizes, from one ton to five tons, as well as water tenders to refill them. Needed bulldozers and other tractors can be obtained locally, the same equipment used for excavation and agriculture. The state has water tenders and engines and could readily obtain access to additional vehicles as needs arise if federal ground equipment were no longer located nearby. A more pressing concern would become state access to trained wildland firefighters capable of carrying out missions using such equipment.

9.8 WILDLAND-URBAN INTERFACE

The wildland-urban interface (WUI) describes areas where people and property are located adjacent to undeveloped areas. The WUI generally consists of low-density housing that is often in proximity to lands susceptible to wildfire. Depending on vegetation, from 40 to 500 meters of defensible space is recommended for fire safety. Education efforts notwithstanding, it is common for owners not to plan construction or landscape their properties in a fire-safe manner. Driven by residential development, a decided trend of WUI expansion is evident throughout the West.

An estimated 15,733 Utah homes were located in the WUI, according to the 2010 Census.[263] Of the state's 408 square miles of WUI, only 7 percent had been developed at that time. The availability of large areas of undeveloped WUI suggests future increases in the population and number of structures that may require state or federal fire protection (Headwaters 2009, p. 5). In western states, the number of homes in the WUI was expected to rise by 40 percent from 2001 to 2030 (p. 12).

Next to fire size, proximity to private lands and structures may be the best predictor of fire suppression costs in a given area (Liang et al. 2008, p. 650). One factor driving costs is that the presence of homes and other infrastructure may require fire managers to defend difficult or costly firelines to protect the WUI, rather than focusing containment on boundaries created by geographic features such as bodies of water, forest roads or ridgelines (Ingalsbee 2010, p. 11). In Montana during 2006 and 2007, an estimated 30 percent of spending to fight large fires was used to protect homes in the WUI (Headwaters 2009, p. 14).

The proliferation of structures in the WUI is a major factor in rising fire suppression expenditures by the Forest Service (OIG 2006, p. 7). In 1994 an estimated one-third of Forest Service fire suppression spending was in the WUI, a share rising above 50 percent by 2006. On the national level, the Forest Service has noted the reticence of states to assume responsibility for their

[263] "As Wildland Urban Interface (WUI) Develops, Firefighting Costs Will Soar," Headwaters Economics, accessed October 22, 2014, headwaterseconomics.org/interactive/wui-development-and-wildfire-costs.

share of rising suppression costs in the WUI (p. 5). Spending by the Forest Service on wildfire in the WUI often draws funding away from programs for fire prevention, recreation management and various other land needs and uses (Headwaters 2009, p. 9).

Prevention and preparedness are valuable components of a balanced response to wildfire in the WUI. Both help relieve rising costs of suppression, which alone generally cannot adequately address wildfire without unacceptable socioeconomic costs (Hirsch et al. 2001). The risk of wildfire can be reduced by effective prevention measures, for example fuel reduction treatments. Yet wildfire cannot be entirely prevented. Given that Utah's environment that is naturally disposed to periodic wildfire, the desirability of prevention also has bounds (Mueller 2014). Preparedness efforts focus on creating fire adapted communities, such that fires can take their natural courses, even nearby, while harm to people and property experience is lessened by fire-safe practices.

One strategy for reducing fire prevention and suppression costs and harm to life and property in the WUI is zoning to direct new construction to defensible areas (Headwaters 2009, p. 50). Another strategy is to install fire-safe landscaping, decking and roofing for structures in areas with wildfire risks (Gorte et al. 2013, p. 10). Some communities require homeowners to comply with fire-safe measures.

9.9 Wildfire and Air Quality

Smoke from active fires and dust from burn-scarred areas are wildfire-related threats to air quality in Utah. Wildfire and air quality is a regional matter in terms of federal oversight of a common airshed that spans state boundaries. In the event of land transfer, federal air quality standards would remain in force for private, state and federal lands post-transfer. The burden of monitoring and improving air quality would rest more heavily upon state agencies in Utah. The state would also become more responsible for other environmental considerations—soil erosion, watershed integrity, and wildlife habitat, among others

9.9.1 Wildfire, Air Quality and Health Outcomes

Wildfires emit gasses and particles that can raise ozone and particulate concentrations in a specific locality or larger region. Burning vegetation releases nitrogen oxides (NO_x) and volatile organic compounds (VOCs), which may result in elevated ozone (O_3) levels (Jaffe et al. 2013). Inhalation of pollutants has been found to increase healthcare expenditures and mortality risk. Small airborne particles designated as $PM_{2.5}$ and PM_{10} can penetrate into regions of the lungs where they become a health risk (Dockery 2009).[264] Ozone is also harmful to the respiratory system (EPA 2014).

Forests in the West account for 20 to 40 percent of the carbon sequestration in the U.S., a benefit offset by wildfires, which generate greenhouse gasses (Westerling et al. 2006, p. 943). If wildfire activity in the region increases sufficiently due to climate and other causes, Western forests could become a net contributor to atmospheric carbon, rather than a carbon sink.

Health impacts from specific wildfire events are difficult to establish. Obstacles include data requirements, confounding variability in climate conditions, the presence of many sources of

[264] PM_{10} refers to airborne particles smaller than 10 micrometers, barely large enough to be visible in hazy air. $PM_{2.5}$ refers to particulate matter smaller than 2.5 micrometers, invisible to the unaided eye.

harmful emissions, and the complexities of medical research. For example, the 2002 Hayman fire, the largest in Colorado's history, blanketed the Denver area in smoke and affected air quality for 1.8 million people in three states (Morton et al. 2003, pp. 31 and 46). While one asthma-related fatality was attributed to poor air quality from the fire, the Colorado Department of Public Health and Environment did not find a clear association between air quality and increased disease incidence on a larger scale in its small, short-term assessment following the fire (pp. 32–33). Medical research on long-term health impacts from wildfire is lacking (p. 51).

In summary, while science has found that health problems are caused by air pollution of the types wildfires can create, direct links have not been clearly established between health outcomes and wildfire incidence and characteristics. Aside from possible health risks, wildfires may reduce visibility, cause smoke damage in buildings, and promote soil conditions that fuel dust storms (Sandberg et al. 2002, pp. 13 and 20).

9.9.2 Utah Air Quality Challenges from Wildfire

Smoke and dust from wildfires affect Utah air quality. On a handful of days during the five-year period 2008–2012, active wildfires in Utah and neighboring states contributed to exceptionally high $PM_{2.5}$ and PM_{10} levels.

Portions of Utah are susceptible to fire-related dust storms. Fires may consume vegetation cover and expose soil. On several occasions during the three years following the 2007 Milford Flat fire that engulfed large areas of Beaver and Millard counties, high winds over burn-scarred lands were noted by Utah's Division of Air Quality as a key factor in substandard air quality readings.[265]

States are subject to national ambient air quality standards specified in the Clean Air Act of 1970 and promoted by the U.S. Environmental Protection Agency (EPA).[266] Wildfire and high winds are natural events for which exceedance of EPA standards in a particular area will not necessarily result in a nonattainment designation, as long as evidence is submitted that adequately documents the link between the event and exceptional air quality problems (Sandberg et al. 2002, p. 16).[267] During four of the five years from 2008 through 2012, Utah requested limited-time EPA exceptions to comply with air quality standards on these grounds (Hart 2014). As of September 2014, EPA had not approved these requests. Utah remained accountable for addressing these exceedances, although their causes were partially outside of the control of land managers and state policymakers.

Wildfire events may have caused levels of ozone and particulate matter ($PM_{2.5}$ and PM_{10}) to exceed EPA standards on six summer days in five fire seasons, ranging from June 26 to September 21. Noticeable air quality problems were evident several days surrounding those six days as well.

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[265] "Exceptional Events: Documentation," Division of Air Quality, Utah Department of Environmental Quality, accessed October 4, 2014, www.airquality.utah.gov/Public-Interest/Public-Commen-Hearings/Exceptional_Events/eedocuments.htm.

[266] 42 U.S.C. §7401-7626.

[267] A nonattainment designation implies an additional compliance burden for the state, including possible land use restrictions and planning requirements for the area so designated. Natural Events Action Plans, which consider recourses in the event of a future occurrence, are part of the documentation to avoid a nonattainment designation from EPA.

As alluded to previously, another six EPA exceedances during 2008–2010 have been associated with high winds in areas where earlier burns caused vegetation loss.

The most recent of these events were the Pinyon and Faust fires, which began August 5, 2012 and together burned an estimated 27,818 acres (MTBS 2014). Daily eight-hour average ozone levels at four monitoring stations in Salt Lake and Davis counties exceeded the 75 parts per billion (ppb) EPA standard on August 12, when ozone levels rose to 78–82 ppb (DAQ 2012a). Rudimentary regression analysis suggests an estimated 19 ppb may have been contributed by the fire, 23.7 percent of the average ozone level at the four stations (Jaffe, et al. 2013).[268]

Multiple fires continued into September of 2012, producing heavy smoke that limited visibility. $PM_{2.5}$ levels rose above the 35 micrograms per cubic meter ($\mu g/m^3$) standard to as high as 38.3 $\mu g/m^3$ during September 17, 18 and 21 in Cache and Weber counties. Wildfire was considered a potential cause for as much as 85 percent of the $PM_{2.5}$ concentration in Ogden and Logan those days (DAQ 2012a).[269]

Two earlier wildfire events caused poor air quality in Utah. At Brigham City in Box Elder County $PM_{2.5}$ concentrations on June 26, 2008 reached 42.7 $\mu g/m^3$, of which approximately 58.4 percent could be attributed to wildfires burning in Nevada and California (DAQ 2010). On August 6, 2009, wildfire was considered the primary source of unusually high PM_{10} levels detected at monitoring stations in Utah, Salt Lake, Davis and Weber counties (DAQ 2009).[270]

9.9.3 Utah Policy Response

In compliance with the Clean Air Act and associated federal regulations, Utah adopted a Regional Haze State Implementation Plan (SIP) in 2003, last revised in 2011, to improve air quality in the state.[271] EPA oversees compliance with Utah's Regional Haze SIP.[272] The SIP establishes milestones for reduction of sulfur dioxide (SO_2) and emissions.

A key element of Utah's Regional Haze SIP is a Smoke Management Program (SMP) to manage air quality and visibility in the context of human health concerns and land management objectives. This program addresses prescribed burns and wildfire. Relevant policies include public notification, suppression strategies, air quality monitoring and analysis. Prescribed burns are indicated in settings where smoke dispersion is optimal and only with approval from the State Smoke Coordinator. Those who respond to wildfire should consider how suppression efforts may alter natural fire regimes in ways that would exacerbate wildfire and associated air quality

[268] Estimates from the Utah Division of Air Quality (DAQ) were consistent with the results in the Jaffe et al. study, although DAQ reported a somewhat smaller effect, approximately 16 ppb or 19.9 percent of ozone levels at four stations August 12 (DAQ 2012a). Statistical modeling helps distinguish ozone creation by wildfires from normal daily and annual variation and from the effects of wind patterns, precipitation and emissions (Jaffe, et al. 2013). However, such analysis is fraught with technical challenges, such as nonlinearities and intervening climate variables. Any results suggesting the shares of ozone and particulate concentrations attributable to wildfire should be interpreted with caution.

[269] Merely suggestive estimates of wildfire's contribution to particulate concentrations were obtained by comparisons of $PM_{2.5}$ values at the time of the 2012 fires to particulate levels at the same time in 2011, a low-wildfire year for Ogden and Logan.

[270] Some 24 fires were burning in this area in early August 2009, of which the largest was Big Pole fire at 41,575 acres burned (MTBS 2014).

[271] 42 U.S.C. §7409

[272] "Division of Air Quality: 2011 Regional Haze SIP," Utah Department of Environmental Quality, accessed October 4, 2014, www.airquality.utah.gov/Public-Interest/Current-Issues/Regionalhazesip/.

problems over the long term. DAQ documents exceptional air quality events where EPA standards are exceeded. Agricultural outdoor burning is not governed by the SMP.

Several organizations in Utah have formed a partnership to support the SMP with funding, staffing and coordinated policies (Karmazyn 2014). These include the U.S. Forest Service, Bureau of Land Management, Utah Department of Natural Resources (DNR) and Division of Air Quality (DAQ). For example, BLM has incorporated an Air Resource Management Strategy for Utah to monitor weather and climate, manage smoke, model pollution impacts, and evaluate visibility with the goal of enhancing air as a renewable resource (Muhn and Stuart, 1988, p. 241).[273]

In the event of large-scale federal land transfer as envisioned in H.B. 148, federal support for Utah's Regional Haze SIP and SMP may be reduced to the extent that federal agency contributions are related to management of their lands. On the other hand, EPA oversight and the governing SIP and SMP will persist, such that the pattern for protecting air quality in Utah will continue regardless of land ownership. Federal air quality standards apply and are administered similarly whether the state or federal government owns public lands.

9.10 ADDRESSING EXCESS FUELS IN UTAH'S FIRESHED

Overabundant fuels increase the incidence of large, high-severity fires (Westerling et al. 2006, p. 940). Of two common remedies, prescribed fire is generally more affordable in Utah than mechanical treatments as a means of hazardous fuels reduction and wildfire risk mitigation. However, mechanical treatments create the potential for economic benefits from harvesting and selling timber. This section addresses hazardous fuels reduction in Utah's fireshed, particularly its forests.

As of 2005, an estimated 77 percent of Utah's timberland, 3.6 million acres, was stocked in excess of prescribed forest conditions (USFS 2005, p. 5). Treatment opportunities exist for these 3.6 million acres of commercially valuable timber species, one-third of which requires particular attention. Removal is recommended for about 38 percent of the total volume of timber standing in Utah forests that have commercially viable trees (p. 6).[274] In particular, strategic timber harvesting in the WUI can create defensible fire states near residences (Mueller 2014).

Mitigation efforts are not without drawbacks. First, fuels treatments can cost from about \$100 per acre to over \$3,000 per acre, as discussed below, some of which could be recovered from selling wood products, depending on the treatment method. Second, whether mechanical thinning as discussed above or prescribed burns, fuel reduction treatments are known to have limited lifespans (Jain et al. 2012, pp. 209–210). For example, in ponderosa pine forests, ten years after prescribed burns, 84 percent of pre-treatment fuel loads had returned. Finally, delayed benefits from fuels reduction accrue over the long term, especially after a period of consistent in-

[273] BLM Utah's 2011 ARMS for the state is part of BLM's nationwide Air Resource Management (ARM) program. The ARM team supports land use planning and shares best management practices to protect air quality on BLM lands. *Sources:* "Air Resources," Bureau of Land Management, accessed September 29, 2014, www.blm.gov/wo/st/en/prog/more/soil2/air2.html; "Air Quality and Climate Data," Bureau of Land Management, accessed October 4, 2014, www.blm.gov/ut/st/en/prog/more/air_quality.html.

[274] Of the 144.6 million bone-dry tons of total forest volume on treatable timberland in Utah, removal is recommended for 54.5 million bone-dry tons or 38 percent of the total volume standing.

vestments, though still with a degree of randomness and uncertainty (Cottam 2014). Given the multitude of factors affecting fire incidence and severity, suppression costs in treated areas may not fall sufficiently to pay for treatments.

In general, federal and state lands in Utah could benefit from more fuel reduction treatments, given additional funding. A cohesive strategy is lacking for fuel reduction treatments in national forests (GAO 2007, pp. 4–5). A systematic approach could prioritize areas where fuel reduction will be most effective at reducing the risk of wildfire and the associated suppression costs. Current priorities for Forest Service planning of fuel reduction treatments are treatment effectiveness, risk of harmful wildfire, location near the WUI, wildlife needs and municipal water supplies (p. 21). Lower priorities include insects and disease, commercial timber opportunities, and smoke emissions. SITLA generally does not perform mechanical treatments on its lands (Carter 2014). However, it conducts burned area rehabilitation and offers timber sales for salvage harvesting as elements of its wildfire management strategy.

Table 9.18
Prescribed Fire and Wildland Fire Use in Utah, 2003–2013

Year	Fires	Acres Burned
2003	59	32,727
2004	113	32,767
2005	120	28,272
2006	107	26,874
2007	104	44,024
2008	140	37,680
2009	147	28,173
2010	124	22,657
2011	115	16,354
2012	82	16,432
2013	111	14,029
Total	1,295	335,126

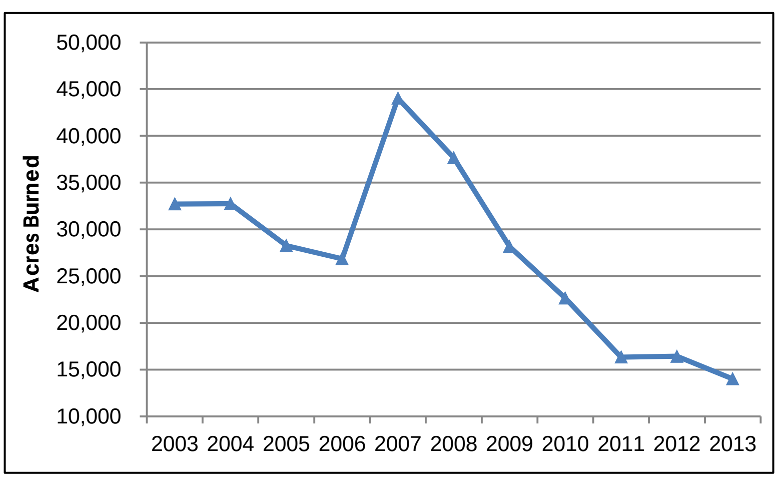
Source: National Interagency Coordination Center.

9.10.1 Prescribed Burns and Wildfire Management

Prescribed fire is a wildfire mitigation tool whereby land managers plan and control moderate, defensible fires. Based on a study from 2000, the average cost of prescribed burns in national forests in the West was $124 per acre in 2013 dollars (USFS 2005, p. 10). Flexible wildfire management strategies, such as Wildland Fire Use (WFU), respond to unplanned, naturally ignited wildfire in a manner that reduces hazardous fuels where circumstances permit or meets other land management objectives, rather than focusing exclusively on aggressive containment (OIG 2006, p. 14). Prescribed fire and strategic wildfire management may prevent severe future fires from accumulated fuels and are often advisable in Utah (Mueller 2014). Prescribed burns often improve wildlife habitat while reducing the risk of high-severity wildfires (GAO 2007, p. 14). Landscape design including firebreaks and systematic attention to fuel loads make beneficial prescribed burns less risky (Hirsch et al. 2001).

Prescribed burns and WFU made up about 7.2 percent of wildfires and 13.4 percent of acres burned in Utah between 2003 and 2013. There were 1,295 of these fires, which reached 335,126 acres of Utah lands (Table 9.18). Of the totals, the Forest Service was the most important contributor with 52.1 percent of these acres burned. BLM was responsible for 18.5 percent of the Utah lands treated with

Figure 9.13
Acres Burned in WFU and Prescribed Fire, Utah 2003–2013



Source: National Interagency Coordination Center.

prescribed fire or WFU. Other shares of acres burned were as follows: state, 7.8 percent; National Park Service, 5.4 percent; U.S. Fish and Wildlife Service, 3.9 percent; Bureau of Indian Affairs, 2.8 percent; and private landowners, 0.8 percent.

The Utah land areas treated with prescribed fire and WFU appear to have declined from 2003 to 2013 (Table 9.18 and Figure 9.13, see above). An evaluation from 2006 suggested the Forest Service and other federal agencies routinely underutilized WFU as a mitigation tool (OIG 2006, p. 14). In 2009, a new Federal Wildland Fire Management Policy departed from WFU terminology and proposed a more flexible strategy for addressing non-prescribed fires based on a more comprehensive range of objectives. The downward trend since 2009 in Figure 12 is related to reporting and terminology changes. SITLA takes advantage of such wildland fire management to improve land conditions but does not conduct prescribed burns on its 3.4 million acres (Carter 2014).

9.10.2 Cost of Fuel Reduction Treatments

Harvesting dead or dying timber from forests, timber salvage, can remove excess fuels from Utah forests to reduce the risk of severe wildfires. The cost of such preventative intervention can be recovered, or at least partially offset, by the sale of harvested timber. A 2013 study of western states discussed the economic viability of timber salvage after insect infestations such as mountain pine beetle (Prestemon et al. 2013). Timber salvage would generally not be expected to generate net revenue for the state of Utah, since the market value of timber delivered to the limited number of existing sawmills would be insufficient to cover removal costs (p. 150).[275] However, resulting fire suppression savings, not estimated in the study, may yet make timber salvage operations a financially attractive proposition for the state. Also, harvesting would create jobs and economic value beyond what revenue the state would receive. On the other hand, harvesting of salvage timber can be detrimental to forest health, since dead wood improves the soil and animal habitats (Mueller 2014). Salvage timber's attractiveness to the timber industry is limited somewhat by low quality and irregular supply, disadvantages reflected in affordable salvage prices.

Costs of fuel reduction treatments vary. As noted previously, as of 2000, the average cost of prescribed burns in national forests in the West was $124 in inflation-adjusted 2013 dollars (USFS 2005, p. 10). From prescribed burns in the 1990s, another study gives a range of $38 to $191 per acre for the West, also in 2013 dollars (Alexander and Thomas 2006, p. 15). More recent estimates would be preferred.

As of 2005, cutting and removal treatments were estimated to cost from $400 to $1,630 per acre for ponderosa and lodgepole pine forests in the Great Basin region where Utah is located. Higher-value products, uncommon in Utah, may be sold for net revenues of –$16 to (positive) $1,562, while logs sold for chips yield net revenues of –$3,171 to –$1,090 (p. 13).[276] According to Fitch, Kim and Waltz (2013), fuels reduction costs of up to $538 per acre may be justified by expected savings in fire suppression, at least for ponderosa pine forests.

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[275] The forests of five other western states face a similar economic reality, according to the study, while six states with more valuable forest endowments were shown to have potential for additional profitable timber salvage operations. Of twelve states studied, timber salvage is expected to be a financial burden in Arizona, Colorado, Nevada, New Mexico, Utah and Wyoming. On the other hand, salvage would likely generate net revenue in California, Idaho, Montana, Oregon, South Dakota, and Washington.

[276] These numbers reflect ponderosa and lodgepole pine species in Southwest, Great Basin and Intermountain areas.

Other studies have also estimated costs and net revenues of mechanical treatments that involve harvesting to prevent wildfire. A recent study of fuels reduction costs was based on forest conditions from 2000 to 2009 on a preselected 113,000 acres of overgrown forest lands in Utah, where there was good road access, certain favorable tree species, and the ability of vegetation to auto-regenerate after harvesting (Jain et al. 2012).[277] As shown in Table 9.19, estimated on-site costs per acre ranged from $448 to $3,024 for Utah, depending on the thoroughness of fire hazard mitigation using various thinning methods, as well as the priority given to revenue generation when selecting areas for treatment (p. 201).

[277] Timber stands were considered where forest health and fire resiliency would benefit from treatments that involve thinning forests. The authors make careful estimates of labor and equipment expenditures required to cut and haul trees from sites with hazardous fuels.

Table 9.19
Estimated Net Revenue from Fuels Reduction in Utah, 2000–2009

Scenario	Acres[1]	Cost per Acre[2]	Net Revenue per Acre
Maximum hazard reduction where treatment was most needed	7,000	$3,024	–$2,101
Some hazard reduction where treatment was most needed	113,000	$1,161	–$506
Some hazard reduction for fairly marketable stands	113,000	$798	–$261
Some hazard reduction only for stands that were profitable	32,000	$448	$1,369

1. Acres indicate the area of forest land in Utah analyzed where the scenario applied.
2. Cost per acre estimates all on-site costs. Transportation costs and the market value of wood are also used to calculate net revenue per acre.

Source: U.S. Forest Service, Jain et al. (2012).

These results are not inconsistent with findings from two other studies. Net revenues from mechanical treatments in Utah's forests throughout the state were estimated to be –$157 or lower per acre in 2013 dollars for each of four scenarios considered (Prestemon, Abt and Barbour 2012).[278] From a 2003 study of fuels reduction projects in Colorado, costs per acre varied by species, diameter, percent removal, and other factors from $985 to $1,636 in 2013 dollars (Mackes and Lynch 2003, p. 169).

Returning to Table 9.19, the most effective thinning methods in Utah cost up to $2,101 per acre in net costs for the 7,000 acres where forest fire hazard is the greatest (Jain et al. 2012, p. 201). A much smaller net cost per acre of $261 is expected where fairly marketable forest types are selected and where more affordable thinning methods are used to achieve some fire hazard reduction. Finally, some fire hazard reduction can be achieved on 32,000 acres of forests with highest market value, earning $1,369 per acre in net revenue. Douglas-fir and pine forests are favorable species for potential profitable treatments. There appears to be a tradeoff between net revenue and wildfire mitigation effectiveness.

9.10.3 Estimating Savings from Treatments

The benefits of preventive treatments in terms of fire suppression savings have been estimated, although this area of the literature is not well developed. A recent study modelled wildfire conditions in a portion of Coconino National Forest in northern Arizona with mainly ponderosa pine forests (Fitch, Kim and Waltz 2013). Ponderosa pines cover about 7.7 percent of Utah timberland and are common in Fishlake and Manti-LaSal National Forests. Fire suppression costs in the event of simulated wildfire incidents are estimated to be $706 to $825 per acre without treatment and $287 to $327 with mechanical or prescribed fire treatments (p. 8). Implied benefits from treatments range from $379 to $538 per acre. The study does not suggest how much these preventative treatments would cost. This range of wildfire suppression savings is insufficient to cover treatment costs in most estimates presented, but one study suggested treatment costs as low as $400 per acre for the Great Basin (USFS 2005). Also, there are usually large costs from wildfire besides suppression, such that the $379–$538 range of benefits may understate savings from mitigation.

[278] Net economic benefits from mechanical treatments were not positive for any part of Utah. Net benefits were generally positive for western Washington and Oregon and for parts of California. Mechanical treatments include removal and alterations.

According to Utah wildfire suppression expenditures, a full cost recovery strategy must be prescient enough to treat areas in a way that prevents fires precisely where one or more wildfires would have burned during the effective lifespan of a treatment. Knowledgeable Utah foresters from state and federal agencies could determine which areas are at the greatest risk for expensive and destructive fires. For example, from 1985 to 2012, multiple fires burned through the same lands in certain parts of Beaver, Juab, Millard, Tooele and Washington counties.[279]

As we have seen, Utah's fire suppression costs averaged $16.23 per acre burned on all BLM, Forest Service, state and private lands from FY2003 to 2012, but on Forest Service lands they reached $44.62 (Table 9.12). With burned area stabilization and rehabilitation added, costs per acre burned could be expected to be $4.82 higher on all three agencies' lands and $1.55 higher on Forest Service lands.[280] Suppression and post-fire restoration costs from wildfire are considerable in Utah, but even on Forest Service lands where these costs are highest at $46.16, they only amount to 37.2 percent of the average cost of prescribed burns in the West, $124 per acre in 2013 dollars (USFS 2005). However, the cost is within the range given in Alexander and Thomas (2006) for the region, $38 to $191, suggesting prescribed burns are cost effective in some settings. Recent Utah costs for prescribed fire likely differ from these estimates for all western states. This comparison assumes wildfire would have occurred precisely where prescribed burns were carried out. Also, the comparison omits other costs from fire, which can be substantial.

The potential to avoid suppression and post-fire restoration costs of $21.05 per acre burned in Utah during FY2003 to 2012 helps justify mechanical treatments (removals/harvesting). However, the most important factors in determining mechanical treatments' cost efficiency are revenue from timber sales and removal costs. In the literature for the Utah area, net revenue from removals ranged from losses above $3,000 per acre to gains of over $1,500 per acre, with net revenue outcomes of about –$1,500 per acre or worse being most common in the alternatives presented (Jain et al. 2012; Mackes and Lynch 2003; Prestemon, Abt and Barbour 2012; USFS 2005).[281] We can conclude that there are likely places in Utah where mechanical treatments would pay for themselves, although generally this is not a financially attractive proposition.

Clearly, suppression and post-fire restoration costs are only part of the true cost of wildfire. Prospects of property losses, personal harm, environmental degradation, and a variety of other economic and noneconomic costs from wildfire would make the argument for prescribed burns and

279 The 28 years since 1985 is certainly longer than the effective lifespan of most fuel reduction treatments, but the interval between repeat burns varied and was sometimes less than 5 or 10 years (Jain et al. 2012).

280 The 29.5 percent figure equals average rehabilitation amounts for BLM and Forest Service divided by average suppression amounts for the three during FY2003 to 2012 (Table 9.15 and Table 9.16). Amounts the state pays through FFSL are mixed with mitigation and preparedness in the fire management account, and other state amounts from DWR and SITLA are not available. Some non-suppression wildfire expenditures, including rehabilitation, relate to burned area recovery, while other such expenditures relate to areas that did not burn, perhaps because of those efforts. Another difficulty is that spending generally does not match the period in which fires occur, thus matching treatment to acres burned is difficult. More importantly, a large share of non-suppression spending would not be saved by land managers undertaking fuels reduction. Rather, treatment approaches increase these expenditures.

281 Further research could include a thorough meta-analysis and more discussion of comparability of findings to specific Utah lands and other circumstances.

mechanical treatments more compelling. The scarcity of sawmills in Utah, limited road access in some areas, and environmental concerns would make treatment propositions less compelling.[282]

[282] Examples of environmental impediments to fuels reduction are endangered species or, in the case of prescribed burns, air quality, both of which would remain important considerations in the event of land transfer in Utah. Treatments may have a positive effect on the environment. Removals and prescribed fire may improve forest health and wildlife habitat.

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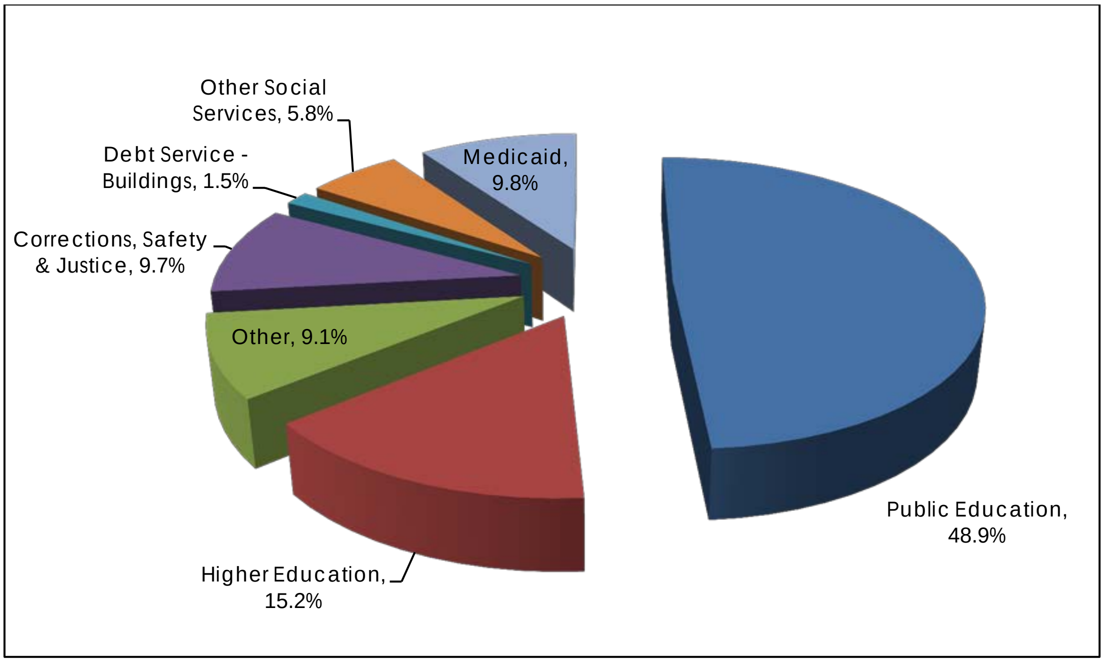
10 State Funding of Public Education in Utah

State funding of public education is a top priority in every legislative session. No other function of state government requires near the funding that public education does. In the fiscal year 2014 budget, 48.9 percent of the $5.5 billion General Fund and Education Fund was appropriated to public education Figure 10.1. The share for public education has been relatively constant for a number of years. The second largest expenditure, higher education, is a distant second, accounting for only 15.2 percent of General Fund and Education Fund appropriations.

Figure 10.1
Uses of Unrestricted General Fund and Education Fund, FY2014



Source: Appropriations Report, Utah State Legislature 2013–2014.

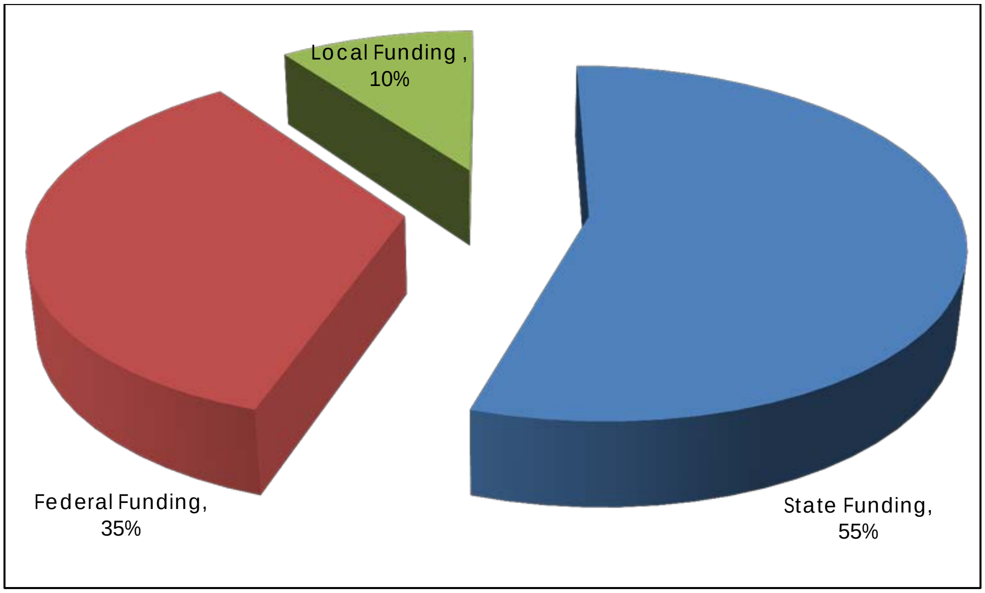
When funding from state, local, and federal sources is combined, total spending on public education in 2014 was $5 billion. With total enrollment of 612,500 students, spending was almost $8,200 per student.

10.1 Sources of Funding

Education funding comes from state, local and federal sources. State funds flow from individual and corporate income taxes. The revenue from these two sources is dedicated solely to public and higher education. State funds provide $2.75 billion for public education. In FY2014 local property taxes provided another $1.8 billion in funding. Federal government funding provided $480 million.

As shown in Figure 10.2, the $2.75 billion in state funds represents 55 percent of all funding for Utah's public schools. Funding from local governments accounts for 35 percent and federal funding about 10 percent.

Figure 10.2
State, Local and Federal Funding of Public Education



Source: Appropriations Report, Utah State Legislature 2013–2014.

10.1.1 Minimum School Program

State funds for public education are distributed to local school districts through the Minimum School Program (MSP). The MSP was created by the Utah State Legislature in 1974 in response to the Utah School Finance Study (1972), which provided recommendations on "alternative allocation of resources to equalize financial burdens among and between school districts and provide some opportunity for districts to enrich local programs if desired."

The 1972 study provided the basis for the current MSP program, although over the intervening years a number of changes have altered the program and added complexity. This growing complexity of the MSP is a subject of controversy with some education advocacy groups. Nevertheless, Utah's MSP has provided a level of equity in public education funding that few states can equal. Failure of many states to achieve equity has led to court challenges. Utah is one of only a handful of states that have avoided judicial review of their funding formulae and the subsequent court order to make the funding system more equitable.

In 2014 Utah's Minimum School Program distributed $3.35 billion in funds. The MSP is divided into three subprograms: (1) the Basic School Program, (2) the Related to Basic School Program, and (3) the Voted and Board Leeway Programs. Within these three broad subprograms there are currently 36 individual programs.

Basic School Program

The Basic School Program (BSP) is the largest subprogram in the MSP. In 2014 the BSP provided $2.1 billion in funding for general operation revenue to local school districts (Table 10.1). BSP funds are unrestricted and spent on local priorities by local school boards.

Table 10.1
Minimum School Program, FY2014

Program Category	Funding	Share
State Funds		
Basic Program – Education Fund	$2.1 Billion	62.7%
Related to Basic Programs – Education Fund	$520 Million	15.5%
Voted & Board Levy Program – Education Fund	$76 Million	2.3%
Local Funds		
Voted & Board Levy Program – Local Property Tax	$355 Million	10.6%
Basic Program – Local Property Tax Basic Levy	$297 Million	8.9%
Total Minimum School Program	**$3.35 billion**	**100%**

Source: Governor's Office of Management and Budget, Budget and Policy Briefs 2013–2014.

The Basic School Program is fully equalized on both the spending and funding side. On the spending side, a school district receives its allocation based on the number of Weighted Pupil Units (WPU) multiplied by the value of the WPU. The revenue side is equalized with a uniform tax rate imposed statewide by local school districts.

The WPU is used to allocate funding on a uniform basis for each student. The WPU is defined as one student in average daily membership. The 1972 study found that the weighted pupil unit was the most equitable approach to funding. The WPU formula is objective and recognizes the different costs associated with different student groups. The number of WPUs for each school district is determined annually and funding is allocated based on the value of a WPU. The number of WPUs is based on: (1) the number of students in kindergarten and grades 1–12, (2) the number of students in special education programs, (3) experience and educational level of professional staff, (4) career and technical education programs, and (5) school district size and rural schools.

Table 10.2
Value of Weighted Pupil Units, 2000–2014

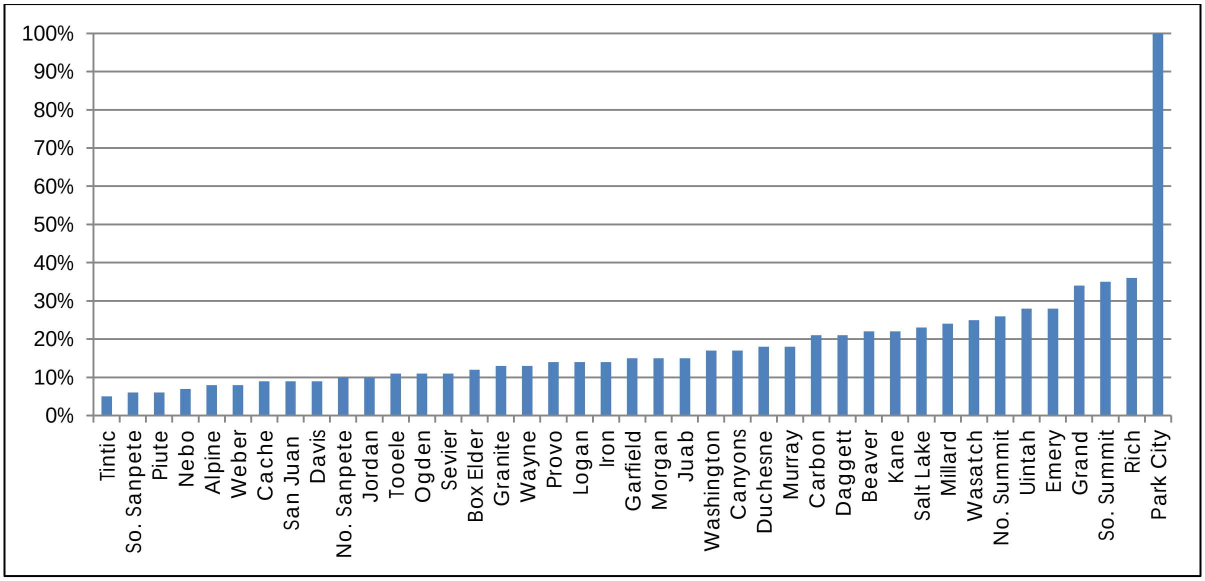
Fiscal Year	Current Dollars	Constant 2014 Dollars
2000	$1,901	$2,626
2001	$2,006	$2,694
2002	$2,116	$2,798
2003	$2,132	$2,757
2004	$2,150	$2,707
2005	$2,182	$2,657
2006	$2,280	$2,690
2007	$2,417	$2,773
2008	$2,514	$2,777
2009	$2,577	$2,858
2010	$2,577	$2,810
2011	$2,577	$2,725
2012	$2,816	$2,917
2013	$2,842	$2,902
2014	$2,899	$2,899

Source: Utah State Office of Education.

School districts, as well as charter schools, are *guaranteed* an amount of state funding based on the WPU and the value of the WPU as determined by the legislature. The combination of the number of WPUs and the value of the WPUs determines the state funding received by a local school district. The WPU value has increased nearly every year; only in FY1997–1998 and 2009–2011 was the WPU left unchanged. The value of a WPU has never been decreased. In 2014 the WPU was $2,899. Adjusting for inflation, the WPU has increased by 10 percent since 2000 (Table 10.2).

The revenue for the Basic School Program and WPUs is generated initially by local property taxes. School districts impose a uniform property tax known as the basic levy or basic tax rate (see Voted and Board Levy Program below). In 2014 the basic tax rate is 0.001419. If the basic levy revenues are below the guaranteed amount determined by the number and value of WPUs—this is the case in 40 of 41 school districts in Utah (Figure 10.3)—state funds from income and corporate taxes supplement the basic levy revenues to achieve the guaranteed funding level for the district. If basic levy revenues exceed the guaranteed amount, the surplus goes to the state.

Figure 10.3
Percent of Basic Program Cost Funded by a School District's Basic Levy Revenue, 2014



Source: Utah State Office of Education.

Related to the Basic Program

The subprogram called "Related to the Basic Program" is fully funded by state money. In 2014 this subprogram was funded at $520 million. These monies are generally targeted for specific purposes such as transportation, youth-in-custody, adult education, at-risk students, enhancement for accelerated students and teacher salary adjustments.

Voted and Board Levy Program

Under this subprogram the state provided $76 million in funding to school districts with a comparatively low property tax base per student. Another $355 million from local property tax levies is accounted for in the state budget, although these are local funds as well as the basic levy of $297 million.

10.1.2 School and Institutional Trust Lands Administration

A source of funding to public education particularly relevant to this study is the State Permanent School Fund administered by the School and Institutional Trust Lands Administration (SITLA). Most SITLA trust lands are public school lands, and the annual net revenues from 3.3 million acres of public school lands must go to the State Permanent School Fund. Currently the State Permanent School Fund has an asset value of over $1.6 billion. By state statute only the dividend and interest earnings generated by the fund are distributed annually to public schools.

In fiscal year 2013 the distribution to public education from permanent fund earnings was nearly $38 million (Table 10.3). Currently, permanent fund earnings provide a very small fraction of state funding to education, only 1.4 percent. Earnings from the Permanent School Fund amount to less than 1 percent of the total $5 billion funding for public education in 2014.

Table 10.3
SITLA Annual Distribution to Public Schools
(Millions of Nominal Dollars)

Fiscal Year	Fund Distribution
2001	$5.0
2002	$6.0
2003	$7.4
2004	$8.3
2005	$9.7
2006	$13.9
2007	$18.4
2008	$25.3
2009	$27.1
2010	$24.3
2011	$22.6
2012	$25.8
2013	$37.8
Total	$231.6

Source: State Institutional Trust Lands Administration.

10.1.3 Payments in Lieu of Taxes and Secure Rural Schools

There are two federal programs that provide funding to public education due to federal ownership of land in Utah: Payments in Lieu of Taxes and the Secure Rural Schools program.

Payments in Lieu of Taxes (PILT) are payments to local government based on the acres of federal land within the jurisdiction. These payments may be used for any local government purpose. In FY2013 PILT payments to local governments in Utah totaled $35.4 million. Local governments directed about 10 percent of the PILT payments to local school districts, a total of $3.2 million (Table 10.4). Garfield School District received the largest amount of PILT funding, $688,113.

Since 1908 states have received a portion of the receipts of timber harvested in national forests. These receipts could be spent on public schools and roads in the counties where the national forests are located. With the decline in timber harvest revenue in the 1990s, the Secure Rural Schools and Community Self-Determination Act of 2000 (SRS) was passed "to stabilize and transition payments to counties to provide funding for schools and roads that supplements other available funds"[283] among other goals.

Receipts to counties fall into three categories; Title I, Title II and Title III payments. Only Title I provides public school funding. Fifty percent of Title I payments received by a county are allocated to the local school district. Garfield County, with $618,301 in payments, led all counties in FY2013 in SRS payments (Table 10.5).

The transfer of federal lands to state ownership would eliminate the federal PILT and Secure Rural Schools payments. In FY2013 these two federal programs distributed $7.8 million to local school districts. If the land transfer were to hold public education harmless, the state would need to replace PILT and SRS funding with state funding.[284]

[283] 16 USC 7101.
[284] See Chapter 5: Federal Land-Based Revenues for a full discussion of PILT and SRS.

Table 10.4
PILT payments to Local School Districts by County, FY2008–FY2013
(Constant 2013 Dollars)

School District (by County)	FY2008	FY2009	FY2010	FY2011	FY2012	FY2013
Beaver	$11,967	$113,455	$94,263	$111,257	$74,436	$72,097
Box Elder	$13,701	$87,986	$79,563	$67,574	$61,616	$0
Cache	$38,728	$221,198	$213,074	$169,661	$163,971	$0
Logan	$0	$89,910	$86,735	$68,995	$64,975	$0
Carbon	$2,081	$0	$0	$0	$0	$0
Daggett	$34,051	$0	$0	$31,165	$30,351	$0
Davis	$0	$0	$0	$0	$0	$0
Duchesne	$83,930	$0	$305,924	$264,095	$295,841	$257,878
Emery	$14,626	$177,306	$189,591	$168,064	$136,580	$93,117
Garfield	$144,815	$904,258	$940,769	$730,211	$623,028	$688,113
Grand	$3,749	$190,960	$85,627	$84,495	$34,477	$26,232
Iron	$22,739	$52,874	$286,243	$243,841	$208,001	$0
Juab	$15,615	$107,579	$0	$0	$46,629	$0
Tintic	$1,808	$68,072	$60,949	$52,609	$46,628	$0
Kane	$20,292	$83,086	$74,040	$64,790	$51,982	$59,797
Millard	$20,619	$267,700	$224,557	$193,385	$195,264	$164,838
Morgan	$10,398	$12,429	$11,699	$9,928	$8,783	$7,713
Piute	$13,120	$182,524	$154,098	$166,645	$143,645	$147,956
Rich	$12,256	$40,672	$40,041	$37,019	$31,032	$31,235
Canyons	$0	$0	$0	$2,865	$2,772	$0
Granite	$0	$0	$0	$0	$0	$14,199
Jordan	$0	$0	$0	$0	$0	$0
Murray	$863	$0	$590	$566	$535	$1,364
Salt Lake City	$0	$2,161	$2,109	$2,011	$1,928	$4,991
San Juan	$30,928	$824,425	$0	$0	$0	$0
No. Sanpete	$336,996	$584,524	$278,336	$230,979	$176,351	$0
So. Sanpete	$14,337	$313,317	$289,034	$251,948	$230,831	$211,081
Sevier	$47,348	$723,286	$689,102	$580,766	$468,289	$476,958
No. Summit	$16,231	$0	$12,308	$11,670	$11,503	$10,548
So. Summit	$22,723	$17,898	$17,484	$16,597	$16,648	$15,541
Park City	$69,251	$56,937	$55,620	$52,775	$50,046	$46,704
Tooele	$37,808	$147,543	$133,741	$126,739	$110,036	$98,534
Uintah	$35,149	$179,918	$158,391	$127,903	$150,344	$130,926
Alpine	$0	$0	$0	$0	$0	$0
Nebo	$15,013	$141,436	$146,041	$122,697	$113,155	$93,292
Provo	$0	$0	$0	$0	$0	$0
Wasatch	$57,357	$0	$0	$0	$0	$278,207
Washington	$51,475	$356,869	$358,430	$316,137	$277,344	$259,716
Wayne	$19,945	$176,595	$147,251	$128,571	$133,222	$0
Weber	$0	$0	$0	$0	$0	$0
Ogden	$10,058	$0	$12,917	$13,251	$8,431	$11,242
Total	$1,229,980	$6,124,918	$5,148,527	$4,449,210	$3,968,672	$3,202,279

Source: Utah State Office of Education, Annual Financial Reports (Revenues); available from www.schools.utah.gov/finance/Financial-Reporting/Annual-Financial-Report-(AFR).aspx.

Table 10.5
Secure Rural Schools Title I Payments to School Districts by County, FY2008–FY2013
(Constant 2013 Dollars)

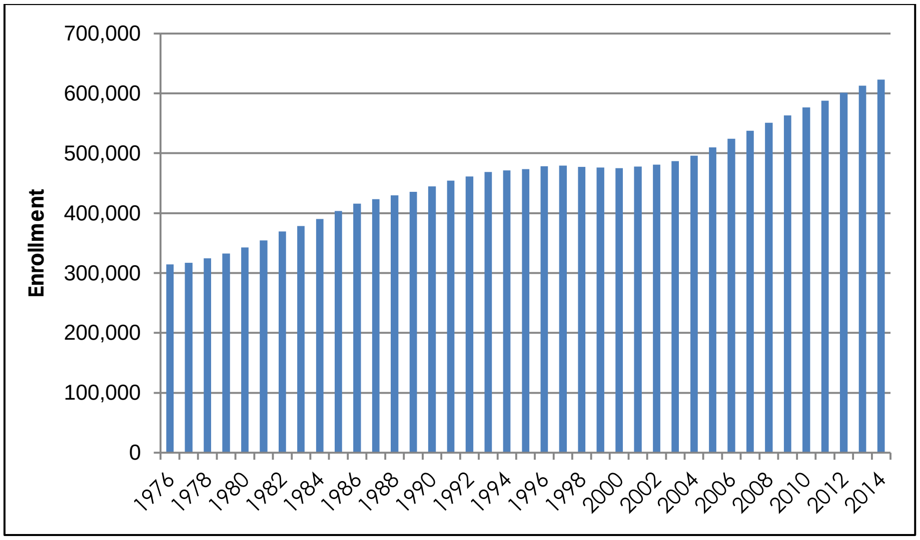
County	FY2008	FY2009	FY2010	FY2011	FY2012	FY2013*
Beaver	$113.620	$95,548	$113,402	$75,661	$72,920	$76,366
Box Elder	$88,114	$80,648	$68,876	$62,630	$55,053	$53,189
Cache	$311,563	$303,893	$243,257	$232,709	$192,568	$180,634
Carbon	$0	$0	$0	$0	$15,247	$15,665
Daggett	$354,914	$338,387	$244,299	$194.740	$150,635	$104,804
Davis	$23,042	$21,451	$19,825	$17,888	$19,189	$17,842
Duchesne	$432,182	$349,283	$269,187	$300,705	$260,821	$210,679
Emery	$177,565	$192,175	$171,304	$138,825	$94,180	$142,002
Garfield	$905,579	$953,588	$744,289	$633,272	$695,965	$618,301
Grand	$46,744	$50,773	$41,526	$35,044	$26,532	$23,202
Iron	$282,929	$290,144	$248,542	$211,421	$216,190	$198,131
Juab	$123,958	$123,559	$107,245	$94,790	$96,487	$90,576
Kane	$83,207	$75,049	$66,039	$52,836	$60,479	$53,389
Millard	$268,091	$227,617	$197,114	$198,475	$166,719	$188,803
Morgan	$12,448	$11,858	$10,120	$8,927	$7,801	$6,557
Piute	$182,791	$156,198	$169,858	$146,008	$149,645	$141,204
Rich	$40,731	$40,587	$37,732	$31,542	$31,592	$27,365
Salt Lake	$0	$0	$0	$0	$38,983	$37,324
San Juan	$825,630	$766,565	$665,637	$499,309	$419,586	$423,400
Sanpete	$566,483	$528,927	$455,007	$413,877	$379,470	$353,773
Sevier	$724,344	$698,492	$591,962	$475,989	$782,400	$459,244
Summit	$0	$0	$41,302	$39,741	$36,812	$36,049
Tooele	$147,758	$135,564	$129,183	$111,846	$99,658	$92,940
Uintah	$180,181	$160,550	$130,369	$152,815	$132,420	$124,242
Utah	$523,632	$547,247	$467,348	$430,606	$355,126	$326,783
Wasatch	$348,522	$318,054	$279,573	$257,543	$281,382	$249,567
Washington	$357,391	$363,313	$322,231	$281,904	$262,367	$250,226
Wayne	$176,853	$149,257	$131,050	$111,954	$103,017	$102,469
Weber	$48,453	$45,197	46,398	$41,440	$39,019	$36,356
State Total	$7,346,724	$7,023,924	$5,971,375	$5,212,756	$4,905,761	$4,605,034

Source: U.S. Forest Service, www.fs.usda.gov/main/pts/securepayments/projectedpayments, accessed 4/11/14.

10.2 The Challenge of Growth

Public education requires substantial financial as well as human resources. In 2014 there were 52,000 employees in Utah's public education system, including 26,000 teachers, 20,500 support staff, 3,800 counselors and 1,600 administrators. The annual growth of such a large enterprise results in significant additional resources. In the 2014–15 school year Utah's student population will grow by 10,300 students, a gain of 1.7 percent. This growth will cost an additional $64 million. In 2013 growth required $68.5 million in additional funding. The number of students in Utah's 41 school districts and 100 charter schools is expected to reach 623,000 in FY2015 (Figure 10.4).

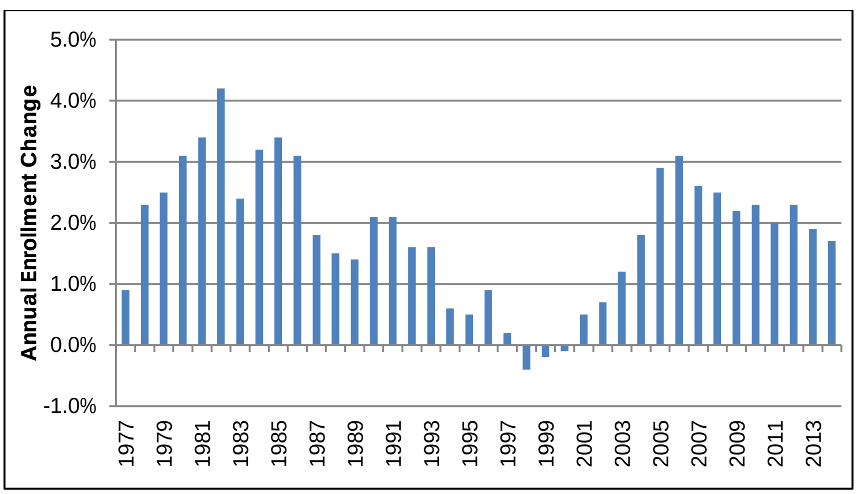
Figure 10.4
Public Education Enrollment in Utah, 1976–2014



Source: Utah State Office of Education.

For a 10-year period from 1994 to 2002, growth in public education enrollment was relatively modest—in three years enrollment actually declined—but by the mid-2000s the grandchildren of Baby Boomers began reaching school age. This new wave of children resulted in a substantial increase in the annual percent change in enrollment (Figure 10.5).

Figure 10.5
Percent Change in Public Education Enrollment in Utah, 1977–2014



Source: Utah State Office of Education.

In this current wave, enrollment growth peaked in 2006 with an increase of 15,648 students, a 3.1 percent increase. Since then enrollment growth has steadily declined to a projected 1.7 percent in 2014 (Table 10.6). Over the next five years increases in enrollment will gradually slow due a small decline in the growth rate of the school-age population. From 2000 to 2010 the average annual enrollment growth rate was 1.76 percent.

Table 10.6
State Public School Enrollment
and Change, 1990–2014

Year	Enrollment	Change Absolute	Change Relative
1990	444,732	8,970	2.1%
1991	454,218	9,486	2.1%
1992	461,259	7,041	1.6%
1993	468,675	7,416	1.6%
1994	471,402	2,727	0.6%
1995	473,666	2,264	0.5%
1996	478,028	4,362	0.9%
1997	479,151	1,123	0.2%
1998	477,061	-2,090	-0.4%
1999	475,974	-1,087	-0.2%
2000	475,269	-705	-0.1%
2001	477,801	2,532	0.5%
2002	481,143	3,342	0.7%
2003	486,938	5,795	1.2%
2004	495,682	8,744	1.8%
2005	510,012	14,330	2.9%
2006	254,003	15,648	3.1%
2007	537,653	13,650	2.6%
2008	551,013	13,360	2.5%
2009	563,273	12,260	2.2%
2010	576,335	13,062	2.3%
2011	587,745	11,420	2.0%
2012	600,970	13,225	2.3%
2013	612,551	11,581	1.9%
2014	622,813	10,262	1.7%

Source: Utah State Office of Education.

Over the 2010 to 2020 period the projected growth rate is 1.68 percent. Consequently, the share of school-age children in Utah will show a slight decline from 22.0 percent of the population in 2010 to 21.8 percent in 2020 (Table 10.7).

Table 10.7
School-Age Population in Utah, 2000–2020

Age	2000	Share	2010	Share	2020	Share
0 to 4	210,415	9.4%	264,947	9.5%	299,912	9.1%
5 to 17	511,683	22.8%	609,413	22.0%	719,997	21.8%
18 to 29	498,627	22.2%	549,733	19.8%	616,361	18.6%
30 to 39	300,039	13.4%	396,031	14.3%	481,175	14.5%
40 to 64	534,061	23.8%	703,838	25.4%	849,033	25.7%
65 and over	191,389	8.5%	250,321	9.0%	342,756	10.4%
Total	2,246,214	100%	2,774,283	100%	3,309,234	100%

Source: Governor's Office of Management and Budget.

Although the growth in enrollment will moderate in the next few years, Utah's perennially low ranking in expenditures per student enrolled will likely remain unchanged. In 2013 Utah ranked 50th among all states and the District of Columbia in expenditures per enrolled student. The impact of Utah's relatively large number of students and low per-student funding level is also reflected in a number of important measures regarding the quality of the public education system.

For example, Utah ranks 49th in the number of students enrolled per teacher, and 44th in per capita expenditures of state and local government for public education, leaving the state at only 64 percent of the national average in public education expenditures per enrolled student.[285]

To raise per-student spending in Utah's public schools to the national average would require $2.6 billion in additional funding according to the Office of Legislative Fiscal Analyst; an additional $4,213 in tax revenue per household. The potential increase for public education funding from the transfer of federal lands to state ownership would not be sufficient to substantially reduce Utah's per-student funding gap. The land transfer would have little impact on local property tax revenues for schools. While at the state level there may be some marginal increase in funding, the net gain would likely not exceed 5 percent of current state expenditures for public education.

[285]National Education Association, *Ranking and Estimates*, March 2014.

11 Linking Public Lands to Social Conditions and Quality of Life[286]

11.1 Executive Summary

This report presents findings derived from both a review of research literature and analysis of data from a 2007 statewide survey of Utah residents regarding possible linkages between the presence of public lands and associated natural resources and selected social conditions that relate to the "quality of life" experienced by populations living in areas where those lands and resources are present.

Key findings derived from the review of research literature include the following:

- In-migration of new residents and resulting population growth at the county level have been shown in both national studies and regional studies to be positively associated with the presence of both "natural amenity" conditions and of public lands and protected landscapes.

- Similarly, natural amenity conditions along with public lands and protected areas have been shown to be positively associated with several dimensions of local economic well-being, including in particular income levels, income growth, and employment growth.

- The selective in-migration to high-amenity areas by people who tend to be highly educated and employed in skilled and professional occupations can cause such areas to exhibit enhanced levels of "human capital."

- The combined effects of population growth linked to in-migration to areas characterized by natural amenity conditions such as those associated with some public lands, along with potential clashes between established and newly arrived populations with different attitudes and priorities regarding issues such as environmental conditions and resource management, can contribute to a reduction in "social capital" levels in such areas.

- Overall, a substantial majority of residents living in Utah and surrounding western states consider public lands important to their quality of life, and to the economies of their states and communities.

Key findings derived from the analysis of data from the 2007 statewide survey of Utah residents include the following:

- Overall, reported participation in a range of outdoor recreation activities on public lands tends to be slightly higher among Utahns who live in counties containing more acreage classified as being in protected resource management status, more land administered by the U.S. Forest Service, the National Park Service, or the Bureau of Land Management, and more designated Wilderness acreage.

[286] This chapter was written by Richard S. Krannich, PhD, Department of Sociology, Social Work and Anthropology and Center for Society, Economy and the Environment, Utah State University.

- Similarly, participation in a variety of "personal use" activities involving the gathering of materials from public lands is positively associated with higher levels of acreage in protected management status and higher levels of U.S. Forest Service, Bureau of Land Management, National Park Service, and designated Wilderness Area acreage.

- Comparisons across grouped sets of counties with varied levels of protected-status or public lands revealed generally weak or nonexistent associations between these measures of public land context and residents' views about the importance to their quality of life of commodity production/resource utilization activities occurring on public lands, of hunting/fishing/off-road vehicle uses of such lands, or of habitat and biodiversity protection that some public lands may provide.

- Although Utahns tend overwhelmingly to agree that public lands are important in providing areas where they can pursue the activities they enjoy most, there was little variation in such responses across grouped sets of counties exhibiting higher or lower levels of protected-status lands or other public land types.

- Differing public land contexts across Utah counties tend not to be associated with residents' views about the importance of public lands to their own personal identities. However, Utahns tend overwhelmingly to agree that public lands are important in defining the culture and heritage of their communities, and the tendency to agree on this point was generally highest in counties with more protected-status acreage and more acreage in various other public land classifications.

11.2 INTRODUCTION

This chapter explores possible linkages between the presence of public lands and associated natural resources and selected social conditions—including aspects of social well-being or "quality of life" experienced by human populations living in areas where those lands and resources are present. Because concepts such as "quality of life" and "social well-being" are inherently vague and multi-dimensional, several distinct themes are explored. Specifically, we consider possible linkages between resource conditions associated with public lands and local patterns of demographic change, economic development and opportunity, "human capital" conditions involving the skills and capacities of local-area populations, "social capital" conditions involving levels of citizen engagement and participation in community life, and public attitudes and values regarding public lands and public land resources.

The chapter begins with an overview of selected social science literature addressing various connections between natural resources in general and public lands more specifically and the social, demographic, and economic characteristics and conditions of nearby human populations and communities. On the whole there is a modest social science literature addressing these themes, and the picture painted by that literature is somewhat uneven with respect to the types of variables and relationships that are considered. This is due in part to the broad range of socioeconomic conditions that are often associated with vaguely defined concepts such as "social well-being" and "quality of life." In addition, much of the literature on this general topic has failed to clearly distinguish between the occurrence of some fairly specific natural resource conditions (in particular, the extent to which "natural amenity" conditions exist) and the presence of public lands more generally. Further, discussions of connections between quality of life and the presence of public lands have generally failed to address the ways in which those relationships might vary across different public land contexts involving a variety of land management agencies, a range of resource management priorities and practices, or varied landscape and resource conditions.

Following the review and discussion of literature-based findings and assertions, our attention shifts to an examination of selected response patterns from a statewide survey of Utah residents conducted by Utah State University in 2007 to evaluate linkages between public lands and resources and social/economic conditions throughout the state. In that analysis we explore Utahns' engagement in activities on public lands and their views about the importance of public lands to their own well-being and to the overall quality of life in their communities, and evaluate how those activities and views might vary in relation to different public land contexts.

11.3 Literature Review

11.3.1 Population Dynamics: Linking Resource Conditions to Demographic Change

Population growth (especially as opposed to population stagnation or decline) has frequently been identified by scholars, policy-makers, and development proponents as an indicator of success in efforts to promote socioeconomic stability and community well-being (see Molotch 1976). In the U.S. and other developed nations, growth involving the in-migration of new residents from other locations has become increasingly linked to quality of life attributes, reflecting a growing tendency for people to prioritize the natural and social features of places, including in particular things like "scenery, outdoor recreation opportunities, environmental quality, and climate," as primary reasons for moving to a new area (Charnley et al. 2008: 745; also see Gosnell and Abrams 2009). As such, studies that explore possible relationships between population growth and natural resource contexts have potential to provide useful insights into whether and how public lands may be linked to quality of life conditions.

Social scientists examining the relationship between certain natural resource conditions and regional as well as local patterns of population change have repeatedly observed that areas characterized by the kinds of natural environments people find attractive and consistent with their recreational and environmental values and interests are considerably more likely to experience higher levels of in-migration and population growth than are areas where such "natural amenity" conditions are limited or absent. While the presence of natural amenity conditions is by no means limited to areas defined as public lands, there are certainly tendencies for particular types of public lands to also be "high amenity" settings. Those tendencies are reflected in the observation by Charnley, McLain and Donoghue (2008: 744) that "public lands play an important role in amenity migration because of the natural amenities they provide."

Research conducted by David McGranahan of the USDA Economic Research Service makes it clear that over a 25-year period at the end of the 20th Century, county-level population change across the U.S. was highly related to natural amenity conditions such as climate, topography, and water area (McGranahan 1999). McGranahan's study, which examined relationships between population growth as well as employment trends in U.S. nonmetropolitan counties and a county-level composite scale designed to measure natural amenity conditions, demonstrated that for the nation as a whole "counties with extremely low scores on the scale tended to lose population over the 1970–96 period, while counties with extremely high scores tended to double their populations over the period" (McGranahan 1999: 9). Average 1970–1996 population change was just 1 percent among counties falling into the lowest category on McGranahan's 7-point amenity scale, compared to 120 percent for counties with scores in the highest scale category. McGranahan also observed that nonmetropolitan counties located in the western region of the U.S. exhibited higher amenity scores overall than was the case for any other region, helping to account for the fact that during 1970–96 population growth was much higher in the rural West than occurred in other parts of the nation.

In the years following McGranahan's groundbreaking research, a number of other researchers have examined relationships between population growth and natural amenity conditions. For example, Albrecht (2004) looked at population change from 1980–2000 across 2,386 nonmetropolitan counties in the U.S., and observed that population increased by 32.6 percent overall for counties with scores falling into the highest quartile on the McGranahan natural amenities scale, compared to just 11.6 percent for those falling into the third quartile, 5.1 percent for those in the second quartile, and below 0 percent (e.g., slight negative growth) for counties with amenity scores falling into the lowest quartile. Using a different approach that classified "recreational" counties based on levels of employment and income in industry categories indicative of recreational activity, Johnson and Beale (2002) observed that during the 1970s, the 1980s and the 1990s population growth rates were consistently higher in recreation counties than in other U.S. counties.

Some studies have moved beyond a focus solely on "natural amenity" conditions to include a more explicit focus on relationships involving the presence of public lands. In a national-level analysis, demographers Kenneth Johnson and Calvin Beale observed that during the early 1990s population growth rates tended to be higher overall in nonmetropolitan counties where much of the land was federally owned land (Johnson and Beale 1999: 6). In a later study, these same researchers found that at the national level population growth during 1990–2000 was highest in nonmetropolitan counties that were classified as "retirement" counties (28.4 percent increase), "federal lands" counties (22.3 percent increase), or "recreation" counties (20.2 percent increase). In another nationwide analysis, Frentz et al. (2004) also found that during all decades from 1970 through 2000 county-level population growth was higher in counties where federal lands were present than in counties without federal lands, a pattern that held for both metropolitan and nonmetropolitan counties and across all regions of the nation. In addition, these researchers found that counties with lands managed by three federal agencies (the Bureau of Land Management, the U.S. Forest Service, and the National Park Service) generally exhibited higher population growth rates across all time periods than was the case for counties with other types of federal land, a relationship they attributed to the fact that "natural amenities provided by BLM, FS, and NPS lands may be especially attractive to migrants" (Frentz et al. 2004: 65).

Other researchers have examined the relationship between amenity conditions (in some cases including the presence of public lands) and population growth at a regional level, with particular attention directed to portions of the western U.S. For example, Brigham Young University geographers J. Matthew Shumway and Samuel Otterstrom have reported that population growth in the Mountain West region during the last decade of the 20th Century was most heavily concentrated in what they labelled "New West" counties characterized by high levels of natural amenities, high levels of employment in and income derived from service-sector industries, high percentages of federal land ownership, and as recreation and retirement destinations (Shumway and Otterstrom 2001: 495; also see Otterstrom and Shumway 2003). Working at the more localized scale of census-designated places, Winkler et al. (2007) identified a number of communities across the Intermountain West region that they classified as "New West" settings (based on patterns of population change, sociodemographic composition of populations, housing characteristics, and local economic conditions), and found that those places were characterized by high rates of in-migration, considerably more likely than other western communities to be located in counties with high levels of recreation-based economic activity, and most often in close proximity National Park, National Monument, or National Forest lands.

A more explicit focus on relationships between population change and certain types of public land settings has been provided in studies by geographer Gundars Rudzitis and his associates. In a study focused on the Pacific Northwest region, Rudzitis (1996) reported that during the 1960s, 1970s and 1980s counties with designated wilderness areas as well as counties with National Park Service lands experienced dramatically greater population growth than did other nonurban counties in the region. In related research, Rudzitis and Johansen (1991) reported that in surveys of in-migrants to wilderness counties, over 70 percent of respondents identified the presence of wilderness as a key factor in their decisions to relocate to the area (also see Rudzitis and Johnson 2000). Similarly, research by Lorah (2000) examining population growth across 113 rural counties in the western U.S. revealed a positive and statistically significant correlation between the percentage of county land designated as federal wilderness and the rate of population growth during 1969–1996. Holmes and Hecox (2004) also found consistently positive and significant correlations between 1970–2000 population growth rates in rural counties in the American West and the percentage of county land area in wilderness, as well as the percentage of land managed by the Bureau of Land Management, the U.S. Forest Service, and the National Park Service.

However, at least one study provides evidence that such relationships are not always present. In a study focused on counties in the Pacific Northwest region included within the area covered by the Northwest Forest Plan, Kerkvliet et al. (2007; as cited in Charnley et al. 2008)) found that between 1994 and 2003 there was not a significant association between county net migration rates and the amounts of either Forest Service or BLM land within the county allocated to protected as opposed to extractive uses. In commenting on the ways in which shifting resource management patterns in the Northwest may relate to community well-being, Charnley et al. (2008: 752) noted that "one cannot assume that forest management policies designed to promote environmental protection will automatically enhance the natural amenity values of forests, thereby drawing people to nearby communities and driving amenity-based economic development."

Overall, nearly all of the literature addressing relationships between amenity conditions, public lands, and population growth indicates that "high-amenity" natural environments, including the kinds of resources and landscapes often associated with certain types of public lands, tend in general to attract new residents and spur higher than average rates of population growth, particularly in rural or nonmetropolitan settings. And, although a few studies have not found a significant relationship between the presence of public lands and in-migration, none of the literature identified as part of this review effort suggests that public lands and resources are associated with out-migration or population decline. On balance, the presence of public lands, and in particular public lands that have high "natural amenity" qualities, appears to attract in-migration of new residents and contribute to population growth.

11.3.2 Economic Outcomes: Linking Resource Conditions to Economic Well-Being

Because the possible economic implications of public land ownership are being addressed separately by Dr. Paul Jakus and Dr. Therese Grijalva, those themes will be considered only briefly in this chapter. However, it is important to recognize that as with studies focused on population changes linked to natural amenities and protected public lands, there is a body of literature that examines the extent to which amenity and land management conditions may also be associated with income levels, employment, and other dimensions of economic well-being. Although research addressing natural amenity conditions does not explicitly examine possible associations between the presence of public lands or protected lands and economic conditions, as noted earlier it is frequently assumed that such lands tend to be characterized by higher natural amenity levels.

Research conducted by David McGranahan with the USDA Economic Research Service, while focused primarily on population change, provided clear support for his observation that on a national scale "employment, like population, has tended to expand more rapidly in nonmetro counties with higher scores on the natural amenities scale" (1999: 14). Indeed, counties falling into the highest category on McGranahan's 7-point natural amenities scale exhibited employment growth averaging 350 percent for the 1969–1996 period, three standard deviations higher than the national mean. At the same time, McGranahan also observed that the relationship between amenity conditions and employment growth was weaker overall than that involving population change, more uneven across counties, and weaker during the 1990s than in earlier periods. The latter observation was interpreted as possibly reflecting a weakening relationship over time between employment change and population growth at the local level.

In another study examining relationships between county-level natural amenity conditions and local socioeconomic outcomes, Don Albrecht (2004) observed a statistically significant positive correlation between county natural amenity scores (using the McGranahan natural amenities scale) and 1980–2000 growth in service sector employment, with increased services employment being far more extensive in high-amenity counties than in others. At the same time, Albrecht's analysis also revealed that counties with higher natural amenity scores tended to have lower percentages of both men and women who were employed, a higher proportion of female-headed households, and higher poverty rates—evidence that high amenity conditions and the growth often experienced in those settings may not always have positive consequences with respect to some dimensions of local economic well-being or for some population groups. Other researchers have also observed that when considering the potential for natural amenity conditions (including those linked to some public lands) to foster both population growth and local economic expansion, it is important to acknowledge that those "growth" effects can bring with them certain economic disadvantages for some populations and locations. In particular, several authors have noted a tendency for income increases observed in rapidly growing high-amenity and recreational areas to be offset by higher costs of living (Hunter et al. 2005; Charnley et al. 2008), as well as a tendency for many of the jobs associated with natural amenities, recreation and tourism to be seasonal, and to involve relatively low wage levels (Charnley et al. 2008; McKean et al. 2005).

Other researchers whose work is focused on the Rocky Mountain West region have also documented increased economic opportunity in at least some high-amenity contexts. In a study focused on rural counties in the region, Shumway and Otterstrom 2001) classified 76 counties as

"New West" areas characterized as having high natural amenity scale scores, high employment and income derived from the service sector, high percentages of federal land ownership, and major retirement or recreation destinations. This research revealed that over a three year period from 1994–1997 average per capita income levels were higher for both nonmigrant and in-migrant populations in these "New West" counties than in any of the other county types (government, diversified, mining/manufacturing, and farming-based local economies) across the region. In related research examining the characteristics of "New West" areas at a more localized community scale, Winkler et al. (2007) found that such places exhibited considerably higher median household income levels and much higher average housing values than did communities lacking the conditions associated with "New West" growth and development patterns.

A larger number of studies have addressed potential relationships between the presence of public lands and protected land areas and economic dimensions of well-being. In a study of 113 rural counties located across the western U.S., Lorah (2000) reported substantial and statistically significant positive correlations between the percent of land designated as wilderness and employment growth 1969–1996, per capita income growth 1969–1996, and total income growth 1969–1996. Similarly substantial and significant relationships were also reported when these three indicators of county-level economic conditions were correlated with the percent of land classified as National Park, National Monument, or wilderness study areas.

In a related study examining the same 113 western rural counties, Holmes and Hecox (2004) reported substantial positive correlations between income growth 1970–2000 as well as employment growth 1970–2000 and three different measures of protected or public land presence: the percentage of county land area designated as wilderness, the percentage of land managed by the Bureau of Land Management or the National Forest Service, and the percentage of land managed by either the BLM, the NFS, or the National Park Service. In addition, these authors observed that both income growth and employment growth occurred at a substantially higher average annual rate for rural counties across the region that contained designated wilderness areas than was the case for counties without wilderness.

Several studies conducted by economist Ray Rasker provide further evidence that under at least some conditions the presence of protected public lands tends to be positively associated with local economic conditions and opportunities. Looking at counties across the 11 mainland states of the western United States, Rasker (2006) found that the presence of public land was positively correlated with growth in personal income from 1970 to 2000 for all types of counties in the region, and that the percentage of county land area classified as "protected" public lands was positively associated with income growth for nonmetropolitan counties. At the same time, it should be noted that this research also found a positive correlation between the presence of public lands classified as available for industrial uses and commodity production and personal income growth for all county types, although that relationship was weakest for counties that were distant from protected public lands. Further, Rasker reported that "much more significant factors" other than public land conditions are the key drivers of economic growth—including in particular the "education levels of the workforce, the presence of an airport and ski resort, and the percentage of the workforce employed in engineering, finance, architecture, and other producer services" (2006: 205).

A more recent study by Rasker and others (Rasker, Gude and Delorey 2013) provides further evidence that the presence of protected federal lands may contribute positively to local economic well-being. Looking again at nonmetropolitan counties in the western U.S., this research examined relationships between the presence of protected public lands and ten measures of overall county economic health. In a multivariate analysis controlling for the influence of several other potentially confounding factors, three of these economic well-being measures were found to be positively associated with the area of protected land within counties. Specifically, the results indicated that (with other factors held constant), an increase of 10,000 acres in protected public land was associated with: (1) a mean increase of $436 in the 2010 per capita income level; (2) a mean increase of $237 in the amount of change from 1990–2010 in per capita income; and (3) a mean change of $175 per person from 1990–2010 in investment income. In summarizing these results, the authors concluded that there was "a meaningful relationship between the amount of protected public land, higher per capita income levels in 2010, and faster growth of per capita income and investment earnings between 1990 and 2010" (p. 118).

Other recent work by Rasker and colleagues, conducted through the nonprofit research organization Headwaters Economics, provides additional support for the notion that federal protected lands may have positive economic consequences. For example, one of this organization's recent reports (Headwaters Economics 2012) noted that for western nonmetropolitan counties with over 30 percent of their land base in federal protected status, jobs increased by 345 percent from 1970 to 2010, compared to an increase of just 83 percent for counties that contained no protected federal lands. In addition, per-capita income levels were found to be substantially higher in counties that contained federal protected lands than in counties without such lands—for example, counties with 150,000 acres of protected lands exhibited an average 2010 per capita income that was $6,540 higher than in counties with no protected federal lands. The study also noted that natural amenity conditions such as those linked to protected land status attract business growth, new business owners, new workers, and retirees to the western region.

On balance, findings such as those reported in the literature summarized above as well as in a number of other studies (e.g., Lorah and Southwick 2003; U.S. Department of Interior 2012; Lewis, Hunt and Plantinga 2002) appear to provide substantial evidence that the presence of protected public lands is not associated with negative economic consequences at the local level. Rather, such findings have generally supported the observation that "protected public lands are a competitive economic advantage in the West, supporting faster rates of job growth and higher levels of per capita income" (Headwaters Economics 2012: 20). However, it is also important to recognize that the relationships between public lands and specific land management practices and local economic well-being are complex, and that the kinds of positive consequences identified in much of the literature are not universally observed. Indeed, research conducted in the Pacific Northwest region following implementation of the Northwest Forest Plan indicates that levels of "socioeconomic well-being" tied closely to employment conditions, poverty levels, and income inequality declined in 40 percent of forest communities following a shift from management emphasizing timber production to management focused more on resource protection (Charnley et al. 2008). It is also clear that the presence of protected lands and the effects of different public land management regimes tend to operate differently across a variety of local contexts (Rasker 2006). As with many factors that influence local socioeconomic conditions, there appear to be important contextual factors that need to be taken into account when assessing the varied ways in which public lands may be associated with higher or lower levels of well-being.

11.3.3 Human Capital: Linking Resource Conditions to the Skills and Capacities of Local Populations

A small number of studies have addressed the question of whether natural amenity conditions might be positively associated with the "human capital" characteristics of local area populations. This vein of research has not dealt specifically with associations involving the presence of public lands or specific public land management contexts. Instead, it has focused on more broadly defined natural amenity conditions—which as noted elsewhere are often assumed to be linked to the presence of certain types of public lands. Several studies have indicated that high-amenity locales tend to not only attract population growth through in-migration, but also increase the prospect of attracting new residents whose education, knowledge, training, skills, and experiences can enhance the overall level of "human capital" in an area—in turn enhancing the adaptive capacity and economic competitiveness of communities.

In research conducted through the USDA Economic Research Service, McGranahan and Wojan (2007a; 2007b) explored the growing importance of what they referred to as the "creative class—people in business ownership and top management, science, engineering, architecture, design, arts and entertainment" in spurring growth and development in rural areas (2007a: 2). Analyzing data from the 2000 Census, these researchers found that across the United States nonmetropolitan counties classified as having "high amenity" characteristics (based on McGranahan's 7-point natural amenities scale) were most likely to be "creative class magnets," with high proportions of residents employed in these types of occupations. These "creative class" counties tended also to be classified as "recreation" counties based on employment concentration in recreation and tourism-linked service sectors, to exhibit above-average employment growth, and to exhibit an average ratio of patents to persons employed during the 1990s that was twice as high as in other nonmetropolitan counties.

Other studies have also documented tendencies for the populations of areas characterized as having high levels of natural amenities to exhibit educational, occupational, or other characteristics linked to the concept of human capital. For example, Hamilton and others (2008) conducted resident surveys in selected rural counties across the United States that they characterized as representing "four rural Americas" (amenity-rich areas, declining resource-dependent areas, chronically poor areas, and areas characterized as "transitional" between natural resource dependency and amenity-based development). In the areas classified as "amenity rich," the percentage of survey respondents with a four-year college degree or higher levels of education was considerably higher (48 percent) than in the amenity/decline (34 percent), declining resource-dependent areas (33 percent), or chronic poverty (26 percent) areas. Similarly, Winkler et al. (2007) reported that for nonmetropolitan communities located in the Intermountain West region, the percentage of residents in 2000 who were college-educated was much higher in places characterized as having "New West" characteristics linked to in-migration, seasonal housing, tourism-based employment, and higher natural amenity levels than in other places across the region. Also, Matarrita-Cascante, Luloff and Jennings (2011) observed that in rural portions of five southern Utah counties characterized by high natural amenity conditions and substantial protected land areas, both seasonal residents and year-round "newcomer" residents were considerably more likely to have a 4-year college degree (or higher levels of education) than were year-round residents who had lived in the area for longer time periods.

In summary, the literature addressing possible linkages between the presence of natural amenities and various "human capital" dimensions tends overall to indicate a positive association between these conditions. High amenity locations appear not only to attract higher levels of in-migration and associated population growth, they also tend selectively to attract new residents who bring with them educational and occupational attributes that are typically considered as enhancements to overall human capital and assets with respect to the adaptive capacity of communities. While none of the literature identified through this effort addressed in specific terms the possibility of associations between various public land contexts and human capital dimensions, it seems reasonable to infer that since at least some types of public land settings tend also to exhibit "high natural amenity" attributes, such a relationship could be anticipated.

11.3.4 Social Capital: Linking Resource Conditions to Local Social Engagement and Attachment

The concept of "social capital" involves the connections and relationships among people and organizations at the community level—including things like participation in community activities and organizations, levels of social cohesion and community attachment, levels of interpersonal trust, and other aspects of engagement in local social and civic life (see Putnam 2000; Emery and Flora 2006). Such conditions are considered by sociologists and community development professionals to be key contributors to both individual-level and community well-being (Wilkinson 1991). Reduced levels of engagement in community affairs and lower levels of interpersonal familiarity and interaction are commonly linked to rapid population growth and the inevitable decrease in levels of interpersonal familiarity that occur at least temporarily in areas experiencing substantial in-migration (Freudenburg 1986). In addition, a number of sociological studies have documented differences and in some instances substantial tensions between "newcomer" and "old-timer" populations in rural areas affected by in-migration, including areas where natural amenity conditions attract growing numbers of seasonal as well as year-round residents. These potential divisions have been described by some as indicative of a "culture clash" that can occur as a result of various sociodemographic, attitudinal and behavioral differences between established populations and in-migrants, and between permanent and seasonal residents. Much of the literature dealing with the occurrence of these types of social divisions has focused explicitly on tensions and conflicts associated with a divergence of values and attitudes regarding environmental, natural resource, and land use issues.

Several studies have shown that established rural residents and recently arrived in-migrants may have more in common regarding their views about resource use, land management, growth and development, and other issues than is often assumed (in particular, see Fortmann and Kusel 1990; Smith and Krannich 2000). Such findings suggest that negative effects on local social capital often assumed to result from the arrival of new residents and potential "culture clash" conditions are not consistently present across various situations and local contexts. Also, recent research conducted by social scientists at the University of New Hampshire involved in a nationwide study of rural counties found that social conditions and citizen perspectives linked to the social capital concept were more evident in "amenity rich" rural communities than in some other types of rural areas. Specifically, Dillon and Young (2011) observed that residents of "amenity rich" rural communities were generally "very positive" about their neighbors and community—and more likely than those living in "chronically poor" or "amenity/decline" areas to say that local people are willing to work together to address community issues or problems, to belong to a local business group such as the Chamber of Commerce, and to participate in local government, school, or conservation organizations; they were also more likely than residents of chronically poor counties to indicate that people in the community trust one another.

At the same time, evidence of different and at times clashing perspectives between longstanding and newly arrived residents, as well as varied levels of engagement in local organizational and civic life, are reported far more frequently in the research literature (for example, see Graber 1974; Cockerham and Blevins 1977; Ploch 1978; Price and Clay 1980; Jobes 1988; Blahna 1990; Durrant and Shumway 2004; Krannich and Jennings 2011; Matarrita-Cascante, Luloff and Jennings 2011). In a Utah-based study, Durrant and Shumway (2004) examined variation in public attitudes regarding wilderness designation and Wilderness Study Areas (WSAs) among residents of six southeastern Utah counties, and observed that "the longer an individual has lived in their current county of residence, the less positive their attitudes are toward WSAs" (2004: 280). Similarly, results from a recent study of five southern Utah counties characterized by extensive public lands and major National Parks and other protected areas revealed substantial differences between longstanding residents and recent in-migrants as well as seasonal residents regarding a variety of natural resource issues. Specifically, those who had lived in rural portions of Garfield, Kane, Iron, Washington and Wayne counties for ten years or longer were considerably more likely than "newcomer" year-round residents and seasonal residents to express attitudes about public land resource use and management consistent with a "commodity production" orientation, while newcomers and seasonal residents were more likely to express support for resource protection (Krannich and Jennings 2011). Such results are suggestive at least of considerable potential for divisions and tensions to arise in some locales over these types of resource management issues.

Other results from the same five-county southern Utah survey also indicated that longer-term year-round residents were more likely than either newcomers or most seasonal residents to participate in local community organizations and activities, to interact frequently with local-area friends, relatives and neighbors, to exhibit high levels of interest in local community conditions and events, and to have strong personal attachments to the community as a place to live (Matarrita-Cascante, Stedman and Luloff 2010; Matarrita-Cascante, Luloff and Jennings 2011; Jennings and Krannich 2013.). These findings are consistent with an extensive sociological literature demonstrating that levels of community attachment are positively associated with length of residence (e.g., Jennings and Krannich 2013; Kasarda and Janowitz 1974). They are also consistent with some recent research indicating that while longer-term residents' community attachments are more likely to center around local social ties and interactions, recent in-migrants to high-amenity areas may be more likely to develop attachments to place and the local community based on the environmental and natural features of the area (Brehm, Eisenhauer and Krannich 2006; Stedman 2003; but also see Matarrita-Cascante, Stedman and Luloff 2010).

On balance, these and related findings provide support for the observation that population growth involving the in-migration of new populations—a phenomenon that often occurs in areas characterized by high natural amenity levels and protected public lands—can in many instances lead to reductions in levels of social capital. Such outcomes may occur simply as a result of the fact that localized social ties, participation patterns, and attachments take time to develop among those who are newcomers to these areas. However, a deterioration of social capital may also be linked to differences between established and newly arrived populations of these areas with respect to the foundations of place attachment and community attachment, as well as differences in attitudes and preferences regarding environmental conditions and resource management.

11.3.5 Public Attitudes and Values Regarding Public and Protected Lands and Resources

Control over and the management of public lands and associated natural resources have been politically volatile issues throughout the American West for many years (Cawley 1993; Kemmis 1990). Debates over these issues have continued unabated into the present, and have been characterized as especially "contentious and polarizing" in the state of Utah (Durrant and Shumway 2004: 276). Nevertheless, evidence from a number of attitudinal surveys makes it clear that residents of the western region, including Utah residents, place substantial value on public lands and the resources and recreational opportunities they provide. Selected findings from several recent public opinion surveys that included questions about public land issues are highlighted here.

Results from a 2012 "public land issues" poll conducted with a representative sample of 400 Idaho voters for the Idaho Outdoor Business Council revealed that 97 percent of respondents agreed (and 81 percent strongly agreed) that "public lands, including forests, national parks, monuments and wildlife areas, are an essential part of Idaho's quality of life." In addition, 92 percent agreed that recreational activities occurring in forests, national parks, monuments and wildlife areas are "an essential part of Idaho's economy," and 87 percent agreed that preservation of the state's roadless areas "is critical to maintaining hunting, fishing and other outdoor recreational opportunities that are important to our way of life" (see Moore Communication 2012: 1–2).

Similarly positive views regarding public land issues emerged from a 2013 public opinion survey of 2,400 voters in six western states conducted for The Colorado College as part of the "State of the Rockies" project. For the region as a whole and for individual states, results from that study indicate that residents throughout the Rocky Mountain West place considerable value on public lands and resources. Region-wide, 79 percent of survey participants expressed a belief that public lands support the economies of their states and enhance overall quality of life. In addition, 74 percent believed that national parks, forests, monuments and wildlife areas help to attract high quality employers and good jobs to their states; 71 percent expressed concerns that selling public lands for development would have negative effects on the economy and quality of life, and 52 percent perceived public lands as contributing positively to job creation (see Weigel and Metz 2013).

State-specific results from the "State of the Rockies" survey focusing specifically on Utah indicated that 96 percent of Utah voters agreed that public lands are essential to the state's economy, 74 percent believed public lands support the state's economy, provide recreational opportunities and enhance quality of life, and 77 percent agreed that national parks, forests, monuments and wildlife areas help to attract high-quality employers and good jobs to the state. Results from this survey also revealed that 57 percent of survey participants in Utah were opposed the sale of federal public lands as a means of reducing the federal budget deficit (see Weigel and Metz 2013: 15–16). In addition, results from a related 2014 survey revealed that 66 percent of Utah voters said they would be more likely to vote for a candidate who supports enhanced protection for some public lands like national forests, and 63 percent said they would be less likely to vote for a candidate who supports the sale of public lands like national forests to reduce the budget deficit (Fairbank, Maslin, Maullin, Metz & Associates 2014).

Results from a statewide survey of 3,799 residents conducted by Utah State University in 2007 for the Utah Public Land Policy Coordination Office also reveal that on the whole Utahns place considerable value on public lands and resources. Data summarizing statewide response patterns revealed that nearly 82 percent of survey participants agreed (52.5 percent strongly agreed) that Utah's public lands "are an important part of the culture and heritage" of their communities. In addition, 82 percent of respondents agreed (48.6 percent strongly agreed) that "the natural environments provided by public lands in Utah are a key part of my life" (Krannich 2008b). Such results reinforce findings from earlier research focused on several southern Utah communities that many residents develop strong emotional attachments to "special places" on public lands. Such place attachments tend to be based on a combination of both social interactional experiences and activities linked to those places and the valued environmental and natural characteristics they provide (Eisenhauer, Krannich and Blahna 2000; also see Brandenburg and Carroll 1995).

In general, data from these and similar statewide surveys provide strong indication that residents of Utah and surrounding western states consider public lands important to their quality of life and to the economies of their states and communities. At the same time it is important to note that such statewide response patterns may mask substantial variation across local contexts, across specific topics, and across time in citizens' views about public land issues. This is illustrated by data from the 2007 statewide survey conducted by Utah State University, which found considerable differences in responses to questions about the importance of public lands across individual counties and multicounty regions of the state. For example, while nearly two-thirds of residents living in Morgan, Summit and Wasatch counties said they "strongly agree" that the natural environments provided by Utah's public lands are a key part of their lives, only 42 percent of survey participants living in Daggett, Duchesne and Uintah counties expressed such views (Krannich 2008a: 69). And, in an earlier study focused on attitudes toward Wilderness Study Areas among residents of six southeastern Utah counties, Durrant and Shumway (2004) found that a majority (66 percent) of survey respondents agreed that WSAs should be opened for mineral or energy development, 64 percent believed that WSAs hinder economic livelihood opportunities, and only 14 percent agreed that existing WSAs should be immediately designated by Congress as formal Wilderness Areas. Such results make it clear that even though there may be broad-based expressions of public support for the presence and protection of public lands, perspectives regarding specific locations, management strategies, and land use patterns are likely to be quite variable and in some cases highly contentious.

11.4 An Exploration of Data from the 2007 Survey of Utah Residents

In 2007 social scientists at Utah State University conducted several studies designed to assess a variety of ways in which social and economic conditions may be linked to public lands and natural resources across the state. Included among those studies was a statewide survey of 3,799 randomly selected Utah residents who responded to a request to complete a mailed questionnaire focusing on public land and resource topics. Survey response patterns were initially reported for eleven clusters of geographically adjacent counties, based on their locations relative to various major public land areas as determined by staff in Utah's Public Land Policy Coordination Office (see Krannich 2008b). In addition, a series of analytic appendices were produced to provide information regarding survey response patterns for individual counties, for the combined sets of counties included in each of Utah's seven multicounty Association of Governments organizations, and for the state as a whole. The full project summary report and all of the supplemental appendices are available electronically through the Utah Public Land Policy Coordination Office at publiclands.utah.gov/rdcc/studies-archive/. Although the data from this 2007 survey are now several years old, they can still provide useful insights into the ways in which Utah residents engage with, think about, and value public lands and resources.

Here, we consider the possibility that patterns of participation in outdoor recreation activities, personal use of materials gathered on public lands, factors considered important to local quality of life, and personal and community identities might be associated with selected indicators of the extensiveness of various public land types across Utah counties. Specifically, we examine whether survey responses pertaining to these issues might vary in relation to the extent to which counties exhibit higher or lower levels of protected-status lands, of designated Wilderness Area lands, and of lands administered by the U.S. Forest Service, the National Park Service, and the Bureau of Land Management. The rationale for conducting these comparisons reflects an expectation that local social conditions and residents' views about the value and importance of public lands and resources might vary in relation to the relative influence of specific land management agencies, the extent to which land management tends to place emphasis more on resource protection or commodity production, and the degree to which public lands are more or less likely to exhibit the kinds of "natural amenity" conditions noted earlier as important correlates of demographic and economic growth. For example, lands administered by the National Park Service, as designated Wilderness, and in many cases as National Forests will likely tend overall to exhibit greater natural amenity attributes than the generally lower-elevation lands administered by the Bureau of Land Management on which commodity production activities are typically more evident.

11.4.1 Participation in Public Land Recreation Activities

Recreation opportunities and participation have been linked to local "quality of life," and the ability to engage in an array of outdoor recreation activities is often assumed to be among the reasons people are attracted to areas characterized by high "natural amenity" conditions and the presence of public lands. For that reason, we examined possible associations between the several county-level measures of public land context outlined above and residents' reported engagement in a range of outdoor recreation activities. Participants in the 2007 statewide survey were asked to indicate whether during the preceding 12 months they had participated in any of 30 outdoor recreation activities anywhere on public lands in Utah. Because this question asked respondents to indicate only whether or not they had engaged in each of these activities, the data do not allow for measurement of the frequency of participation in various activities or the locations in which those activities might have occurred. Nevertheless, by creating a single summed variable indicating the total number of outdoor recreation activities reported by respondents, we can assess the extent to which a tendency to participate in such activities may be associated with county-level public land contexts. Responses to each of the 30 recreation activity items (coded Yes = 1 and No = 0) were summed to create a single summary measure of recreation participation, with possible values ranging from 0 (e.g., no participation reported in any of these activities) to 30 (participation reported for all 30 of the activities). For analysis purposes those values were grouped into four categories: participation in none of the activities , participation in 1 to 5 of the activities, participation in 6 to 10 activities, and participation in 11 or more of the activities.

To assess the possible association between this measure of recreation participation and local-area public land contexts, we looked first at the amount of "protected" status land in each of Utah's counties based on the total acreage classified as being managed in ways that emphasize permanent protection from conversion of natural land cover and maintenance of a natural state; such lands fall within either GAP status code 1 or GAP status code 2 classifications as outlined by the USDA National Gap Analysis Program (2013). The state's 29 counties were then grouped into five categories based on the total number of "protected" acres present. Those categories were as follows: "Highest" (426,409–981,873 protected acres); "High" (189,215–425,300 protected acres); "Medium" (90,472–165,788 protected acres); "Low" (40,647–51,596 protected acres), and "Lowest" (6,988–27,089 protected acres).[287] Table 11.1 summarizes the observed relationship between these five levels of protected status lands within survey respondents' counties of residence and reported levels of participation in public land outdoor recreation activities, based on the measurement strategies outlined above.

Table 11.1
Participation in Outdoor Recreation Activities on Public Lands in Utah, by County-Level Protected Land Acreage

	County Protected Acres				
Number of Recreation Activities	**Highest**	**High**	**Medium**	**Low**	**Lowest**
None	3.2%	4.4%	7.6%	8.4%	6.6%
1–5	22.2%	23.8%	25.0%	26.4%	22.4%
6–10	33.7%	34.2%	34.5%	33.2%	33.3%
11 or more	40.9%	37.5%	32.9%	31.9%	37.8%
No. of Responses	680	810	923	867	519

Results from this comparison indicate that there is at best only a weak and inconsistent relationship between the acreage of protected lands within Utah counties and participation in public land outdoor recreation activities reported. Across all of the county-level protected area classifications a substantial majority of survey respondents reported participation in six or more of the listed recreation activities during the preceding twelve months. Respondents living in counties with the highest levels of protected land acreage were most likely to report participation in eleven or more of the listed outdoor recreation activities (40.9 percent), but the percentages of residents living in the "high" and "lowest" protected area county classifications reporting that level of participation were nearly as high. While the observed differences across the five protected area categories are statistically significant ($X^2 = 39.6$; df = 12; $p<.001$), that is largely an artifact of the large sample size. Overall, the data do not reveal a directionally consistent or substantively important relationship between protected status acreage at the county level and participation in the range of outdoor recreation activities addressed in the survey instrument.

A similar comparison was examined based on the total acres of land administered by the U.S. Forest Service (USFS) in each county. Counties were assigned to four categories according to the total number of USFS acres they contain: "Highest" (422,809–1,041,852 USFS acres), "High" (210,843–394,600 USFS acres), "Low" (103,974–196,479 USFS acres) and "Lowest" (14,415–96,087 USFS acres).[288] The relationship between the amount of Forest Service acreage within

[287] The "highest" protected acreage category included San Juan, Kane, Garfield, Emery, Grand and Wayne counties. The "high" category included Duchesne, Millard, Washington, Summit, Tooele and Uintah counties. The "medium" category included Juab, Box Elder, Cache, Carbon, Daggett and Utah counties. The "low" category included Salt Lake, Weber, Wasatch, Beaver, Davis and Sanpete counties. The "lowest" category included Iron, Piute, Rich, Sevier and Morgan counties.

[288] Counties included in the "highest" USFS acreage category were Garfield, Sevier, Duchesne, Summit, Utah, San Juan and Wasatch counties. The "high" USFS acreage counties were Washington, Sanpete, Millard, Cache, Uintah, Daggett, Iron and Emery counties. The "low" USFS acreage counties were Piute, Tooele, Wayne, Beaver, Kane, Juab and Box Elder counties. Salt Lake, Weber, Grand, Rich, Davis, Carbon and Morgan counties were included in the "lowest" USFS acreage category.

counties and survey participants' reported engagement in public land outdoor recreation activities is summarized in Table 11.2.

Table 11.2
Participation in Outdoor Recreation Activities on Public Lands in Utah, by County-Level U.S. Forest Service Land Acreage

	County USFS Acres			
Number of Recreation Activities	**Highest**	**High**	**Low**	**Lowest**
None	4.8%	5.3%	5.9%	8.6%
1–5	23.0%	23.8%	24.6%	25.5%
6–10	34.8%	33.5%	33.6%	33.4%
11 or more	37.4%	37.3%	35.8%	32.5%
No. of Responses	974	1154	625	1046

Results from this comparison reveal a weak association between the amount of USFS acreage within counties and the extent to which residents reported participation in the public land outdoor recreation activities addressed in the survey. Respondents from counties with the lowest amounts of USFS acreage were more likely (8.6 percent) to report they did not participate in any of these activities than were residents of counties with more USFS acreage. And, residents of counties with the "highest" (37.4 percent) or "high" (37.3 percent) levels of USFS acreage were more likely to report participation in eleven or more of the listed recreation activities. Although the observed relationship is statistically significant ($X^2 = 20.8$; df = 9; p<.001), that is again due largely to the large sample size. Substantively, the association between total acres of USFS lands within Utah counties and reported participation in outdoor recreation activities on public lands is quite weak.

We also assessed participation in outdoor recreation relative to presence of lands administered by the National Park Service. Counties were assigned to three categories: those with "high" NPS acreage (87,776–585,746 acres), with "intermediate" levels of NPS acreage (250–54,172 acres), and with no NPS acreage.[289] As indicated in Table 11.3, results reveal slight differences in participation in outdoor recreation on public lands across these categories. The percentage of respondents saying they did not participate in any of the listed recreation activities was highest in counties with no NPS acres (7.4 percent) and lowest in those with the most NPS acreage (2.8 percent); the percentage reporting participation in eleven or more of the activities was highest (37.5 percent) in counties with the most NPS acres. Still, the differences across these grouped sets of counties based on the presence of NPS-administered land are quite small. While the association does attain statistical significance ($X^2 = 22.7$; df = 6; p=.001), it is substantively weak.

Table 11.3
Participation in Outdoor Recreation Activities on Public Lands in Utah, by County-Level National Park Service Land Acreage

	County NPS Acres		
Number of Recreation Activities	**High**	**Intermediate**	**None**
None	2.8%	6.2%	7.4%
1–5	25.0%	25.7%	23.3%
6–10	34.8%	33.1%	33.8%
11 or more	37.5%	35.0%	35.5%
No. of Responses	785	898	2,116

Another comparison involving the measure of participation in outdoor recreation

[289] The "high" NPS acreage category included San Juan, Kane, Garfield, Wayne, Washington and Grand counties. The "intermediate" category included Uintah, Iron, Sevier, Box Elder, Emery, and Utah counties. All other counties did not contain any NPS-administered acreage.

activities involved the extent to which Utah counties contain acreage administered by the Bureau of Land Management (BLM). As with the other land status comparisons, counties were assigned to several grouped categories based on the number of BLM-administered acres they contain: a “highest” (1,505,860–2,982,730 BLM acres) category, a “high” (660,640–1,432,086 BLM acres) category, a “low” (113,408–425,669 acres) category, and a “lowest” (41–99,600 acres) category.[290] Results of this comparison, summarized in Table 11.4, indicate that there is limited and inconsistent variation in reported participation in the listed outdoor recreation activities across counties with varied presence of BLM lands. Persons living in counties with the lowest amounts of BLM-administered acreage were more likely to report that they did not participate in any of the outdoor recreation activities (8.2 percent) than were residents of counties with more extensive BLM acreage, and less likely than residents of other counties to report that they had participated in eleven or more of these activities (31.9 percent). Overall, there appears to be a positive but weak association between the extent to which BLM acreage is present within a county and residents’ likelihood of reporting participation in more of the outdoor recreation activities listed in the survey questionnaire. The observed relationship is statistically significant (X^2 = 37.2; df = 9; p<.001), thought once again that is due in part to the large number of survey responses.

Table 11.4
Participation in Outdoor Recreation Activities on Public Lands in Utah, by County-Level Bureau of Land Management Land Acreage

	County BLM Acres			
Number of Recreation Activities	**Highest**	**High**	**Low**	**Lowest**
None	4.3%	4.7%	6.2%	8.2%
1–5	22.0%	25.4%	22.3%	25.7%
6–10	33.9%	34.9%	31.5%	34.2%
11 or more	39.8%	35.0%	39.9%	31.9%
No. of Responses	891	828	631	1,449

Finally, we considered the possibility that participation in the listed outdoor recreation activities might be associated with variation in the presence of federally designated wilderness areas within Utah counties. Counties were assigned to one of four categories: those with the “highest” amounts of designated wilderness (213,051–713,667 acres), those with “high” wilderness acreage (49,939–179,119 acres), those with “low” wilderness acreage (7,402–38,666 acres), and those with no wilderness acreage.[291] As indicated in Table 11.5, the association between this indicator of public land context and residents’ reported participation in outdoor recreation activities was once again weak and inconsistent. Respondents living in counties with the highest levels of designated wilderness acreage were least likely to report that they had participated in none of the listed outdoor recreation activities (3.7 percent), and most likely to say they had participated in eleven or more of those activities over the past year (38.1 percent). However, the pattern of differences across the four county wilderness acreage categories is not uniform, and differences are

[290] The “highest” category for presence of BLM lands included Millard, San Juan, Emery, Tooele, Kane, Grand and Garfield counties. The “high” category included Juab, Uintah, Beaver, Box Elder, Iron, Wayne and Washington counties. The “low” category included Carbon, Duchesne, Sevier, Rich, Piute, Sanpete and Daggett counties. Utah, Wasatch, Salt Lake, Summit, Morgan, Davis, Cache and Weber counties fell into the “low” BLM acreage category.

[291] The “highest” wilderness area counties were Kane, Garfield, Emery, San Juan, Grand, Washington, Millard, Duchesne and Wayne. Included in the “high” wilderness area category were Tooele, Summit, Juab, Carbon, Cache and Uintah counties. The “low" wilderness acreage counties were Utah, Salt Lake, Iron, Box Elder, Beaver and Daggett. Sevier, Rich, Piute, Sanpete, Wasatch, Morgan, Davis and Weber counties all have no designated wilderness lands.

for the most part fairly small. The observed positive association between wilderness acreage and reported participation in outdoor recreation activities is statistically significant ($X^2 = 32.6$; df = 9; p<.001), but once again very weak.

Table 11.5
Participation in Outdoor Recreation Activities on Public Lands in Utah, by County-Level Wilderness Area Land Acreage

	County Wilderness Acres			
Number of Recreation Activities	**Highest**	**High**	**Low**	**None**
None	3.7%	6.6%	7.6%	7.5%
1–5	22.9%	23.8%	26.9%	23.9%
6–10	35.3%	32.1%	35.2%	32.5%
11 or more	38.1%	37.4%	30.2%	36.1%
No. of Responses	1,143	844	798	1,014

On the whole, results from this series of comparisons examining relationships between various measures of county-level public land contexts and survey responses regarding participation in outdoor recreation activities reveal only slight associations. In general the data indicate a slight tendency for higher levels of participation in the listed set of recreation activities to be reported by residents of counties that have more acreage classified as being under a protective resource management status, more USFS acreage, more NPS acreage, more BLM acreage, and more designated federal wilderness acreage. However, in all cases the observed relationships are weak, and in some cases the directionality of differences across acreage classifications is not consistent.

11.4.2 Personal Use of Materials Gathered on Public Lands

Participants in the 2007 statewide survey on public land issues were also asked to indicate whether during the preceding twelve months they had participated in any of nine different activities involving the gathering of various materials for personal use—for example, firewood for home use, Christmas trees, craft project materials, landscaping materials, wild foods, etc. As with the questions pertaining to recreation activity participation, responses were recorded as either Yes (1) or No (0). A single measure of participation in these types of personal use activities was created by summing responses to the nine individual items. This produced a variable with a potential range from 0 to 9 that was then grouped for analysis into three categories: no reported participation in any of these activities (49.7 percent of all respondents), participation in one of these activities (18.7 percent of respondents), and participation in two or more of the activities (31.6 percent of respondents). Response patterns for this measure were then compared across the same county-level indicators of public land context considered in the analysis of recreation activity participation.

Table 11.6 presents results produced by examining participation in the gathering of materials from public lands in relation to the amount of "protected" status land present across Utah's counties. As previously described, individual counties were grouped into five categories ("highest" to "lowest") based on the total number of acres of land within the county classified as falling into protected management status. This comparison makes it clear that persons living in counties with the highest amounts of protected status land acreage (426,409–981,873 acres) were considerably more likely than those living in counties with lower levels of protected acreage to report participation in two or more of the listed personal-use activities, and far less likely than residents of other counties to report that they did not engage in any personal-use activities involving the gathering of materials from public lands. Overall there is a noteworthy positive and statistically significant (X^2 = 233.6; df = 8; p<.001) association between these measures.

Table 11.6
Participation in Gathering of Materials for Personal Use on Public Lands in Utah, by County-Level Protected Land Acreage

	County Protected Acres				
Number of Personal Use Activities	Highest	High	Medium	Low	Lowest
None	28.7%	46.2%	58.4%	61.9%	45.9%
1	19.2%	19.9%	18.0%	17.5%	19.4%
2 or more	52.3%	34.0%	23.6%	20.6%	34.7%
No. of Responses	621	745	878	817	495

Results summarized in Table 11.7 address the potential relationship between personal use of materials gathered on public lands and the extent to which lands administered by the U.S. Forest Service are present in Utah counties. Utahns living in counties with the lowest amounts of USFS acreage were more likely than residents of other parts of the state to say they participated in none of these activities (59.7 percent), and least likely to report participation in two or more of the activities (22.5 percent). At the same time, differences across other county groupings based on USFS acreage are small and directionally inconsistent; residents of counties with higher USFS acreage do not necessarily report more participation in gathering of personal use materials from public lands. While the observed differences across the four county categories are statistically significant (X^2 = 70.2; df = 6; p<.001), the association is both inconsistent and weak overall.

Table 11.7
Participation in Gathering of Materials for Personal Use on Public Lands in Utah, by County-Level U.S. Forest Service Land Acreage

	County USFS Acres			
Number of Personal Use Activities	Highest	High	Low	Lowest
None	47.6%	46.1%	42.8%	59.7%
1	19.6%	18.9%	18.3%	17.8%
2 or more	32.7%	35.0%	38.9%	22.5%
No. of Responses	901	1,074	591	990

Table 11.8 presents results of a comparison of participation in gathering of materials for personal use from public lands across counties with varying presence of National Park Service lands. Survey participants living in counties with the highest levels of NPS acreage were considerably more likely to report having engaged in two or more such activities (48.1 percent) than were residents of counties with "intermediate" levels of NPS acreage (31.4 percent) or counties with no NPS acreage (25.7 percent). This finding is somewhat difficult to interpret, since many of the types of materials-gathering activities referenced in the survey questionnaire tend not to be allowed on NPS lands. Nevertheless, the results do clearly reflect a substantial and statistically significant (X^2 = 141.0; df = 4; p<.001) positive relationship between the presence of NPS lands across Utah counties and residents' engagement in these types of material-gathering activities.

Table 11.8
Participation in Gathering of Materials for Personal Use on Public Lands in Utah, by County-Level National Park Service Land Acreage

	County NPS Acres		
Number of Personal Use Activities	**Highest**	**Intermediate**	**None**
None	32.6%	50.3%	55.7%
1	19.3%	18.3%	18.6%
2 or more	48.1%	31.4%	25.7%
No. of Responses	721	845	1,990

Next, we examined the relationship between Utahns' reported participation in gathering of personal-use materials from public lands and the extent to which lands administered by the Bureau of Land Management are present in the counties where they live. As indicated in Table 11.9, there is a positive and statistically significant (X^2 = 326.4; df = 6; p<.001) association between the presence of higher levels of BLM acreage and survey respondents' likelihood of reporting participation in such activities. Respondents living in counties with the highest levels of BLM-administered acreage (1,505,860 or more acres) were considerably more likely than residents of other counties to report participation in two or more such activities during the preceding 12 months (47.5 percent), and least likely to reported that they had done none of those things (33 percent).

Table 11.9
Participation in Gathering of Materials for Personal Use on Public Lands in Utah, by County-Level Bureau of Land Management Land Acreage

	County BLM Acres			
Number of Personal Use Activities	**Highest**	**High**	**Low**	**Lowest**
None	33.0%	44.9%	41.3%	65.8%
1	19.5%	18.0%	18.5%	18.6%
2 or more	47.5%	37.1%	40.1%	15.6%
No. of Responses	809	782	583	1,382

Survey results also reveal a substantial and statistically significant (X^2 = 169.1; df = 6; p<.001) positive relationship between reported participation in personal-use materials-gathering from public lands and the extent to which designated Wilderness Areas are present in Utah counties (Table 11.10). Residents of counties with the highest levels of Wilderness acreage (213,051 acres or more) were far more likely to report participation in two or more of the listed personal-use activities (46.3 percent) than were residents of counties with lower amounts (26.4 percent) or no (26 percent) Wilderness acreage.

Table 11.10
Participation in Gathering of Materials for Personal Use on Public Lands in Utah, by County-Level Wilderness Area Land Acreage

	County Wilderness Acres			
Number of Personal Use Activities	**Highest**	**High**	**Low**	**None**
None	34.8%	54.3%	56.7%	56.6%
1	18.9%	19.2%	17.3%	19.0%
2 or more	46.3%	26.4%	26.0%	26.0%
No. of Responses	1,043	795	762	956

In combination, this series of comparisons makes it clear that higher levels of acreage in protected management status and higher levels of USFS, BLM, NPS, and designated Wilderness lands all are associated with an increased likelihood that residents of Utah counties will be engaged in the kinds of personal-use and gathering activities addressed in the 2007 statewide survey. While the data do not provide the detail needed to assess what specific land types or areas tend to be accessed for such personal-use activities, higher presence of most types of federal land is linked to more extensive personal use of materials obtained on public lands.

11.4.3 Utahns' Views About Public Lands and Local Quality of Life

The 2007 statewide survey included a series of questions that asked participants to indicate the extent to which they considered various types of public land resources and resource uses to be important contributors to the quality of life experienced by people living in their communities. Respondents were asked to rate the importance of fifteen different natural resource conditions and uses as potential quality of life determinants; these individual items addressed a variety of recreational, commodity production/resource utilization, and resource protection themes. Using factor analysis and multivariate reliability analysis procedures, we determined that responses to these items were could be used to address three distinct themes or dimensions that could best be measured through the creation of multiple-item summated scales.

Importance of Commodity Production/Resource Utilization

The first of these summated scales was designed to measure respondents' ratings of the importance of commodity production and resource utilization activities on public lands as contributors to community quality of life. This measure was created by summing responses to five questionnaire items addressing the importance of public land livestock grazing, development of energy resources such as oil, gas, coal or uranium; development of sand, gravel and minerals industries used in construction; use of water resources for crop and pasture irrigation; and timber production. The resulting five-item summated scale had a range of values from 4 (least important) to 20 (most important), and exhibited a high degree of internal consistency as evidenced by a Cronbach's reliability coefficient of 0.78. These values were then grouped into low- (scores of 5–14), intermediate- (scores of 15–18), and high-importance categories (scores of 19–20) for analysis purposes.

Results summarized in Table 11.11 address the relationship between residents ratings of the importance of commodity production/resource utilization activities as contributors to local quality of life by the extent to which lands in protected management status are present within the counties where they live. Interestingly, residents living in counties with the highest protected-status acreage totals (426,409 acres or more) were most likely to consider public land commodity production/resource utilization activities to be highly important to local quality of life, and least likely to consider such activities to have low importance. It is not entirely clear why this might be the case. Perhaps it reflects the fact that at least some counties with large areas of protected-status lands also tend to be characterized by substantial levels of resource-based commodity production, or it may be that residents' views about the connection between commodity production and quality of life have more to do with their sense of what might have occurred in the past or what they would prefer to see happening as opposed to what is actually taking place. Also, it should be noted that differences in response patterns across the several other levels of protected land acreage do not reflect a consistent or linear relationship between these variables. Although the observed differences in importance ratings across the protected acreage categories are statistically significant (X^2 = 82.5; df = 8; p<.001), the association between these variables is directionally inconsistent and does not lend itself to straightforward interpretation.

Table 11.11
Residents' Ratings of the Importance of Public Land Commodity Production/Resource Utilization Activities as Contributors to Community Quality of Life, by County-Level Protected Land Acreage

	County Protected Acres				
Overall Importance Rating	**Highest**	**High**	**Medium**	**Low**	**Lowest**
Low	18.8%	26.4%	27.8%	34.1%	24.5%
Intermediate	42.7%	44.0%	50.1%	45.3%	47.1%
High	38.5%	29.6%	22.1%	20.6%	28.4%
No. of Responses	602	668	748	689	429

Table 11.12 presents results from a comparison of survey respondents' ratings of the importance of commodity production/resource utilization activities as contributors to local quality of life relative to the amount of county acreage administered by the U.S. Forest Service. Results of this comparison reveal that those living in counties with the lowest levels of USFS acreage (96,087 acres or less) were more likely than Utahns living elsewhere to consider commodity production/resource utilization activities on public lands to be of low importance to local quality of life, and least likely to consider such uses highly important. Differences across other county categories were very small; in counties with the highest (422,809–1,041,852), high (210,843–394,600) or low (103,974–196,479) USFS acreage, approximately three out of ten respondents considered commodity production/resource utilization activities to be highly important as contributors to the quality of life in their local communities. Overall the association between these variables is statistically significant (X^2 = 48.4; df = 6; p<.001).

The next comparison in this series examines Utahns' views about the importance of public land commodity production/resource utilization activities across counties in relation to the presence of National Park Service lands. As indicated in Table 11.13, residents of counties with no NPS lands were most likely to consider such activities to be of low importance (30.7 percent) and least likely to consider them highly important (24 percent) to local quality of life. In addition, residents of counties with the most NPS-administered acreage (87,776 acres or more) were most likely (33.9 percent) to consider commodity production/resource utilization activities to be of high importance. Although the differences across the three levels of NPS acreage within counties are not very large, the relationship is statistically significant (X^2 = 47.1; df = 4; p<.001).

Table 11.12
Residents' Ratings of the Importance of Public Land Commodity Production/Resource Utilization Activities as Contributors to Community Quality of Life, by County-Level U.S. Forest Service Land Acreage

	County USFS Acres			
Overall Importance Rating	**Highest**	**High**	**Low**	**Lowest**
Low	24.2%	22.7%	24.7%	34.9%
Intermediate	46.7%	48.1%	44.0%	43.9%
High	29.2%	29.2%	31.3%	21.2%
No. of Responses	823	952	518	843

Table 11.13
Residents' Ratings of the Importance of Public Land Commodity Production/Resource Utilization Activities as Contributors to Community Quality of Life, by County-Level National Park Service Land Acreage

Overall Importance Rating	County NPS Acres		
	Highest	Intermediate	None
Low	22.9%	20.7%	30.7%
Intermediate	43.2%	49.9%	45.3%
High	33.9%	29.5%	24.0%
No. of Responses	672	740	1,724

Table 11.14 summarizes results from a comparison of Utahns' views about the importance of commodity production and resource utilization activities relative to the amount of BLM-administered lands in the counties where they live. Survey respondents living in counties with the least BLM acreage were most likely to consider such activities to have low importance for local quality of life (37.9 percent), while those living in counties with the most BLM acreage were most likely to consider such activities highly important to quality of life (35.6 percent). Differences across the various other county-level categories of BLM acreage are generally small and not directionally consistent, though the overall relationship is statistically significant (X^2 = 160.2; df = 6; p<.001).

Table 11.14
Residents' Ratings of the Importance of Public Land Commodity Production/Resource Utilization Activities as Contributors to Community Quality of Life, by County-Level Bureau of Land Management Land Acreage

Overall Importance Rating	County BLM Acres			
	Highest	High	Low	Lowest
Low	21.1%	22.9%	15.4%	37.9%
Intermediate	43.3%	49.0%	50.9%	43.6%
High	35.6%	28.1%	33.7%	18.5%
No. of Responses	778	672	534	1,152

The final comparison involving survey respondents' views about the importance of commodity production/resource utilization activities as quality of life contributors involved variation across counties in the presence of designated Wilderness Areas. Results summarized in Table 11.15 indicate that persons living in counties with the highest levels of wilderness acreage (213,051 acres or more) were least likely to consider such activities to be of "low" importance to local quality of life (20 percent), and most likely to consider them to be of "high" importance (35.2 percent). At the same time differences across the counties with "high," "low," and "lowest" levels of wilderness acreage were generally small, though the overall relationship is statistically significant (X^2 = 62.6; df = 6; p<.001).

Table 11.15
Residents' Ratings of the Importance of Public Land Commodity Production/ Resource Utilization Activities as Contributors to Community Quality of Life, by County-Level Wilderness Area Land Acreage

Overall Importance Rating	County Wilderness Acres			
	Highest	High	Low	None
Low	20.0%	28.3%	31.0%	30.0%
Intermediate	44.9%	45.2%	48.6%	45.7%
High	35.2%	26.5%	20.4%	24.3%
No. of Responses	981	697	638	820

Overall, this portion of the analysis indicates that relationships between the several indicators of public land status and Utahns' views about the importance of public land-based commodity production and resource utilization activities as factors contributing to local quality of life are generally weak, and in many cases directionally inconsistent. To the extent that slight differences were observed, they were sometimes perplexing. In particular, it is unclear why ratings of the importance of commodity production and resource utilization might be higher in counties characterized by higher levels of protected-status lands or more acreage administered by the National Park Service or as designated Wilderness Areas.

Importance of Hunting, Fishing and Motorized Recreation

Results from factor analysis indicated that a second major "quality of life" dimension addressed in the survey questionnaire could be represented by responses to three items focused on Utahns' views about the importance of opportunities to engage in hunting, fishing, and off-road vehicle/snowmobile uses on public lands as contributors to local quality of life. A single summary measure was created by summing responses to these three items, producing a scale with values ranging from 3 (least important) to 12 (most important). The resulting three-item scale exhibited a high level of internal consistency (Cronbach's alpha = 0.78), further reinforcing the appropriateness of combining these items into a single measure. For analysis purposes the resulting scale values were grouped into three categories: "low" importance (scores of 3–8), "intermediate" importance (scores of 9–10), and "high" importance (scores of 11–12).

Results outlined in Table 11.16 indicate that there is not a clear-cut or consistent association between varied levels of protected status lands in Utah counties and residents' ratings of hunting/fishing/off-road motorized recreation opportunities on public lands as contributors to local quality of life. While those living in counties with the highest amounts of protected status lands were most likely to rate these types of recreation opportunities as highly important to local quality of life (59.6 percent of responses), a nearly identical percentage (57.8 percent) of respondents living in the counties with the lowest protected acreage totals also rated such opportunities as highly important to local quality of life. Although the observed differences across in importance ratings across the five protected acreage categories are statistically significant ($X^2 = 72.6$; df = 8; $p<.001$), that is due in part to the large number of cases available for analysis. On the whole, there is not an obvious or readily interpretable connection between these variables.

Table 11.16
Residents' Ratings of the Importance of Hunting/Fishing/Off-Road Motorized Recreation Opportunities on Public Lands as Contributors to Community Quality of Life, by County-Level Protected Land Acreage

	County Protected Acres				
Overall Importance Rating	**Highest**	**High**	**Medium**	**Low**	**Lowest**
Low	16.3%	22.3%	20.3%	29.0%	15.7%
Intermediate	24.1%	31.2%	31.2%	26.5%	26.5%
High	59.6%	46.5%	48.6%	44.6%	57.8%
No. of Responses	646	767	873	801	502

Table 11.17 summarizes the observed relationship between ratings of the importance of hunting/fishing/off-road motorized recreation to local quality of life and the extent to which lands administered by the U.S. Forest Service acreage are present across Utah counties. The percentage of survey participants considering such recreation opportunities to be of "high" importance to local quality of life was lowest in counties with the least USFS acreage (42.6 percent). At the

same time, the percentage considering such opportunities to be highly important to quality of life was highest (57.6 percent) in counties falling into the "low" USFS acreage category, while about 52 percent those living in counties with the highest or high levels of USFS acreage provided similar ratings. On the whole the variation across counties based on these differing levels of USFS land area is generally small and not directionally consistent, though the observed differences are statistically significant (X^2 = 66.2; df = 6; p<.001).

Table 11.17
Residents' Ratings of the Importance of Hunting/Fishing/Off-Road Motorized Recreation Opportunities on Public Lands as Contributors to Community Quality of Life, by County-Level U.S. Forest Service Land Acreage

	County USFS Acres			
Overall Importance Rating	**Highest**	**High**	**Low**	**Lowest**
Low	21.3%	18.3%	14.1%	28.9%
Intermediate	26.6%	29.3%	28.2%	28.5%
High	52.1%	52.4%	57.6%	42.6%
No. of Responses	929	1,090	595	975

Comparisons involving variation in importance ratings for this same hunting/fishing/motorized recreation measure across counties with varied levels of National Park Service lands are summarized in Table 11.18. Overall the response distributions are similar across the three categories of NPS acreage, indicating that there is essentially no relationship between the two variables. While the observed differences do barely attain statistical significance (X^2 = 79.8; df = 4; p= .044), the association is substantively trivial.

Table 11.18
Residents' Ratings of the Importance of Hunting/Fishing/Off-Road Motorized Recreation Opportunities on Public Lands as Contributors to Community Quality of Life, by County-Level National Park Service Land Acreage

	County NPS Acres		
Overall Importance Rating	**Highest**	**Intermediate**	**None**
Low	21.6%	17.9%	22.6%
Intermediate	27.7%	27.8%	28.5%
High	50.7%	54.2%	48.8%
No. of Responses	751	848	1,990

Results summarized in Table 11.19 address the potential relationship between county-level variation in the presence of BLM-administered lands and residents' views about the extent to which opportunities to engage in hunting/fishing/motorized recreation on public lands are important to local quality of life. Survey participants from counties with the least BLM acreage (99,600 acres or less) were more likely than those living elsewhere to indicate that such recreational opportunities have low importance as contributors to local quality of life, and also less likely than Utahns living elsewhere to say that such recreational opportunities are highly important to local quality of life (40.5 percent). At the same time, differences across the other three categories of BLM acreage are generally small and not directionally consistent. For example, persons living in counties with "low" BLM acreage (113,409–425,669 acres) were more likely than residents of counties with higher BLM acreages to rate these recreation opportunities as highly important to quality of life. Overall the observed differences across counties grouped by the four BLM acreage categories are statistically significant ($X^2 = 128.4$; df = 6; p<.001).

Table 11.19
Residents' Ratings of the Importance of Hunting/Fishing/Off-Road Motorized Recreation Opportunities on Public Lands as Contributors to Community Quality of Life, by County-Level Bureau of Land Management Land Acreage

	County BLM Acres			
Overall Importance Rating	**Highest**	**High**	**Low**	**Lowest**
Low	16.4%	17.9%	13.8%	29.6%
Intermediate	26.2%	29.9%	25.0%	29.9%
High	57.4%	52.2%	61.2%	40.5%
No. of Responses	848	782	601	1,358

Finally, we compared ratings of the importance of hunting/fishing/off-road motorized recreation to quality of life across counties characterized by differing levels of Wilderness Area acreage (Table 11.20). While there are differences in response patterns across the four wilderness acreage categories, there is not a clearly interpretable pattern to those differences. Very similar percentages of survey participants living in counties with the highest, high, and no wilderness acreage indicated that these types of recreation activities are highly important to quality of life in their communities, while a notably lower percentage of respondents living in counties with low wilderness acreage provided similar ratings. Although the observed differences in rating patterns across the wilderness acreage categories are statistically significant ($X^2 = 34.5$; df = 6; p<.001), the relationship between these variables is weak overall and directionally inconsistent.

Table 11.20
Residents' Ratings of the Importance of Hunting/Fishing/Off-Road Motorized Recreation Opportunities on Public Lands as Contributors to Community Quality of Life, by County-Level Wilderness Area Land Acreage

	County Wilderness Acres			
Overall Importance Rating	**Highest**	**High**	**Low**	**None**
Low	18.7%	18.9%	27.3%	21.6%
Intermediate	27.2%	31.0%	29.5%	26.0%
High	54.1%	50.1%	43.2%	52.5%
No. of Responses	1,088	794	752	955

In summary, the observed relationships between Utahns' views about this "quality of life" dimension and the various county-level public land classifications are generally weak to nonexistent, and also often directionally inconsistent. On balance, there do not appear to be meaningful associations between the measures of public land context considered here and residents' ratings of the importance of hunting/fishing/off-road motorized recreation to local quality of life.

Importance of Wildlife Habitat and Biodiversity Protection

Five survey items were used to create a final measure addressing Utahns' views about how various conditions and uses involving public lands may contribute to local quality of life. Factor analysis revealed that responses to survey items addressing the importance of water resources providing fish and wildlife habitat, trees and vegetated areas that provide wildlife habitat, opportunities for various types of nonmotorized recreation, undeveloped landscapes with restrictions on motorized use, and areas managed to maintain biodiversity and protect habitat for sensitive species were all linked to a common underlying attitudinal dimension. Reliability analysis confirmed that these five items could be combined into a single unidimensional index with high internal consistency (Cronbach's alpha = 0.78). The resulting summated scale had values ranging from 5 (lowest importance) to 20 (highest importance for local quality of life). For analysis purposes scale scores were grouped into three ordinal categories: "low" importance (scores of 5–14), "intermediate" importance (scores of 15–18), and "high" importance (scores of 19–20).

Table 11.21 outlines results from a comparison of Utahns' views regarding the importance of habitat and biodiversity protection and nonmotorized recreation opportunities as quality of life contributors across counties with varied presence of protected-status lands. Overall the variation across the five protected acreage categories is generally small, and directionally inconsistent . The percentage of survey participants considering such conditions to be highly important to local quality of life was actually highest in counties classified as having "low" levels of protected-status acreage (40,647–51,596 acres), and lowest in counties falling into either the "highest" (33.1 percent) or "lowest" (31.3 percent) protected acreage categories. The observed differences across categories are statistically significant ($X^2 = 36.1$; df = 8; p<.001), but there is not a clear patterning of variation across the categories of the protected acreage measure.

Table 11.21
Residents' Ratings of the Importance of Habitat and Biodiversity Protection and Nonmotorized Recreational Uses of Public Lands as Contributors to Community Quality of Life, by County-Level Protected Land Acreage

	County Protected Acres				
Overall Importance Rating	**Highest**	**High**	**Medium**	**Low**	**Lowest**
Low	23.9%	20.7%	23.6%	14.8%	22.8%
Intermediate	43.0%	42.6%	39.1%	42.9%	45.9%
High	33.1%	36.8%	37.3%	42.4%	31.3%
No. of Responses	602	721	804	765	451

Results summarized in Table 11.22 also reveal an inconsistent and generally weak association between Utahns' views about the importance of habitat and resource protection and nonmotorized recreation on public lands and the extent to which lands administered by the U.S. Forest Service are present in their counties. The percentage of survey participants indicating that such public land conditions and opportunities are highly important to local quality of life was highest among residents living in counties with the lowest amounts of USFS acreage (41.7 percent), but nearly as high among those living in counties with the highest USFS acreage totals (37.7 percent). Meanwhile, lower importance ratings were evident among those living in counties with either "high" or "low" levels of USFS acreage. This inconsistent directionality indicates that there is not a clearly interpretable or meaningful relationship between these variables, though due primarily to the large sample size the differences in response patterns across the four county-level categories of USFS acreage are statistically significant ($X^2 = 28.6$; df = 6; p<.001).

Table 11.22
Residents' Ratings of the Importance of Habitat and Biodiversity Protection and Nonmotorized Recreational Uses of Public Lands as Contributors to Community Quality of Life, by County-Level U.S. Forest Service Land Acreage

	County USFS Acres			
Overall Importance Rating	**Highest**	**High**	**Low**	**Lowest**
Low	18.0%	22.8%	25.7%	18.7%
Intermediate	44.3%	44.2%	40.3%	39.6%
High	37.7%	33.0%	34.0%	41.7%
No. of Responses	862	1,006	556	919

The relationship between Utahns' scores on the habitat/biodiversity protection/nonmotorized recreation values scale and the county-level measure of land acreage administered by the National Park Service is presented in Table 11.23. Interestingly, survey participants living in counties with no NPS acreage were slightly more likely to rate such public land conditions and uses as being highly important to local quality of life (39.7 percent) than were those living in counties with the highest or intermediate levels of NPS-administered lands. While the differences are small overall, this seems to indicate that views about the importance of such "protective" resource conditions as contributors to quality of life are most pronounced in areas where NPS lands that would tend to provide such conditions are absent. The overall relationship between these variables is substantively weak but statistically significant ($X^2 = 23.2$; df = 4; p<.001).

Results outlined in Table 11.24 reveal a more clear cut and consistent relationship between the scale measuring Utahns' views about the importance of habitat/biodiversity protection and nonmotorized recreational conditions on public lands to local quality of life and the measure of acreage administered by the Bureau of Land Management. Survey participants living in counties with the least BLM acreage (99,600 acres or less) were least likely to consider such conditions to be of "low" importance to local quality of life, and considerably more likely than residents of other counties to consider those conditions of "high" importance (44.3 percent). Conversely, residents of counties with the highest levels of BLM-administered acreage were most likely (25.1 percent) to consider such conditions to be of low importance. Overall, the observed relationship indicates that there is a statistically significant ($X^2 = 60.9$; df = 6; p<.001) inverse association between these variables—residents of counties with lower BLM acreage tend overall to attach higher importance to habitat/biodiversity protection and nonmotorized contexts on public lands than do those living in counties with higher amounts of BLM acreage.

Table 11.23
Residents' Ratings of the Importance of Habitat and Biodiversity Protection and Nonmotorized Recreational Uses of Public Lands as Contributors to Community Quality of Life, by County-Level National Park Service Land Acreage

	County NPS Acres		
Overall Importance Rating	**Highest**	**Intermediate**	**None**
Low	23.9%	24.3%	18.4%
Intermediate	43.0%	42.7%	41.9%
High	33.1%	32.9%	39.7%
No. of Responses	698	765	1,880

Table 11.24
Residents' Ratings of the Importance of Habitat and Biodiversity Protection and Nonmotorized Recreational Uses of Public Lands as Contributors to Community Quality of Life, by County-Level Bureau of Land Management Land Acreage

	County BLM Acres			
Overall Importance Rating	**Highest**	**High**	**Low**	**Lowest**
Low	25.1%	24.2%	20.9%	16.5%
Intermediate	43.0%	43.0%	39.3%	39.3%
High	31.9%	32.8%	31.7%	44.3%
No. of Responses	788	723	556	1,276

The final comparison in this series considered the potential relationship between the presence of designated Wilderness Area acreage and residents' views about the importance of habitat/biodiversity protection and nonmotorized recreation opportunities on public lands (Table 11.25). Differences observed across the four categories reflecting varied presence of wilderness acreage do not reveal a clearly patterned association—residents of counties with the "highest" wilderness acreage were least likely to consider such conditions highly important to local quality of life (30. percent), yet those living in counties with "high" levels of wilderness acreage were most likely to consider those conditions highly important. Although the differences in response values across the four wilderness acreage categories are statistically significant ($X^2 = 37.6$; df = 6; $p<.001$), the association involving these variables is weak overall and directionally inconsistent.

On the whole, this portion of the analysis revealed generally weak to nonexistent associations between the importance attached to habitat and biodiversity protection on public lands and the several measures of public land context. The one exception to this general observation involved the county-level measure of BLM acreage, with higher amounts of BLM land linked to lower ratings of the importance of habitat and biodiversity protection to local quality of life. This could perhaps be a reflection of general tendencies for BLM lands to be managed less as protected areas, and more for multiple use and commodity production purposes.

Table 11.25
Residents' Ratings of the Importance of Habitat and Biodiversity Protection and Nonmotorized Recreational Uses of Public Lands as Contributors to Community Quality of Life, by County-Level Wilderness Area Land Acreage

	County Wilderness Acres			
Overall Importance Rating	**Highest**	**High**	**Low**	**None**
Low	24.4%	18.2%	22.9%	17.7%
Intermediate	45.0%	39.0%	40.5%	43.5%
High	30.6%	42.8%	36.6%	38.8%
No. of Responses	1,012	748	689	894

11.4.4 The Importance of Public Lands to Personal and Community Identities

The final set of comparisons considered here involves survey questions that focused on Utahns' views about the importance of public lands to their own lives and personal identities, and to their communities overall. As with other variables considered in this analysis, responses to several of those questions are examined relative to varied county-level contexts involving protected land areas and various types of federally administered public lands.

Public Lands as Settings to Pursue Most-Enjoyed Activities

The first of the survey questions considered in this portion of the analysis asked respondents to indicate the extent to which they agreed or disagreed that "natural settings found on Utah public lands provide the best possible opportunities for me to enjoy the things I like to do best." Responses were recorded on a five-point scale, with values ranging from 1 ("strongly disagree") to 5 ("strongly agree"). Results summarized in Table 11.26 indicate that regardless of whether they live in counties with higher or lower levels of protected-status lands, a substantial majority of Utahns agree that the natural settings found on public lands provide them with the best opportunities to engage in activities they enjoy most. Overall, differences in response patterns across the county categories involving varied presence of protected-status lands are very small. The highest percentage of respondents saying they "strongly agree" with this statement occurred among those living in counties with the most protected-status acreage (53.5 percent), but that level of agreement is only slightly greater than what was observed in counties with high, low, and lowest levels of protected lands. The limited magnitude of the observed association between these variables is reinforced by the fact that the observed differences across protected-acreage categories are not statistically significant. On balance, there is not a meaningful relationship between these variables.

Table 11.26
Residents' Levels of Agreement that Natural Settings on Public Lands Provide the Best Opportunities to Enjoy Things They Like to Do Most, by County-Level Protected Land Acreage

Level of Agreement	County Protected Acres Highest	High	Medium	Low	Lowest
Strongly Disagree	1.9%	1.6%	2.3%	1.6%	1.6%
Somewhat Disagree	4.5%	3.7%	3.5%	2.8%	3.7%
Unsure	10.7%	14.1%	16.3%	13.8%	13.1%
Somewhat Agree	29.4%	31.6%	34.2%	34.0%	34.4%
Strongly Agree	53.5%	49.0%	43.6%	47.7%	47.3%
No. of Responses	673	794	906	849	512

Similar patterns emerged when comparing levels of agreement that public land natural settings provide residents with the best opportunities to enjoy things they like to do most across categories representing the extent to which USFS lands are present within counties. Regardless of the level of USFS acreage, a large majority of survey participants expressed agreement with this statement, with just under one-half of respondents reporting strong agreement across all four of the USFS acreage categories. Overall the differences in response patterns observed across the USFS acreage categories are very small, and not statistically significant.

Table 11.27
Residents' Levels of Agreement that Natural Settings on Public Lands Provide the Best Opportunities to Enjoy Things They Like to Do Most, by County-Level U.S. Forest Service Land Acreage

Level of Agreement	County USFS Acres Highest	High	Low	Lowest
Strongly Disagree	2.7%	1.0%	2.3%	1.8%
Somewhat Disagree	3.9%	3.4%	3.8%	3.4%
Unsure	12.0%	15.1%	13.9%	14.0%
Somewhat Agree	32.0%	33.8%	31.9%	32.9%
Strongly Agree	49.4%	46.7%	48.2%	47.9%
No. of Responses	959	1,137	612	1,026

Results reported in Table 11.28 reveal a similar story regarding responses to this question across counties with varied levels of acreage administered by the National Park Service. While the percentage of survey participants indicating they "strongly agree" that public land natural settings provide the best opportunities to engage in activities they enjoy most was highest (51.6 percent) in counties with the most NPS acreage, the percentages of respondents reporting strong agreement were nearly as high among those living in counties with lower levels of or no NPS lands. Once again differences across the three categories representing the presence of NPS lands are quite small. Although the association between these variables does attain statistical significance (X^2 = 20.7; df = 8; p=.008), that is again largely due to the large sample size.

Table 11.29 examines the association between survey participants' agreement that public land natural settings provide the best opportunities to pursue activities they enjoy most by the presence of BLM-administered lands. Once again a large majority of respondents across all of four of the BLM acreage levels indicated agreement with this statement. The highest percentage reporting strong agreement occurred in counties with the most BLM lands (52.7 percent), but that was only slightly higher than the percentages observed in counties with lower BLM acreage. Overall the differences observed across the four BLM acreage categories are small, though the observed association does attain statistical significance (X^2 = 25.3; df = 12; p=.014).

Table 11.28
Residents' Levels of Agreement that Natural Settings on Public Lands Provide the Best Opportunities to Enjoy Things They Like to Do Most, by County-Level National Park Service Land Acreage

Level of Agreement	County NPS Acres High	Intermediate	None
Strongly Disagree	1.7%	1.9%	1.9%
Somewhat Disagree	4.2%	4.6%	2.9%
Unsure	11.6%	16.5%	13.5%
Somewhat Agree	30.9%	30.6%	34.4%
Strongly Agree	51.6%	46.4%	47.3%
No. of Responses	777	886	2,071

Table 11.29
Residents' Levels of Agreement that Natural Settings on Public Lands Provide the Best Opportunities to Enjoy Things They Like to Do Most, by County-Level Bureau of Land Management Land Acreage

	County BLM Acres			
Level of Agreement	**Highest**	**High**	**Low**	**Lowest**
Strongly Disagree	1.8%	1.4%	2.1%	2.0%
Somewhat Disagree	4.7%	3.6%	2.9%	3.2%
Unsure	10.7%	16.2%	13.4%	14.5%
Somewhat Agree	30.1%	32.9%	35.9%	33.0%
Strongly Agree	52.7%	45.9%	45.2%	47.2%
No. of Responses	877	814	618	1,425

The final comparison in this series examines the extent to which Utahns agreed that public land natural areas provide the best opportunities to engage in things they like to do most, across counties characterized by varied levels of Wilderness Area acreage (Table 11.30). Variation in response patterns across the four categories of wilderness acreage is generally quite small. The percentage of survey participants indicating that they "strongly agree" with the questionnaire statement was highest among those living in counties with the most wilderness acreage (50.6 percent), but that percentage is only marginally higher than what was observed for residents of counties with lower levels of or no wilderness lands. The limited differences observed across the four levels of wilderness land presence are substantively trivial, and not statistically significant.

Table 11.30
Residents' Levels of Agreement that Natural Settings on Public Lands Provide the Best Opportunities to Enjoy Things They Like to Do Most, by County-Level Wilderness Area Land Acreage

	County Wilderness Acres			
Level of Agreement	**Highest**	**High**	**Low**	**None**
Strongly Disagree	1.9%	1.6%	2.2%	1.7%
Somewhat Disagree	4.1%	2.9%	4.5%	2.9%
Unsure	12.5%	14.7%	15.3%	13.4%
Somewhat Agree	30.9%	34.5%	30.7%	35.1%
Strongly Agree	50.6%	46.3%	47.3%	46.8%
No. of Responses	1,130	823	782	999

Overall, this set of comparisons revealed that substantial majorities of Utahns agree that public lands are important in providing such opportunities to engage in things they enjoy most. However, there were no substantively meaningful differences across the several measures of public land context consider in the analysis.

Importance of Public Lands to Personal Identities

Participants in the 2007 statewide survey were asked to indicate their level of agreement with the following statement: "Utah's public lands and the natural areas they contain play an important role in defining who I am as a person." Responses were again recorded on a five-point ordinal scale, with values ranging from 1 ("strongly disagree") to 5 ("strongly agree"). Results summarized in Table 11.31 indicate that 31 percent of survey participants from counties with the highest levels of protected-status lands agreed strongly that public lands and natural areas are important to their personal identities; that percentage is higher than in any of the other county categories characterized by lower levels protected acreage. At the same time, differences across the other four county-level classifications are generally small, with approximately 22 percent to 25 percent of respondents saying they "strongly agree" with this statement. Overall the observed association between the county-level protected acreage categories and response to this "personal identities" question is statistically significant ($X^2 = 30.8$; df = 16; p=.014) but weak.

Table 11.31
Residents' Levels of Agreement that Public Lands and the Natural Settings They Contain Are Important to Their Personal Identities, by County-Level Protected Land Acreage

	County Protected Acres				
Level of Agreement	**Highest**	**High**	**Medium**	**Low**	**Lowest**
Strongly Disagree	6.3%	5.9%	7.1%	7.2%	5.9%
Somewhat Disagree	4.9%	6.2%	7.2%	8.0%	6.1%
Unsure	27.0%	33.7%	32.3%	31.0%	29.3%
Somewhat Agree	30.8%	30.1%	31.7%	28.7%	33.4%
Strongly Agree	31.0%	24.1%	21.7%	25.1%	25.4%
No. of Responses	671	790	906	849	512

Table 11.32 presents results from a comparison of responses to the statement regarding the role of public land natural areas as a contributor to personal identities across county-level classifications based on the amount of land administered by the U.S. Forest Service. Overall, there are only slight differences in response patterns across the four USFS acreage categories. While those living in counties with the highest amounts of USFS acreage were most likely to indicate strong agreement with this "personal identity" statement (27.6 percent of responses), the percentage selecting that answer was nearly identical in counties with the lowest levels of USFS acreage (26.7 percent). On the whole the observed association is substantively trivial, and not statistically significant.

The comparison of levels of agreement with this "personal identities" statement across the three categories representing varied county-level acreage administered by the National Park Service is summarized in Table 11.33. Residents of counties with the highest levels of NPS acreage were slightly more likely to indicate that they "strongly agree" that public land natural areas are important in defining who they are as a person (29 percent) than were those living in counties with lower (21.1 percent) or no (25.4 percent) NPS acreage. For the overall comparison differences across the three NPS acreage categories are consistently small; the observed relationship is substantively unimportant, though it does attain statistical significance ($X^2 = 18.1$; df = 8; p=.021).

Table 11.32
Residents' Levels of Agreement that Public Lands and the Natural Settings They Contain Are Important to Their Personal Identities, by County-Level U.S. Forest Service Land Acreage

	County USFS Acres			
Level of Agreement	**Highest**	**High**	**Low**	**Lowest**
Strongly Disagree	6.8%	5.8%	7.0%	6.8%
Somewhat Disagree	5.5%	7.0%	6.4%	7.2%
Unsure	28.0%	33.4%	31.6%	30.6%
Somewhat Agree	32.1%	31.8%	30.3%	28.7%
Strongly Agree	27.6%	22.0%	24.7%	26.7%
No. of Responses	957	1,136	611	1,024

Table 11.33
Residents' Levels of Agreement that Public Lands and the Natural Settings They Contain Are Important to Their Personal Identities, by County-Level National Park Service Land Acreage

Level of Agreement	County NPS Acres High	Intermediate	None
Strongly Disagree	5.9%	7.6%	6.3%
Somewhat Disagree	5.7%	6.8%	6.9%
Unsure	30.5%	30.5%	31.3%
Somewhat Agree	28.9%	34.0%	30.1%
Strongly Agree	29.0%	21.1%	25.4%
No. of Responses	775	885	2,068

Table 11.34 summarizes results involving a comparison of responses to this "personal identities" question and the extent to which BLM-administered acreage is present across Utah counties. Once again differences across the several categories representing varied county-level acreage totals involving lands administered by this federal agency are generally small. Residents of counties with the highest levels of BLM acreage were most likely (27.7 percent) to express strong agreement that public land natural areas are important to their personal identities, but only slightly more so than residents of counties in the "low" and "lowest" BLM acreage classifications. While the observed relationship between these variables is statistically significant (X^2 = 30.8; df = 16; p=.014) it is substantively trivial.

Table 11.35 depicts survey participants' levels of agreement that public land natural areas are important to their personal identities, across the four categories representing varied levels of designated Wilderness Area acreage. Overall, the response distributions are very similar to those discussed above for other land classification measures. Across all of the wilderness acreage categories, a combined 53 percent to 58 percent of respondents either somewhat or strongly agreed that public land natural areas are important in defining who they are as a person. While the percentage expressing strong agreement was highest among residents of counties with the most wilderness acreage (27.3 percent), that value is only slightly higher than what was observed for those living in counties with lower levels of or no wilderness lands. The observed differences across acreage categories are statistically significant due primarily to the large sample size (X^2 = 22.4; df = 12; p=.034), but not substantively important.

Table 11.34
Residents' Levels of Agreement that Public Lands and the Natural Settings They Contain Are Important to Their Personal Identities, by County-Level Bureau of Land Management Land Acreage

Level of Agreement	County BLM Acres Highest	High	Low	Lowest
Strongly Disagree	7.2%	5.4%	5.4%	7.3%
Somewhat Disagree	4.9%	7.8%	5.2%	7.6%
Unsure	29.1%	33.9%	31.9%	29.9%
Somewhat Agree	31.1%	31.4%	31.1%	30.1%
Strongly Agree	27.7%	21.6%	26.5%	25.1%
No. of Responses	875	812	615	1,426

Table 11.35
Residents' Levels of Agreement that Public Lands and the Natural Settings They Contain Are Important to Their Personal Identities, by County-Level Wilderness Area Land Acreage

	County Wilderness Acres			
Level of Agreement	**Highest**	**High**	**Low**	**None**
Strongly Disagree	6.2%	5.1%	8.5%	6.5%
Somewhat Disagree	5.4%	6.8%	8.7%	6.1%
Unsure	30.7%	32.0%	29.8%	31.2%
Somewhat Agree	30.4%	30.7%	31.4%	30.8%
Strongly Agree	27.3%	25.4%	21.6%	25.4%
No. of Responses	1,125	822	784	997

On the whole, this series of comparisons revealed no real evidence of relationships between the various county-level measures of public land context and Utahns' levels of agreement that public lands and the natural settings they contain are important to their personal identities. To the extent that differences across categories of the public land context measures were observed, they were consistently small and substantively trivial.

Importance of Public Lands to Community Identities

Finally, survey participants were asked to indicate the extent to which they agreed or disagreed that "Utah's public lands are an important part of the culture and heritage of my community." Looking first at the potential association between responses to this item and the county-level measure representing the presence of protected-status lands (Table 11.36), it is clear that across all of the county-level protected lands categories respondents expressed substantial agreement that public lands are important to the identities of the communities where they live. In combination, approximately 82 percent to 89 percent of residents across the five protected-status acreage categories indicated that they either somewhat or strongly agreed with this statement. And, while differences across the acreage categories are not entirely consistent, those living in counties with the most protected-status acreage (426,409 acres or more) were most likely to indicate strong agreement with the statement (68 percent). Overall the observed association involving these variables reflects a relatively weak but statistically significant relationship (X^2 = 57.1; df = 20; p<.001).

Table 11.36
Residents' Levels of Agreement that Public Lands Are Important to the Culture and Heritage of Their Communities, by County-Level Protected Land Acreage

	County Protected Acres				
Level of Agreement	**Highest**	**High**	**Medium**	**Low**	**Lowest**
Strongly Disagree	1.9%	3.3%	2.4%	2.7%	2.5%
Somewhat Disagree	3.0%	2.4%	2.6%	2.2%	3.1%
Unsure	5.9%	9.2%	12.3%	11.0%	5.5%
Somewhat Agree	21.2%	26.9%	28.1%	27.3%	27.9%
Strongly Agree	68.0%	58.2%	54.4%	56.8%	60.9%
No. of Responses	674	795	906	851	512

There is also little evidence of a meaningful association between Utahns' views about the importance of public lands to the culture and heritage of their communities and the extent to which lands administered by the U.S. Forest Service are present in their counties (Table 11.37). Across all four of the county-level USFS acreage categories a large majority of survey participants indicated some level of agreement that public lands are important to these aspects of community identity; the percentage of responses falling into the "strongly agree" category ranged from approximately 56 percent in the "lowest USFS acreage" category to nearly 62 percent in the "highest" category. Variation in response patterns across the four USFS acreage groupings was very small overall, and the limited differences observed did attain statistical significance.

Table 11.38 summarizes the relationship between Utahns' views about the importance of public lands to the culture and heritage of their communities and the extent to which NPS-administered lands occur at the county level. Residents of counties with the highest levels of NPS lands (87,776 acres or more) were more likely to express strong agreement with this statement (61.5 percent) than were those living in counties with lower (59.2 percent) or no (57.8 percent) NPS acreage. Overall the observed differences across the three NPS acreage categories are modest in magnitude, but statistically significant (X^2 = 17.3; df = 12; p= .027).

Table 11.37
Residents' Levels of Agreement that Public Lands Are Important to the Culture and Heritage of Their Communities, by County-Level U.S. Forest Service Land Acreage

	County USFS Acres			
Level of Agreement	**Highest**	**High**	**Low**	**Lowest**
Strongly Disagree	2.3%	2.8%	2.5%	2.7%
Somewhat Disagree	2.5%	2.1%	2.8%	3.2%
Unsure	9.0%	9.3%	8.8%	9.6%
Somewhat Agree	24.6%	26.6%	24.7%	28.8%
Strongly Agree	61.5%	59.2%	61.0%	55.6%
No. of Responses	962	1,139	611	1,026

Table 11.38
Residents' Levels of Agreement that Public Lands Are Important to the Culture and Heritage of Their Communities, by County-Level National Park Service Land Acreage

	County NPS Acres		
Level of Agreement	**High**	**Intermediate**	**None**
Strongly Disagree	2.2%	2.7%	2.7%
Somewhat Disagree	2.4%	3.0%	2.5%
Unsure	6.6%	10.3%	9.8%
Somewhat Agree	23.9%	26.9%	27.1%
Strongly Agree	64.9%	57.1%	57.8%
No. of Responses	778	886	2,073

Results summarized in Table 11.39 examine the potential association between responses regarding the perceived importance of public lands to community culture and heritage across the four county-level categories representing higher or lower levels of acreage administered by the Bureau of Land Management. As with other comparisons it is clear that throughout Utah most survey respondents do consider public lands to be important to the identities of their communities. At the same time, there is evidence of a positive association between these variables, with those living in counties with higher levels of BLM acreage generally more likely to express strong agreement with the statement than did those living in counties with the least BLM acreage. Counties with the highest levels of BLM acreage (1,505,860 acres or more) also had the highest percentage of respondents saying they strongly agreed with the statement (64.7 percent). Overall the observed differences across the four BLM acreage categories reflect a modest, statistically significant association (X^2 = 33.4; df = 12; p<.001).

Table 11.39
Residents' Levels of Agreement that Public Lands Are Important to the Culture and Heritage of Their Communities, by County-Level Bureau of Land Management Land Acreage

	County BLM Acres			
Level of Agreement	**Highest**	**High**	**Low**	**Lowest**
Strongly Disagree	2.6%	2.7%	2.6%	2.5%
Somewhat Disagree	3.0%	1.8%	1.6%	3.3%
Unsure	6.6%	9.5%	8.2%	11.2%
Somewhat Agree	23.1%	27.3%	27.1%	27.6%
Strongly Agree	64.7%	58.5%	60.5%	55.4%
No. of Responses	878	811	620	1,428

The final relationship consider in this series examines Utahns' levels of agreement that public lands are important to the culture and heritage of their communities across categories of the county-level measure used to assess variation in the presence of federally designated Wilderness Area acreage. As indicated in Table 11.40, residents of counties with the most wilderness acreage (213,051 or more acres) were most likely to express strong agreement (63.4 percent). Overall the observed differences in response patterns across the four wilderness acreage categories are statistically significant (X^2 = 22.9; df = 12; p=.029), though the magnitude of differences is generally small.

Table 11.40
Residents' Levels of Agreement that Public Lands Are Important to the Culture and Heritage of Their Communities, by County-Level Wilderness Area Land Acreage

	County Wilderness Acres			
Level of Agreement	**Highest**	**High**	**Low**	**None**
Strongly Disagree	2.1%	3.2%	2.8%	2.5%
Somewhat Disagree	2.5%	2.5%	2.9%	2.6%
Unsure	7.7%	10.0%	11.1%	9.0%
Somewhat Agree	24.3%	25.2%	29.9%	26.9%
Strongly Agree	63.4%	59.0%	53.2%	59.0%
No. of Responses	1,130	823	785	999

On the whole, results involving responses to the question pertaining to the importance of public lands to the culture and heritage of Utah communities revealed weak to moderate but fairly consistent associations involving the various county-level measures of public land context. In general, residents of counties with the highest levels of protected-status lands, wilderness lands, and lands administered by the National Park Service and the Bureau of Land Management tended to attach greater importance to public lands to these aspects of community identity.

11.5 SUMMARY AND CONCLUDING OBSERVATIONS

Although the scope of the current study was substantially limited by time and budget allocations, several key observations can be derived regarding possible linkages between public lands and social conditions. Both literature-based findings and results derived from further analysis of data from a 2007 survey of Utah residents suggest that varied public land contexts are in at least some instances associated with differing local social and economic patterns, and different "quality of life" conditions.

Based on a review of relevant literature, it seems clear that there is a generally positive relationship between the presence of both "natural amenity" conditions and the presence of public lands (particularly those managed for resource protection purposes) and county-level population growth. National-level studies as well as studies focused specifically on the western United States consistently demonstrate that in-migration of new populations and broader patterns of population increase occur at higher levels in high-amenity and public land contexts. Similarly, the literature paints a consistent picture with regard to the presence of a positive association between natural amenities as well as public lands and various indicators of economic opportunity. County-level employment growth, income growth, and other related measures of economic well-being appear to be consistently higher in areas characterized by high natural amenity levels, and also in areas where public lands are present. These positive associations involving population growth and economic growth are further reflected in evidence that local "human capital" conditions appear to be enhanced in high-amenity locales, where in-migrants tend disproportionately to be persons with higher incomes, in professional and technical occupations, and more broadly representative of the so-called "creative class."

While much of the literature suggests that natural amenities contexts and the presence of public lands tend to be associated with social and economic conditions that are consistent with improved quality of life, there is also evidence that some problems can arise in such contexts. Due simply to the extensiveness of in-migration and population change that can occur in some such areas, levels of community attachment, engagement, and social integration can be suppressed at least in the near term. In addition, the dynamics of population and cultural changes occurring in high-amenity areas can give rise to tensions and divisions involving divergent values and belief systems, especially those related to environmental conditions and natural resource management. As such, there may be reason for concern that the growth and development observed in some high-amenity and public land locales could be accompanied by reduced levels of "social capital." Thus, while data from surveys addressing public attitudes and values regarding public lands issues appear generally to indicate broad-based public support for the protection of public land resources, at the local level there can be considerable and potentially divisive variation in views about these issues.

Findings from analyses of data from the 2007 Utah State University survey addressing Utahns' views about public lands issues revealed mixed evidence regarding associations between varied public land contexts and various measures of addressing aspects of social well-being and quality of life. Overall we found weak but consistently positive associations between the presence of protected-status lands as well as various types of public lands and the extent to which Utahns reported participation in an array of outdoor recreation activities. Residents of counties with more protected-status lands and more public lands of various types were also more likely to report that they engaged in various personal use activities involving acquisition of materials from public land locations. At the same time, comparisons across the various county-level classifications used to address local public land contexts revealed consistently weak to nonexistent associations between these measures and residents' views about the importance for local quality of life of public land commodity production/resource utilization activities, hunting/fishing/ORV uses, and habitat/biodiversity protection.

Overall, Utah residents tend overwhelmingly to express agreement that public lands are important in providing areas where they can pursue activities they enjoy most. However, there was little variation in responses to this question across the various county-level public land classifications considered here. In addition, there was little variation between the measures used to assess county-level public land contexts and Utahns' views about the importance of public lands to their own personal identities. At the same time, survey participants tended overwhelmingly to agree that public lands are important in defining the culture and heritage of their communities, and the tendency to agree on this point was generally highest in counties with more protected-status acreage and more acreage in various public land classifications. On the whole Utah residents clearly place high value on public lands and the opportunities they provide, and they do view those lands and resources as central to the identities of the communities where they live.

In closing, it is important to note that virtually all of the studies reported in the literature, as well as all of the analytic comparisons presented here based on responses to the 2007 statewide survey, are reflective only of associations between variables rather than of clearly defined causal relationships. Without question local social, demographic, economic, and quality of life conditions are influenced by a complex array of factors. And, as noted most clearly by Rasker (2006), there are typically many other factors in addition to natural amenity conditions and public land contexts that are more important in determining the course of local social and economic change. While evidence from the literature and from survey findings may suggest that natural amenities, protected-status lands, and public lands of various types can contribute positively to certain social and economic conditions, substantial additional research is needed to sort out the influence of other variables, the variation in these relationships across highly divergent local contexts, and the possible causal linkages among what will inevitably be a complex set of interrelated factors.

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12 SUMMARY OF COUNTY FEEDBACK

Land ownership in Utah by federal, state, tribal, and private entities is shown by share and total acreage in each county in Table 12.1. A third of the counties in Utah have 75 percent or more federal land. Thirteen counties have federal land shares greater than that of the total state share of 64 percent. In fifteen of Utah's twenty-nine counties at least 75 percent of the land is not privately owned—either federal, state or tribal. Only Summit, Rich, Cache, Salt Lake, and Weber counties have a majority share of private land.

Table 12.1
Land Ownership in Utah by Type by County, Acres and Share, 2014

	Federal		State		Tribal		Private		Total	Federal, State & Tribal	
County	Acres	Share	Acres	Share	Acres	Share	Acres	Share	Acres	Acres	Share
State	350,30,813	64%	5,421,171	10%	2,449,807	5%	11,432,852	21%	54,334,643	42,901,791	79%
Beaver	1,275,936	77%	169,994	10%	0	0%	20,8451	13%	1,654,381	1,445,930	87%
Box Elder	1,479,783	34%	930,644	22%	187	0%	1,896,068	44%	4,306,683	2,410,615	56%
Cache	286,614	38%	38,038	5%	0	0%	425,926	57%	750,578	324,652	43%
Carbon	451,435	47%	127,113	13%	0	0%	371,937	39%	950,485	578,548	61%
Daggett	370,526	81%	40,521	9%	0	0%	49,211	11%	460,258	411,047	89%
Davis	45,082	11%	264,051	65%	0	0%	97,359	24%	406,492	309,133	76%
Duchesne	931,510	45%	157,337	8%	393,473	19%	597,982	29%	2,080,303	1,482,320	71%
Emery	2,278,809	80%	348,610	12%	0	0%	234,752	8%	2,862,171	2,627,419	92%
Garfield	3,001,113	90%	162,046	5%	0	0%	170,521	5%	3,333,680	3,163,159	95%
Grand	1,686,836	72%	370,897	16%	198,545	8%	101,727	4%	2,358,005	2,256,278	96%
Iron	1,217,318	58%	138,918	7%	2,503	0%	753,621	36%	2,112,360	1,358,738	64%
Juab	1,574,283	72%	182,989	8%	47,345	2%	375,121	17%	2,179,738	1,804,617	83%
Kane	2,246,806	85%	110,681	4%	0	0%	271,092	10%	2,628,580	2,357,488	90%
Millard	3,380,189	77%	403,307	9%	1,107	0%	590,983	14%	4,375,586	3,784,603	86%
Morgan	17,712	5%	9,733	2%	0	0%	363,532	93%	390,978	27,446	7%
Piute	362,660	74%	62,473	13%	0	0%	65,137	13%	490,271	425,134	87%
Rich	223,867	32%	86,427	12%	0	0%	384,890	55%	695,184	310,294	45%
Salt Lake	106,811	21%	32,018	6%	0	0%	376,818	73%	515,647	138,829	27%
San Juan	3,118,086	61%	268,516	5%	1,280,261	25%	410,629	8%	5,077,492	4,666,863	92%
Sanpete	527,606	51%	59,912	6%	0	0%	437,908	43%	1,025,427	587,519	57%
Sevier	942,713	77%	47,304	4%	1,298	0%	236,369	19%	1,227,684	991,315	81%
Summit	529,987	44%	28,140	2%	0	0%	646,197	54%	1,204,325	558,127	46%
Tooele	3,642,311	78%	500,416	11%	19,377	0%	500,988	11%	4,663,092	4,162,104	89%
Uintah	1,703,594	59%	271,527	9%	473,515	16%	434,181	15%	2,882,817	2,448,637	85%
Utah	606,363	44%	185,896	14%	0	0%	578,875	42%	1,371,134	792,259	58%
Wasatch	435,863	56%	85,966	11%	3,167	0%	249,023	32%	774,019	524,996	68%
Washington	1,161,771	75%	88,652	6%	28,810	2%	276,332	18%	1,555,565	1,279,233	82%
Wayne	1,350,879	86%	170,085	11%	0	0%	57,770	4%	1,578,734	1,520,964	96%
Weber	74,113	18%	78,915	19%	0	0%	269,298	64%	422,326	153,028	36%

Source: BEBR analysis of data from State of Utah, SGID.

12.1 PRIMARY PRIORITIES AND CONCERNS OF UTAH COUNTIES

In an effort to fully understand the challenges facing Utah in the proposed land transfer, the Bureau of Economic and Business Research, in conjunction with the Utah Association of Counties, developed and distributed multiple surveys to each of the 29 counties in Utah. The surveys were sent to county commissioners and other county political leaders. The purpose of the surveys was to identify the prevailing sentiment regarding potential gains and losses from the proposed land transfer. The questions were designed to gather information and identify the economic advantages and disadvantages of current land allocation and management, any problems counties may have with federal land authorities, the priorities and concerns of the transfer to state management, and the potential economic effects of the proposed land transfer. Overall, BEBR received some form of response to the surveys from 17 counties, including Beaver, Box Elder, Carbon, Daggett, Davis, Duchesne, Emery, Garfield, Iron, Kane, San Juan, Sanpete, Sevier, Summit, Uintah, Washington, and Wayne. The responses varied from incomplete surveys, to detailed responses that included budgetary information, county land-use plans, and other documentation.

Priority 1: Keeping Public Land Open and Available to the Public

Nearly all of the counties that responded to the surveys mentioned the desire to keep the federal lands open and available to the public. Some respondents expressed hope for greater access to the federal lands with fewer restrictions and more recreational and commercial use. Very few counties mentioned selling portions of the public land to private entities, and those that did felt the land sale to private enterprises should be minimal. Other counties were inherently opposed to the idea of selling any of the land to private entities. They feared private ownership would limit access and could be more restrictive than current federal ownership and management.

Priority 2: Mixed-Use Land Management

One of the most often-stated priorities was for more mixed-use of federal lands. Many stated the federal agencies tend to manage the land for a single purpose and therefore forego many opportunities. Counties hope that under state management Utah could open current public land for more diversified use, personal and commercial. This includes motorized vehicle use, more trail management, commercial exploration and development, and easier access to these lands via physical infrastructure. Likewise, some respondents mentioned the opening of more public lands to commercial development, including mining and oil and gas exploration. These counties hoped a more mixed-use approach would allow for greater levels of commercial development with only minimal negative impacts on preservation and recreation.

Priority 3: More Local Authority in Public Land Management

A universal sentiment expressed by responding counties was the need and desire for more local input and control over the lands in their county. Most counties feel the federal government is not sensitive to local concerns and priorities. No single county expressed explicit appreciation of current federal management, but some did note their satisfaction or indifference toward current federal management. In most cases each county wanted local representation and management of the land in their counties. Some even expressed concern that under state control, there still wouldn't be enough local authority in the management of public lands.

Priority 4: Return of the Timber Industry

Many respondents mentioned disappointment regarding Utah's timber industry. Utah has seen a decline in timber production over the past few decades, including a lowered harvest and the closing of many sawmills. The loss of the timber industry is attributed to the policies and practices of federal land agencies. Several respondents expressed an interest in resurrecting the timber industry under state land management.

Priority 5: Healthy Forest Management Practices

Associated with a resurgent timber industry is a healthy forest management practices policy. Many respondents gave high priority to managing the forests and fostering healthy forest growth, revegetation and control of invasive/noxious species. Counties felt with changing public land management there would be an opportunity to improve forest management and promote healthy forests. This could include re-growing natural forest land, increased vegetation after wildfires, and invasive species control.

Priority 6: Rural Road and ATV Trail Expansion and Maintenance

Many county officials expressed grievances over a lack of ATV and 4x4 trails and frequent road closures. While some agreed with the federal road closures, others stated the road closures to be unjust and unnecessary. Generally, counties would like to see fewer road closures under new management, thus making more roads available for commercial and recreational use. Many counties are popular for ATV and motorized recreation on their public lands. This market could be expanded with an increase in properly maintained and established trail networks.

Concern 1: Lack of Defined Management Plan and Organizational Structure

Regardless of whether a county outright supported or opposed the land transfer, many counties expressed their concern over the lack of a defined management structure and plan by the State of Utah after the proposed transfer. Currently, the state has not outlined a management plan, organizational structure, or funding mechanism to manage the additional public land that would come under its control. Therefore, counties fear the state may continue many policies or manage in a similar fashion to the federal agencies. In this sense the counties would not realize any direct benefit from state management. Some county officials expressed concern that the state may mimic the federal government and simply operate from a central location, excluding local authorities from public land management decisions.

Concern 2: Funding for New Management and Responsibilities

County officials expressed concern regarding the state's ability to fund the additional land management programs subsequent to the transfer, with particular concern for the transitional period from federal to state ownership. Will the federal agencies pull out immediately, creating a loss of high-paying federal jobs and federal funding? Likewise, a few counties alluded to the issue of continued high-cost endeavors, including wildfire suppression and the state's ability to adequately fight and suppress a wildfire on public land without federal assistance. Counties recognize this is not something they can manage on their own and doubt the state's ability to respond adequately to large-scale fires.

Concern 3: Loss of Federal Revenues

As mentioned in Concern 2, counties are alarmed about the potential loss of federal monies, specifically, Payments in Lieu of Taxes (PILT) and Secure Rural Schools (SRS) payments. In some counties, this money amounts to over $1 million a year, and can account for more than 20 percent of the county's revenue. If the transfer occurs, will the state match the loss of federal funding and hold counties harmless?

Concern 4: Cost-Benefit Structure of Public Land Management

Similar to Concern 1, some counties were unsure of the cost and benefit structure of public lands in the state. This included the concern that the state may place more burdens on local communities to manage the public lands in their area without offsetting funding. Other concerns were related to mineral lease payments, grazing, commercial development, and other payments made for the use of public land. Officials were concerned with a potential restructuring of management of public lands that could negatively affect counties, includeing less secure grazing AUMs in certain areas, unequal distribution of mineral lease payments, and increased costs to recreationists.

12.2 Summary

Based on the 17 counties responding, there is a high priority for local communities to have more authority in the public land management process. While some called directly for local control, others simply mentioned a need for local input in the land management decision-making process. Generally, most county officials see the proposed land transfer as a catalyst for change that could result in a net benefit to their county through the promotion of local authority.

County officials, however, are concerned over the state's lack of a defined management plan and organizational structure for the management and funding of the newly acquired public lands. With an increase of about 30 million acres, which would nearly quadruple the current amount of state-owned land, many counties are unsure of how the future management and structure under the state would function. Some fear the state will mimic the federal government in practice and policy, negating any net benefit to cities and counties throughout Utah. Understanding the magnitude of the land transfer and amount of additional resources needed, many are concerned about the funding and establishment of new organizational structures and policies.

13 Transfer Scenarios

One of the requirements under H.B. 142 was to evaluate, through theoretical modeling, the potential economic impact of the transfer of public lands on state, county and local governments. To this end, we modeled the effects of changing production outputs for two activities—oil and gas production and coal production—and changing the user fee for cattle grazing on current federal lands.

The oil and gas revenue and production forecasts provided in this study are based on a model developed by BEBR. The primary purpose of the model is to provide forecasts of oil and gas revenues accruing to the state during the period 2017–2036, under various scenarios. These revenue forecasts are derived from other, more fundamental, forecasts generated by the model, along with oil and natural gas price forecasts not generated by the model, but obtained from a recent report published by the U.S. Department of Energy, Energy Information Administration (EIA 2014).

The oil and gas model has three major components: (1) Forecasting oil and gas production for each oil and gas well in the state that is currently producing, (2) forecasting the number of new oil and gas wells that will be drilled in the future, and (3) for each such well, forecasting the future course of production from that well. Total future oil and gas production is the sum of production from existing wells and production from wells yet to be drilled.

For this study, The Utah Governor's Public Lands Policy Coordination Office requested the modeling of a number of different scenarios. Broadly, the scenarios relate to how production royalties are divided among various parties, "what if" deviations in the number of wells drilled from that predicted by the well-count model described above, future oil and natural gas prices, and royalty rates. In total, we produced 10 oil and gas forecasts under various transfer scenarios.

Potential coal royalties (and associated tax revenues) were calculated using three coal production scenarios provided by the Utah Geological Survey. These coal scenarios project different levels of production based on assumptions about national and international industry trends. The scenarios are Low, Middle, and High. Under each coal production scenario, royalty revenues were estimated based on a rate of 8.0 percent of the value of production. The forecasts go one step further by estimating revenue to the state under various transfer scenarios. The projected fiscal effects that would accrue to state and local governments under each transfer scenario include coal royalties, revenues from taxable investment purchases, state income and sales taxes, property taxes, local sales taxes, and royalties that would accrue to SITLA.

The economic impacts of the changes in oil, gas and production were calculated using REMI PI+, a dynamic, multiregional simulation model. The grazing scenarios considered the potential revenue to the state under various grazing fee rates. Potential revenues were estimated using information on cattle grazing provided by the Utah Department of Agriculture and Food, the Forest Service, and the Bureau of Land Management. The economic impacts were estimated using RIMS II, an input-output model developed by the Bureau of Economic Analysis that has been regionalized for Utah and regions within Utah.

13.1 OIL AND NATURAL GAS PRODUCTION SCENARIOS

The oil and gas revenue and production forecasts provided in this study are based on a model developed by BEBR. This section provides a broad overview of the model and the forecasts it generates.

The primary purpose of the model is to provide forecasts of oil and gas revenues accruing to the state during period 2017–2036, under various scenarios. These revenue forecasts are derived from other, more fundamental, forecasts generated by the model, along with oil and natural gas price forecasts not generated by the model, but obtained from a recent report published by the U.S. Department of Energy, Energy Information Administration (EIA 2014).[292]

The model has three major components: (1) Forecasting oil and gas production for each oil and gas well in the state that is currently producing, (2) forecasting the number of new oil and gas wells that will be drilled in the future, and (3) for each such well, forecasting the future course of production from that well. Total future oil and gas production is the sum of production from existing wells and production from wells yet to be drilled.

The forecast oil and gas production revenues and volumes are shown in Tables 13.1–13.12. To simplify presentation, the figures presented in the tables are the median predictions from the model, rather than more complex characterizations of the underlying predictive distributions.

13.1.1 Forecasting Production from Currently Active Wells

The production of oil or gas from a successfully completed well is modeled using decline curves. A decline curve relates the expected production rate of a well to the elapsed time since the date the well first produced.

A decline curve was fit to each oil or gas well active as of the beginning of the forecast period. There were approximately 13.5 thousand such wells. For the purpose of fitting a decline curve, these wells were assigned to groups, where the groups are the unique combinations of (a) the region in which the well is located (Duchesne County, Uintah County, other), (b) the type of well (oil, gas), and (c) the type of product (oil, gas). A given well, whether classified as an "oil well" or "gas well," may produce both oil and natural gas. Each well, therefore, has two decline curves—one for oil and one for natural gas.[293] An exception to the above is made for coalbed methane wells, all of which are gathered into one group that contains only coalbed methane wells.[294] Each currently active well in the state falls into exactly one of the groups defined above.

The decline curves have three parameters, which relate to various aspects of their shape and the initial level of oil or gas production for the well. A joint probability distribution—a "posterior

[292] All the data used in the modeling, with the exception of oil and natural gas prices, were obtained from the Utah Division of Oil, Gas and Mining. Price data were obtained from the U.S. Department of Energy, Energy Information Administration.
[293] For simplicity, the term "well" may be used to refer to the wellbore and any products that flow from it, or to a particular product. In the latter case, a term such as "well-product" might be more appropriate, but we do not make such distinction here.
[294] Coalbed methane wells are always gas wells and only produce only natural gas.

distribution"—is derived for these parameters for each well. This distribution reflects particular characteristics of the individual well (i.e. all historical production data for the well) and characteristics of the group to which the well belongs.

Production from all currently active wells is forecast over the period 2014–2036 as follows. For each calendar quarter over 2014–2036, a triplet of parameter values is drawn from the posterior distribution of parameters associated with each well and the predicted rate of production given that triplet is determined. These predicted rates are then summed across all wells. This is repeated a large number of times; each time, in general, resulting in a distinct sum. The "sum" here refers to the sum rate of production from all currently active wells during this particular calendar quarter and is a sampled value from the probability distribution of "total production from currently active wells" during that calendar quarter. For example, the median of a large number of such sums is approximately the median "total production from currently active wells." This process is repeated for every calendar quarter.

The total value of production, royalties, severance taxes, conservation fees, property taxes, and sales taxes are calculated in parallel with the simulation of total production volume as it is described above.

Eventually the rate of production from a well declines to a level that the revenues generated from the well are no longer sufficient to justify the cost of continuing to operate it, at which point the well is permanently closed ("abandoned"). How long it takes to reach this point varies by well because the initial production and shape of decline varies by well, as does the mix of hydrocarbons it produces. Prevalent market prices for oil and gas affect closing rates too, since they affect revenues. The total value of production from each well is monitored during the simulations and wells which produce too little value are closed in the model.

13.1.2 Predicting the Number of Wells Drilled

The predicted total volume of production from currently active wells, described above, steadily drops during the study period.[295][296] Eventually, though well beyond the end of the study period, production from this collection of wells will reach zero, as all the wells will eventually have their production rates fall to a level that leads to permanent closure of the well, given prevalent oil and natural gas prices.

Declining production from existing wells may be offset by the drilling and successful completion of new wells. Total production—the sum of that from existing wells and that from new wells—may increase or decrease over time, depending largely on the number of new wells drilled.

During the study period, counts of new and successfully completed wells are forecast for each calendar quarter.[297] The model from which the forecasts are generated relates the current num-

[295] "Ride-along" quantities such as the value of production, royalties and various taxes, may or may not decline with the volume, as they depend on oil and natural gas prices. In order for these quantities to resist decline, oil and natural gas prices have to rise at a rate sufficient to offset the declining volumes.

[296] The shape of the decline in total production from currently active wells—a different sort of "decline curve"—varies by group (as described above). Groups with a larger proportion of older wells will tend to decline more slowly (the rate of decline for a given well generally decreases as the well ages). Group of gas wells tend to decline more rapidly than groups of oil wells.

[297] Not all wells that are drilled end up producing oil or gas—some wells are "dry." The model incorporates estimates of the success rates of new wells by group.

ber of wells drilled to current and past prices of oil and natural gas. The model is fit to historical data on wellcounts and oil and natural gas prices. As with the decline curve model, wells are divided into groups. The groups are the same as before, but with no division of the well by the hydrocarbons it produces. Thus, the seven groups for the wellcounts model are: (1) Duchesne County oil wells, (2) Duchesne County gas wells, (3) Uintah County oil wells, (4) Uintah County gas wells, (5) other oil wells, (6) other gas wells and, finally, (7) statewide coalbed methane wells.

As with the decline curves, coalbed methane wells were treated differently than other wells. Rather than current and past oil or natural gas prices, the number of coalbed methane wells was modeled as a function of the current volume of coal production.

Forecasts of wellcounts are produced by inputting into the model proposed paths of future oil and gas prices. BEBR created such "what if" price paths based on long-term oil and natural gas forecasts published by the U.S. Department of Energy, Energy Information Administration. Those paths are described later in this section. It is important to bear in mind that the wellcount forecasts take these price paths as given.

In a fashion similar to that of the decline curves, the result of the wellcounts model is, for every calendar quarter in the study period, a probability distribution for the number of wells drilled. Again, these distributions are conditional on particular courses of future oil and natural gas prices.

13.1.3 Forecasting Production from New Wells

The wellcounts model predicts the number of wells drilled given current and past prices of oil and natural gas. When a new well is drilled and successfully completed it produces subject to a decline curve specific to the group to which the well is associated.[298] Since such a well has no production history, the distribution of parameters for this well will bear only group-level characteristics.

The total volume of production from new wells is simulated as follows. (1) For each calendar quarter in the study period one draw is made from the probability distribution of wellcounts for that quarter. (2) For each such well—there may be just a few or several thousand, depending on the group and on the draw—a triplet of values is drawn from the group-level distribution of decline curve parameters, and a decline curve for the well is simulated for all remaining quarters in the study period.[299] (3) These decline curves are summed across wells for each calendar quarter, yielding one simulated value of total production from new wells during that quarter. Repeating (1)–(3) a large number of times yields a large sample of values of "total production from new wells."

13.1.4 Derivative Forecasts

Once predictions can be obtained for the total volume of production, predictions for certain other quantities, such as the total value of production, royalties paid to various parties, severance

[298] For example, a well from the wellcounts group "Duchesne oil well" will be associated with two groups from the decline curve groups, the "Duchesne oil well, oil product" and "Duchesne oil well, gas product" groups.
[299] The group-level distribution is constant for each well in the group but, because it is a distribution, distinct wells get distinct decline curves though all such decline curves are similar in the sense that they are citizens of the same distribution.

taxes, conservation fees, property taxes, and sales taxes can be derived without further simulations. In the model, such "ride-along" quantities are calculated in parallel with the volume simulations.

13.1.5 Scenarios

The Utah Public Lands Policy Coordination Office requested the modeling of a number of different scenarios. Broadly, the scenarios relate to how production royalties are divided among various parties, "what if" deviations in the number of wells drilled from that predicted by the wellcount model described above, future oil and natural gas prices, and royalty rates.

More specifically, each scenario is a particular combination of the following five parameters.

State share in royalties from existing wells on lands currently federal This parameter is the proportion of royalty revenue the state receives from oil and gas wells that, as of the beginning of 2017, are producing oil or gas on lands currently federal. Under current policy, the state receives 50 percent of the royalty revenues generated from the production of oil and natural gas from federal lands in Utah. Two possibilities were considered: (1) That the state share in royalties from existing wells on lands currently federal stays at 50 percent, or (2) increases to 100 percent.

State share This parameter is the proportion of royalty revenue the state would receive on wells completed on lands currently federal during or after 2017. Two possibilities were considered: (1) That the state share in royalties remains at the 50 percent that applies to existing wells, or (2) the state share in royalties increases to 100 percent because lands currently federal are transferred to the state and is not required to, and chooses not to, share royalties from wells on lands—now formerly federal—with the federal government.

The degree to which state ownership of lands currently federal would increase the number of oil and gas wells drilled in the state This parameter controls the proportion of wells drilled relative to the baseline number of wells drilled. The baseline number of wells drilled is predicted from the "wellcounts" model (described above). The scenarios consider two possibilities: (1) That the predicted wellcounts are exactly those predicted by the wellcounts model, or (2) that on lands currently federal and state lands the wellcounts are 15 percent greater than those predicted by the wellcounts model. The scaling is ad hoc, but intended to reflect the belief of the state that it can lower the cost of production on lands currently federal, either by lowering regulatory requirements on those lands that are already open to production or by opening lands to oil and gas production which are currently closed to it.

Twenty-year oil and gas price forecast Forecasts of oil and gas prices were used as inputs to the model used to predict future wellcounts. The scenarios consider "high" and "low" price forecasts. The high forecast is based on the Energy Information Administration (EIA) Reference price forecasts for the period 2014 through 2036. The scenarios consider two possibilities: (1) Generally high oil and natural gas prices prevail over the study period, or (2) prices gradually fall toward levels at or slightly below historical norms. In the high-price scenario, the average inflation-adjusted price for oil is $92 (ranging from a low of $77 to a high of $109) per barrel and for gas is $5.10 per thousand cubic feet (ranging from a low of $3.60 to a high of $6.60 during the forecast).[300] In the low scenario, the average inflation-adjusted price for oil is $62 (ranging from a low of $40 to a high of $86) per barrel and for gas is $3.30 per thousand cubic feet (ranging from a low of $3.30 to a high of $3.60).[301]

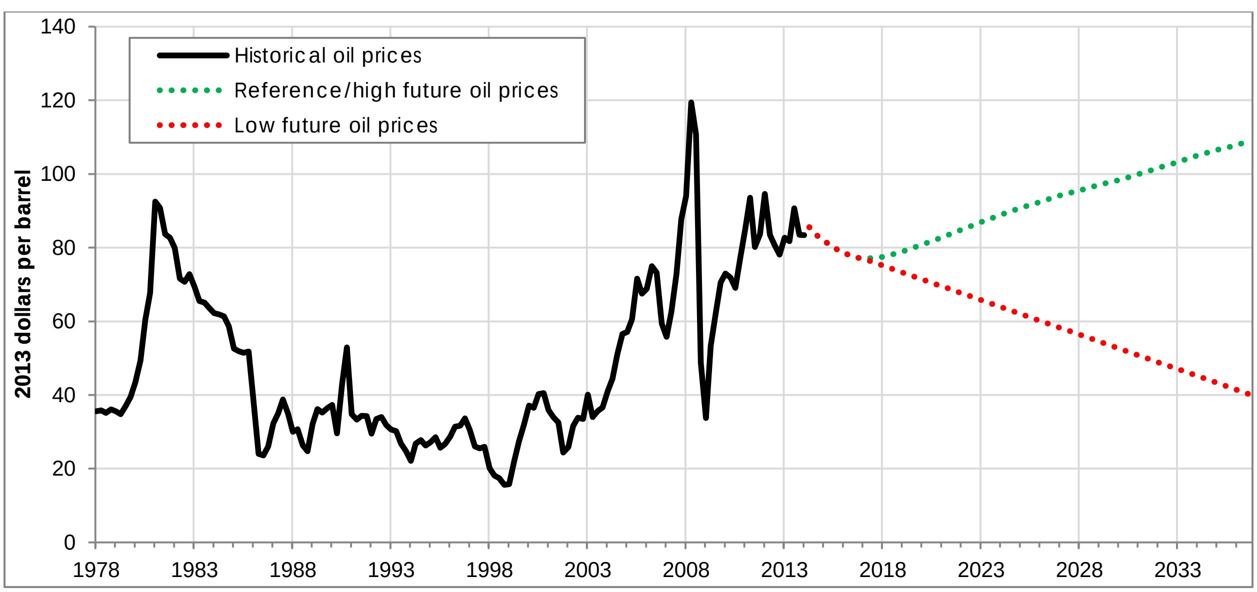
The reference prices used in the modeling are based on long-term (through the year 2040) "reference" oil and natural gas price forecasts published by the U.S. Department of Energy, Energy Information Administration (EIA), in its Annual Energy Outlook 2014. For the purposes of the oil and gas modeling presented in this section, the EIA forecasts for oil were adjusted so as to approximate Utah wellhead prices. For natural gas, the EIA forecasts were similarly adjusted to approximate wellhead prices (though not "Utah" wellhead prices, as Utah wellhead natural gas prices were not available at less than annual intervals and, for some years, not available at all).

The "low" prices used in the modeling were created by BEBR as a "what if" scenario. In this case, prices follow the EIA reference price paths until the first date at which prices are rising (this point occurs in 2015 for natural gas prices and in 2017 for oil prices). At these points, the "low" forecasts diverge from the reference forecasts, with the low forecasts decreasing at a constant rate toward $40/barrel for oil and $3/Mcf for natural gas in the year 2036.

Figures 13.1 and 13.2 show historical prices, along with "high" and "low" forecasts, for oil and natural gas prices respectively.

It is not intended that these forecasts represent the view of BEBR of the likely course of future oil and natural gas prices. They are best viewed simply as "what if" scenarios, that reveal the sensitivity of oil and gas production and revenue forecasts to future energy prices, a factor over which the state has little control.

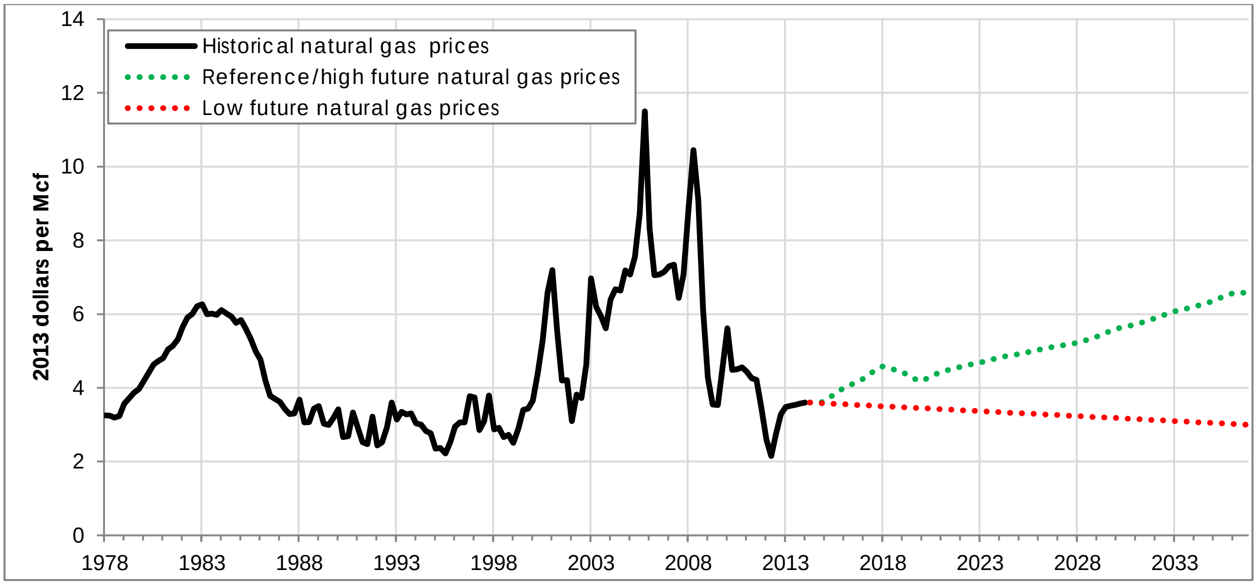
Figure 13.1
Historical and Forecast Oil Prices



Source: Energy Information Administration; BEBR.

300 Prices are in constant 2013 dollars.
301 Prices are in constant 2013 dollars.

Figure 13.2
Historical and Forecast Natural Gas Prices



Source: Energy Information Administration; BEBR.

Royalty rate This parameter is the royalty rate that applies to wells on lands that are currently federal. The scenarios consider two possibilities: (1) That royalties rates remain at their current level of 12.5 percent, or (2) royalties rates are increased to 16.7 percent. The state would only have the ability to raise royalty rates from 12.5 to 16.7 on lands currently federal if those lands were transferred to state control.

13.1.6 Discussion of Results

Tables 13.1–13.12 present a summary of the model results from a particular scenario. In what follows, each scenario is described and brief comments are given concerning the results presented in the table corresponding to that scenario.

Table 13.1: Oil and Gas Forecast 1—Reference Price Baseline: 50% on Existing & 50% on New Royalty Sharing, Baseline Drilling, 12.5% Royalty In this scenario, the oil and natural gas prices assumed for the period 2014–2036 are those based on the EIA Reference case forecasts—relatively "high" oil and gas prices—the state continues to receive 50 percent of royalties generated from existing (as of the beginning of 2017) federal wells, 50 percent of royalties generated from new (after the beginning of 2017) federal wells, the number of wells drilled during the study period is the median count predicted by the model, and royalty rates applying to production from federal wells remains at its current level of 12.5 percent.

This scenario represents a "business as usual" environment with oil and gas prices climbing during the study period. Under the assumptions of this scenario, described in the paragraph above, the median predicted inflation-adjusted royalties accruing to the state rise from $146.6 million in 2017 to $486 million in 2036.

Table 13.2: Oil and Gas Forecast 2—Reference Prices, 50% on Existing & 100% on New Royalty Sharing, Baseline Drilling, 12.5% Royalty This scenario departs from that of Fore-

cast 1 in, and only in, that the state's share of royalties from new (after the beginning of 2017) wells drilled on lands currently federal is 100 percent, rather than 50 percent. An interpretation of this change to a 100 percent share is that the lands currently federal are transferred to the state, so that the full value of royalties generated by wells that would have been drilled on such lands accrues to the state. The remaining assumptions of this scenario are: The oil and natural gas prices assumed for the period 2014–2036 are those based on the EIA Reference case forecasts—relatively "high" oil and gas prices—the state continues to receive 50 percent of royalties generated from existing (as of the beginning of 2017) federal wells, the number of wells drilled during the study period is the median count predicted by the model, and royalty rates applying to production from federal wells remains at its current level of 12.5 percent.

Under the assumptions of this scenario, described in the paragraph above, the median predicted inflation-adjusted royalties accruing to the state rise from $154.9 million in 2017 to $860.3 million in 2036. A point to make about the difference between this result and the corresponding one of Forecast 1 is that although in this scenario royalties generated by new wells on lands currently federal are twice that of the scenario behind Forecast 1, total royalties accruing to the state under Forecast 2 are initially well below twice the royalties of Forecast 1 and are close to twice as much only late in the study period. The reason for this is that total royalties accruing to the state from wells on lands currently federal is the sum of royalties from wells already producing as of the beginning of 2017 and royalties from wells that were drilled after the beginning of 2017. Production rates for the former set of wells decline over time, so that the composition of "new" production—on which the state's share is, in this scenario, 100 percent rather than 50 percent—in total production rises over time.

Table 13.3: Oil and Gas Forecast 3—Reference Prices, 50% on Existing & 100% on New Royalty Sharing, Baseline +15% Drilling, 12.5% Royalty This scenario departs from that of Forecast 2 in, and only in, that beginning in 2017 the number of wells drilled on lands currently federal and state lands is 15 percent higher than what is predicted by the wellcounts model.

Comparing the results of Forecast 3 to Forecast 2, one can see that the effect of increasing the number of wells drilled is initially quite small but increases as one moves out along the forecast horizon. For example, Forecast 2 predicts that 40.8 million barrels of oil will be produced in 2017, while Forecast 3 predicts 41.8 million barrels, an increase of 2.5 percent. At the end of the forecast period, 2036, Forecast 2 predicts 92.5 million barrels, while Forecast 3 predicts 98.7 million barrels, an increase of 6.7 percent. Other quantities, such as the values of production, royalties, and the various taxes move in like fashion. Royalties accruing to the state follow a similar pattern, increasing from $163 million in 2017 to $974.3 million in 2036.

Table 13.4: Oil and Gas Forecast 4—Reference Prices, 50% on Existing & 100% on New Royalty Sharing, Baseline +15% Drilling, 16.7% Royalty This scenario departs from that of Forecast 3 in, and only in, that wells drilled during or after 2017 on lands currently federal are subject to a royalty rate of 16.7 percent rather than 12.5 percent (wells already producing as of the beginning of 2017 are still subject to 12.5 percent).

The higher royalty rate reduces the number of new wells drilled on lands currently federal. Consequently, it also reduces the production volumes of oil and natural gas, which reduces the total value of production. The higher royalty rate does, however, increase total royalties accruing to the state. For example, in Forecast 3, royalties accruing to the state begin at $163 million in 2017 and end at 974.3 in 2036; in Forecast 4—which retains all the assumptions of Forecast 3 but re-places the 12.5 percent royalty rate with a 16.7 percent royalty rate—royalties accruing to the state begin at $183.3 million in 2017 and end at $1,121.7 million in 2036. Simply put, though increased royalty rates reduce the number of wells drilled, and reduce the economic lifetime of those wells that are drilled, the increased royalties collected from wells that are drilled is sufficient to offset the lost royalty revenues from the wells that were not drilled due to the higher royalty rate.

Table 13.5: Oil and Gas Forecast 5—Reference Prices, 100% on Existing & 100% on New Royalty Sharing, Baseline +15% Drilling, 16.7% Royalty This scenario departs from that of Forecast 4 in, and only in, that the state collects 100 percent—rather than 50 percent—of royalties generated from wells drilled before 2017 on lands currently federal.

In this scenario, royalties accruing to the state begin at a level almost twice as large as that of Forecast 4 ($340.1 million versus $183.3). The differences narrow, however, as time passes. For example, in 2036 royalties accruing to the state are $1,121.7 million in Forecast 4 and $1,198.1 million in Forecast 5. The reason for this diminishing impact is simply that wells drilled before 2017 age as time passes along the forecast period. As these wells age, the volume of oil or gas they produce declines rapidly, decreasing the royalties they generate just as rapidly. Therefore the advantage to the state of receiving the full share of royalties from this cohort of wells, rather than only half, diminishes over the forecast period, too.

Table 13.6: Oil and Gas Forecast 6—Low Prices, 50% on Existing & 50% on New Royalty Sharing, Baseline Drilling, 12.5% Royalty This scenario departs from that of Forecast 1 in, and only in, that the oil and gas price forecasts assumed are the "low prices" forecasts described previously in this section.

In this forecast, royalties accruing to the state start at $130.1 million in 2017 but decline to $81.6 million in 2036. The volume of oil produced remains fairly constant over the forecast period, while the volume of natural gas clearly declines. These phenomena are not accidental: Utah's oil wells tend to decline less rapidly than its gas wells. Thus, although fewer oil wells are being drilled as time passes, production from those wells that are drilled is sufficient to hold off overall decline, at least for the duration of the forecast period. Gas wells, on the other hand, decline too rapidly to be fully compensated by "new" production. Lastly, the total value of production declines along the forecast period because it is the product of volume and price, and price declines along the forecast period.

Table 13.7: Oil and Gas Forecast 7—Low Prices, 50% on Existing & 100% on New Royalty Sharing, Baseline Drilling, 12.5% Royalty This scenario departs from that of Forecast 6 in, and only in, that the state's share of royalties from new (after the beginning of 2017) wells drilled on lands currently federal is 100 percent, rather than 50 percent.

In this forecast, like that of Forecast 6, royalties accruing to the state fall during the forecast period. The decline in royalties seen in Forecast 6 is stemmed in Forecast 7 by the state's receiving the full value of royalties generated from wells drilled prior to 2017. Royalties accruing to the state start at $138.1 million in 2017, climb to a peak of $164.5 million in 2023, then fall to $124.3 million in 2036, a value still well above the $81.6 million for the same year in Forecast 6.

Table 13.8: Oil and Gas Forecast 8—Low Prices, 50% on Existing & 100% on New Royalty Sharing, Baseline +15% Drilling, 12.5% Royalty This scenario departs from that of

Forecast 7 in, and only in, that beginning in 2017 the number of wells drilled on lands currently federal and state lands is 15 percent higher than what is predicted by the wellcounts model.

Compared to Forecast 7, Forecast 8 offers only a small increase in royalties accruing to the state. The reason is that although the count of new wells is increased by 15 percent in Forecast 8 versus the baseline of Forecast 7, the baseline predicted count of wells in Forecast 7 is dropping rapidly along the forecast period as oil and gas prices fall. Royalties accruing to the state begin at $144.9 million in 2017, climb to a peak of $180.3 million in 2023, then fall to $138 million in 2036.

Table 13.9: Oil and Gas Forecast 9—Low Prices, 50% on Existing & 100% on New Royalty Sharing, Baseline +15% Drilling, 16.7% Royalty This scenario departs from that of Forecast 8 in, and only in, that wells drilled during or after 2017 on lands currently federal are subject to a royalty rate of 16.7 percent rather than 12.5 percent (wells already producing as of the beginning of 2017 are still subject to 12.5 percent).

In Forecast 9, royalties accruing to the state begin at $161.3 million in 2017, climb to a peak of $203.2 in 2024–2025, then fall to $159.6 million in 2036.

Table 13.10: Oil and Gas Forecast 10—Low Prices, 100% on Existing & 100% on New Royalty Sharing, Baseline +15% Drilling, 16.7% Royalty This scenario departs from that of Forecast 9 in, and only in, that the state collects 100 percent—rather than 50 percent—of royalties generated from wells drilled before 2017 on lands currently federal.

Compared to Forecast 9, Forecast 10 presents large increases in royalties accruing to the state, particularly early in the forecast period, when oil and natural gas prices are still relatively high. For reasons discussed in the comments to Forecast 5, the effect of receiving 100 percent of royalties on wells drilled before 2017 diminishes as time passes. In Forecast 10, royalties accruing to the state begin at $303.2 million, then decline almost steadily to $205 million in 2036.

Table 13.11: Oil and Gas Forecast 11—Reference Prices, 100% on Existing & 100% on New Royalty Sharing, Baseline +15% Drilling, 12.5% Royalty This scenario departs from that of Forecast 5 in, and only in, that wells drilled during or after 2017 on lands currently federal are subject to a royalty rate of 12.5 percent rather than 16.7 percent (wells already producing as of the beginning of 2017 are subject to 12.5 percent in any case).

In Forecast 11, royalties accruing to the state begin at $306.8 million and climb, along with oil and natural gas prices, to $1,095.6 million in 2036.

Table 13.12: Oil and Gas Forecast 12—Low Prices, 100% on Existing & 100% on New Royalty Sharing, Baseline +15% Drilling, 12.5% Royalty This scenario departs from that of Forecast 10 in, and only in, that wells drilled during or after 2017 on lands currently federal are subject to a royalty rate of 12.5 percent rather than 16.7 percent (wells already producing as of the beginning of 2017 are subject to 12.5 percent in any case).

In Forecast 12, royalties accruing to the state begin at $272.3 million but fall, along with oil and natural gas prices, in a largely steady manner to $178.2 million in 2036.

Table 13.1
Oil and Gas Forecast 1—Reference Price Baseline: 50% on Existing & 50% on New Royalty Sharing, Baseline Drilling, 12.5% Royalty
(Dollar Amounts in Millions of Constant 2013 Dollars)

Year	Oil Volume (million bbls)	Gas Volume (bcf)	Federal Value	Total Value	State Royalties	Severance Tax	Sales Tax	State Total	Conservation Fee[1]	County Property Taxes	SITLA Royalties
2017	40.8	447.3	$2,346.1	$5,111.8	$146.6	$70.8	$9.4	$226.8	$4.8	$52.1	$83.6
2018	41.4	448.9	$2,433.3	$5,265.8	$152.1	$72.9	$9.7	$234.7	$5.0	$53.6	$88.0
2019	42.4	452.8	$2,455.4	$5,334.6	$153.5	$73.9	$9.8	$237.2	$5.0	$54.3	$88.1
2020	43.6	458.4	$2,544.1	$5,519.6	$159.0	$76.5	$10.1	$245.6	$5.2	$56.2	$90.8
2021	45.1	468.6	$2,722.8	$5,871.7	$170.2	$81.3	$10.8	$262.3	$5.5	$59.8	$97.9
2022	46.9	479.5	$2,905.5	$6,231.2	$181.6	$86.3	$11.4	$279.4	$5.9	$63.5	$104.4
2023	49.0	493.5	$3,106.1	$6,642.0	$194.1	$92.0	$12.2	$298.3	$6.2	$67.7	$112.2
2024	51.2	509.5	$3,327.7	$7,063.9	$208.0	$97.9	$13.0	$318.8	$6.6	$72.0	$119.8
2025	54.1	530.0	$3,582.7	$7,572.9	$223.9	$104.9	$13.9	$342.7	$7.1	$77.1	$128.9
2026	56.4	547.5	$3,825.8	$8,026.4	$239.1	$111.2	$14.7	$365.0	$7.6	$81.8	$138.0
2027	59.4	569.5	$4,099.2	$8,566.0	$256.2	$118.7	$15.7	$390.6	$8.1	$87.3	$148.4
2028	62.5	592.0	$4,397.0	$9,136.4	$274.8	$126.6	$16.8	$418.2	$8.6	$93.1	$159.4
2029	65.4	618.9	$4,739.2	$9,773.9	$296.2	$135.4	$18.0	$449.5	$9.2	$99.6	$172.9
2030	68.8	645.7	$5,075.3	$10,454.7	$317.2	$144.8	$19.2	$481.2	$9.8	$106.5	$187.0
2031	72.4	675.4	$5,457.7	$11,190.2	$341.1	$155.0	$20.6	$516.7	$10.5	$114.0	$201.5
2032	76.1	709.3	$5,879.8	$12,010.7	$367.5	$166.4	$22.1	$555.9	$11.3	$122.3	$218.4
2033	79.7	741.7	$6,304.2	$12,825.2	$394.0	$177.7	$23.6	$595.2	$12.1	$130.6	$236.5
2034	83.9	774.9	$6,739.0	$13,705.0	$421.2	$189.8	$25.2	$636.2	$12.9	$139.6	$253.9
2035	88.4	816.6	$7,297.8	$14,730.4	$456.1	$204.1	$27.1	$687.2	$13.9	$150.0	$276.1
2036	92.5	858.1	$7,776.0	$15,680.4	$486.0	$217.2	$28.8	$732.0	$14.8	$159.7	$298.2

1. Revenues from the oil and gas conservation fee fund the Division of Oil, Gas and Mining.

Source: BEBR analysis.

Table 13.2
Oil and Gas Forecast 2—Reference Prices, 50% on Existing & 100% on New Royalty Sharing, Baseline Drilling, 12.5% Royalty
(Dollar Amounts in Millions of Constant 2013 Dollars)

Year	Oil Volume (million bbls)	Gas Volume (bcf)	Federal Value	Total Value	State Royalties	Severance Tax	Sales Tax	State Total	Conservation Fee[1]	County Property Taxes	SITLA Royalties
2017	40.8	447.3	$2,346.1	$5,111.8	$154.9	$70.8	$9.4	$235.1	$4.8	$52.1	$83.6
2018	41.4	448.9	$2,433.3	$5,265.8	$173.7	$72.9	$9.7	$256.3	$5.0	$53.6	$88.0
2019	42.4	452.8	$2,455.4	$5,334.6	$186.7	$73.9	$9.8	$270.4	$5.0	$54.3	$88.1
2020	43.6	458.4	$2,544.1	$5,519.6	$203.7	$76.5	$10.1	$290.3	$5.2	$56.2	$90.8
2021	45.1	468.6	$2,722.8	$5,871.7	$228.0	$81.3	$10.8	$320.2	$5.5	$59.8	$97.9
2022	46.9	479.5	$2,905.5	$6,231.2	$253.4	$86.3	$11.4	$351.2	$5.9	$63.5	$104.4
2023	49.0	493.5	$3,106.1	$6,642.0	$281.5	$92.0	$12.2	$385.7	$6.2	$67.7	$112.2
2024	51.2	509.5	$3,327.7	$7,063.9	$312.0	$97.9	$13.0	$422.8	$6.6	$72.0	$119.8
2025	54.1	530.0	$3,582.7	$7,572.9	$340.6	$104.9	$13.9	$459.5	$7.1	$77.1	$128.9
2026	56.4	547.5	$3,825.8	$8,026.4	$371.5	$111.2	$14.7	$497.4	$7.6	$81.8	$138.0
2027	59.4	569.5	$4,099.2	$8,566.0	$402.6	$118.7	$15.7	$537.0	$8.1	$87.3	$148.4
2028	62.5	592.0	$4,397.0	$9,136.4	$436.9	$126.6	$16.8	$580.2	$8.6	$93.1	$159.4
2029	65.4	618.9	$4,739.2	$9,773.9	$479.7	$135.4	$18.0	$633.1	$9.2	$99.6	$172.9
2030	68.8	645.7	$5,075.3	$10,454.7	$523.7	$144.8	$19.2	$687.7	$9.8	$106.5	$187.0
2031	72.4	675.4	$5,457.7	$11,190.2	$568.3	$155.0	$20.6	$743.8	$10.5	$114.0	$201.5
2032	76.1	709.3	$5,879.8	$12,010.7	$619.7	$166.4	$22.1	$808.2	$11.3	$122.3	$218.4
2033	79.7	741.7	$6,304.2	$12,825.2	$674.7	$177.7	$23.6	$875.9	$12.1	$130.6	$236.5
2034	83.9	774.9	$6,739.0	$13,705.0	$729.7	$189.8	$25.2	$944.7	$12.9	$139.6	$253.9
2035	88.4	816.6	$7,297.8	$14,730.4	$794.1	$204.1	$27.1	$1,025.2	$13.9	$150.0	$276.1
2036	92.5	858.1	$7,776.0	$15,680.4	$860.3	$217.2	$28.8	$1,106.3	$14.8	$159.7	$298.2

1. Revenues from the oil and gas conservation fee fund the Division of Oil, Gas and Mining.

Source: BEBR analysis.

Table 13.3
Oil and Gas Forecast 3—Reference Prices, 50% on Existing & 100% on New Royalty Sharing, Baseline +15% Drilling, 12.5% Royalty
(Dollar Amounts in Millions of Constant 2013 Dollars)

Year	Oil Volume (million bbls)	Gas Volume (bcf)	Federal Value	Total Value	State Royalties	Severance Tax	Sales Tax	State Total	Conservation Fee[1]	County Property Taxes	SITLA Royalties
2017	41.8	461.9	$2,454.4	$5,252.3	$163.0	$72.8	$9.6	$245.4	$4.9	$53.5	$87.8
2018	42.6	465.2	$2,561.9	$5,433.7	$185.4	$75.3	$10.0	$270.7	$5.1	$55.3	$93.0
2019	43.7	471.7	$2,614.5	$5,521.9	$200.9	$76.5	$10.1	$287.5	$5.2	$56.2	$93.6
2020	45.2	480.3	$2,724.1	$5,745.4	$221.0	$79.6	$10.6	$311.1	$5.4	$58.5	$97.1
2021	46.8	493.9	$2,930.8	$6,128.4	$249.5	$84.9	$11.3	$345.6	$5.8	$62.4	$105.2
2022	48.7	506.9	$3,145.8	$6,514.6	$279.6	$90.2	$12.0	$381.8	$6.1	$66.4	$113.1
2023	51.1	522.5	$3,382.5	$6,961.0	$312.0	$96.4	$12.8	$421.2	$6.5	$70.9	$122.0
2024	53.5	542.9	$3,632.3	$7,440.8	$346.5	$103.1	$13.7	$463.2	$7.0	$75.8	$131.6
2025	56.7	569.0	$3,925.1	$8,004.2	$380.3	$110.9	$14.7	$505.9	$7.5	$81.5	$141.8
2026	59.2	589.0	$4,209.2	$8,495.4	$414.1	$117.7	$15.6	$547.4	$8.0	$86.5	$152.1
2027	62.4	613.4	$4,528.0	$9,081.5	$452.8	$125.8	$16.7	$595.3	$8.5	$92.5	$163.9
2028	65.9	640.5	$4,871.7	$9,717.9	$493.3	$134.6	$17.8	$645.8	$9.1	$99.0	$176.9
2029	69.2	670.8	$5,248.8	$10,426.1	$541.8	$144.4	$19.1	$705.4	$9.8	$106.2	$192.1
2030	72.7	699.6	$5,651.4	$11,152.7	$591.5	$154.5	$20.5	$766.4	$10.5	$113.6	$208.2
2031	76.8	734.6	$6,085.5	$11,978.7	$644.1	$165.9	$22.0	$832.0	$11.3	$122.0	$225.1
2032	80.7	772.5	$6,586.8	$12,861.8	$700.5	$178.2	$23.6	$902.3	$12.1	$131.0	$244.6
2033	84.6	809.8	$7,072.4	$13,754.3	$763.4	$190.5	$25.3	$979.2	$12.9	$140.1	$264.1
2034	89.4	846.2	$7,589.5	$14,738.2	$826.2	$204.2	$27.1	$1,057.4	$13.9	$150.1	$284.9
2035	94.3	894.3	$8,205.0	$15,857.1	$899.6	$219.7	$29.1	$1,148.4	$14.9	$161.5	$310.5
2036	98.7	941.8	$8,764.4	$16,893.6	$974.3	$234.0	$31.0	$1,239.4	$15.9	$172.1	$334.6

1. Revenues from the oil and gas conservation fee fund the Division of Oil, Gas and Mining.
Source: BEBR analysis.

Table 13.4
Oil and Gas Forecast 4—Reference Prices, 50% on Existing & 100% on New Royalty Sharing, Baseline +15% Drilling, 16.7% Royalty
(Dollar Amounts in Millions of Constant 2013 Dollars)

Year	Oil Volume (million bbls)	Gas Volume (bcf)	Federal Value	Total Value	State Royalties	Severance Tax	Sales Tax	State Total	Conservation Fee[1]	County Property Taxes	SITLA Royalties
2017	41.7	456.8	$2,437.6	$5,222.1	$183.3	$72.3	$9.6	$265.3	$4.9	$53.2	$87.8
2018	42.2	456.6	$2,520.0	$5,362.0	$211.0	$74.3	$9.8	$295.2	$5.0	$54.6	$93.0
2019	43.0	459.0	$2,546.2	$5,407.1	$232.0	$74.9	$9.9	$316.8	$5.1	$55.1	$93.6
2020	44.0	461.3	$2,626.9	$5,568.5	$256.0	$77.1	$10.2	$343.3	$5.2	$56.7	$97.1
2021	45.2	467.8	$2,791.2	$5,881.9	$287.7	$81.5	$10.8	$379.9	$5.5	$59.9	$105.2
2022	46.8	474.5	$2,959.4	$6,195.1	$319.0	$85.8	$11.4	$416.2	$5.8	$63.1	$113.1
2023	48.2	488.4	$3,158.3	$6,547.1	$356.9	$90.7	$12.0	$459.6	$6.2	$66.7	$122.0
2024	50.3	504.4	$3,371.7	$6,964.0	$399.9	$96.5	$12.8	$509.1	$6.6	$70.9	$131.6
2025	52.4	517.4	$3,583.7	$7,355.2	$440.7	$101.9	$13.5	$556.1	$6.9	$74.9	$141.8
2026	55.0	539.4	$3,847.8	$7,851.8	$487.4	$108.8	$14.4	$610.6	$7.4	$80.0	$152.1
2027	57.4	562.1	$4,104.1	$8,337.0	$530.9	$115.5	$15.3	$661.7	$7.8	$84.9	$163.9
2028	59.6	579.2	$4,364.9	$8,796.1	$586.6	$121.8	$16.2	$724.6	$8.3	$89.6	$176.9
2029	62.2	597.9	$4,660.0	$9,344.0	$641.7	$129.4	$17.2	$788.3	$8.8	$95.2	$192.1
2030	65.3	618.6	$4,993.8	$9,953.5	$695.7	$137.9	$18.3	$851.9	$9.4	$101.4	$208.2
2031	68.0	642.6	$5,326.3	$10,559.4	$754.0	$146.3	$19.4	$919.7	$9.9	$107.6	$225.1
2032	71.3	670.8	$5,708.3	$11,292.5	$816.0	$156.4	$20.7	$993.2	$10.6	$115.0	$244.6
2033	74.4	702.6	$6,126.3	$12,032.8	$892.2	$166.7	$22.1	$1,081.0	$11.3	$122.6	$264.1
2034	78.2	734.4	$6,541.8	$12,854.1	$960.4	$178.1	$23.6	$1,162.0	$12.1	$130.9	$284.9
2035	81.6	769.4	$7,018.3	$13,692.3	$1,037.0	$189.7	$25.1	$1,251.8	$12.9	$139.5	$310.5
2036	86.0	807.7	$7,487.7	$14,643.9	$1,121.7	$202.9	$26.9	$1,351.4	$13.8	$149.2	$334.6

1. Revenues from the oil and gas conservation fee fund the Division of Oil, Gas and Mining.
Source: BEBR analysis.

Table 13.5
Oil and Gas Forecast 5—Reference Prices, 100% on Existing & 100% on New Royalty Sharing, Baseline +15% Drilling, 16.7% Royalty
(Dollar Amounts in Millions of Constant 2013 Dollars)

Year	Oil Volume (million bbls)	Gas Volume (bcf)	Federal Value	Total Value	State Royalties	Severance Tax	Sales Tax	State Total	Conservation Fee[1]	County Property Taxes	SITLA Royalties
2017	41.7	456.8	$2,437.6	$5,222.1	$340.1	$72.3	$9.6	$422.0	$4.9	$53.2	$87.8
2018	42.2	456.6	$2,520.0	$5,362.0	$356.8	$74.3	$9.8	$440.9	$5.0	$54.6	$93.0
2019	43.0	459.0	$2,546.2	$5,407.1	$365.5	$74.9	$9.9	$450.3	$5.1	$55.1	$93.6
2020	44.0	461.3	$2,626.9	$5,568.5	$381.5	$77.1	$10.2	$468.9	$5.2	$56.7	$97.1
2021	45.2	467.8	$2,791.2	$5,881.9	$409.4	$81.5	$10.8	$501.7	$5.5	$59.9	$105.2
2022	46.8	474.5	$2,959.4	$6,195.1	$438.4	$85.8	$11.4	$535.6	$5.8	$63.1	$113.1
2023	48.2	488.4	$3,158.3	$6,547.1	$472.3	$90.7	$12.0	$575.0	$6.2	$66.7	$122.0
2024	50.3	504.4	$3,371.7	$6,964.0	$508.5	$96.5	$12.8	$617.7	$6.6	$70.9	$131.6
2025	52.4	517.4	$3,583.7	$7,355.2	$544.5	$101.9	$13.5	$659.9	$6.9	$74.9	$141.8
2026	55.0	539.4	$3,847.8	$7,851.8	$589.2	$108.8	$14.4	$712.4	$7.4	$80.0	$152.1
2027	57.4	562.1	$4,104.1	$8,337.0	$632.5	$115.5	$15.3	$763.3	$7.8	$84.9	$163.9
2028	59.6	579.2	$4,364.9	$8,796.1	$676.4	$121.8	$16.2	$814.4	$8.3	$89.6	$176.9
2029	62.2	597.9	$4,660.0	$9,344.0	$725.8	$129.4	$17.2	$872.4	$8.8	$95.2	$192.1
2030	65.3	618.6	$4,993.8	$9,953.5	$781.6	$137.9	$18.3	$937.7	$9.4	$101.4	$208.2
2031	68.0	642.6	$5,326.3	$10,559.4	$837.2	$146.3	$19.4	$1,002.9	$9.9	$107.6	$225.1
2032	71.3	670.8	$5,708.3	$11,292.5	$901.0	$156.4	$20.7	$1,078.1	$10.6	$115.0	$244.6
2033	74.4	702.6	$6,126.3	$12,032.8	$970.7	$166.7	$22.1	$1,159.5	$11.3	$122.6	$264.1
2034	78.2	734.4	$6,541.8	$12,854.1	$1,040.2	$178.1	$23.6	$1,241.8	$12.1	$130.9	$284.9
2035	81.6	769.4	$7,018.3	$13,692.3	$1,119.6	$189.7	$25.1	$1,334.4	$12.9	$139.5	$310.5
2036	86.0	807.7	$7,487.7	$14,643.9	$1,198.1	$202.9	$26.9	$1,427.9	$13.8	$149.2	$334.6

1. Revenues from the oil and gas conservation fee fund the Division of Oil, Gas and Mining.

Source: BEBR analysis.

Table 13.6
Oil and Gas Forecast 6—Low Price Baseline: 50% on Existing & 50% on New Royalty Sharing, Baseline Drilling, 12.5% Royalty
(Dollar Amounts in Millions of Constant 2013 Dollars)

Year	Oil Volume (million bbls)	Gas Volume (bcf)	Federal Value	Total Value	State Royalties	Severance Tax	Sales Tax	State Total	Conservation Fee[1]	County Property Taxes	SITLA Royalties
2017	40.5	436.9	$2,081.9	$4,629.5	$130.1	$64.1	$8.5	$202.7	$4.4	$47.2	$70.1
2018	41.1	431.9	$2,059.5	$4,570.5	$128.7	$63.3	$8.4	$200.4	$4.3	$46.6	$70.0
2019	41.6	429.0	$2,038.2	$4,507.6	$127.4	$62.4	$8.3	$198.1	$4.2	$45.9	$69.5
2020	42.0	427.5	$2,012.3	$4,437.2	$125.8	$61.5	$8.1	$195.4	$4.2	$45.2	$68.7
2021	42.2	425.2	$1,981.5	$4,354.7	$123.8	$60.3	$8.0	$192.2	$4.1	$44.4	$68.0
2022	42.5	422.0	$1,951.5	$4,275.1	$122.0	$59.2	$7.9	$189.0	$4.0	$43.5	$67.0
2023	42.8	418.6	$1,915.7	$4,189.6	$119.7	$58.0	$7.7	$185.5	$3.9	$42.7	$65.9
2024	43.0	416.8	$1,881.0	$4,105.6	$117.6	$56.9	$7.5	$182.0	$3.9	$41.8	$64.8
2025	43.0	414.6	$1,840.8	$4,007.1	$115.1	$55.5	$7.4	$177.9	$3.8	$40.8	$63.8
2026	42.9	411.7	$1,792.3	$3,901.7	$112.0	$54.0	$7.2	$173.2	$3.7	$39.7	$62.4
2027	42.9	408.1	$1,752.6	$3,798.4	$109.5	$52.6	$7.0	$169.1	$3.6	$38.7	$61.1
2028	42.7	404.0	$1,705.7	$3,682.7	$106.6	$51.0	$6.8	$164.4	$3.5	$37.5	$59.7
2029	42.8	401.0	$1,657.3	$3,584.1	$103.6	$49.6	$6.6	$159.8	$3.4	$36.5	$58.2
2030	42.7	397.3	$1,613.6	$3,477.7	$100.8	$48.2	$6.4	$155.4	$3.3	$35.4	$56.8
2031	42.6	393.5	$1,565.5	$3,370.5	$97.8	$46.7	$6.2	$150.7	$3.2	$34.3	$55.4
2032	42.3	390.7	$1,515.7	$3,255.6	$94.7	$45.1	$6.0	$145.8	$3.1	$33.2	$54.2
2033	42.0	386.4	$1,465.4	$3,139.1	$91.6	$43.5	$5.8	$140.8	$3.0	$32.0	$52.5
2034	41.7	381.2	$1,410.2	$3,021.2	$88.1	$41.9	$5.5	$135.5	$2.8	$30.8	$50.7
2035	41.4	376.2	$1,357.8	$2,905.1	$84.9	$40.2	$5.3	$130.4	$2.7	$29.6	$49.2
2036	41.1	373.1	$1,304.9	$2,794.6	$81.6	$38.7	$5.1	$125.4	$2.6	$28.5	$47.6

1. Revenues from the oil and gas conservation fee fund the Division of Oil, Gas and Mining.

Source: BEBR analysis.

Table 13.7
Oil and Gas Forecast 7—Low Prices, 50% on Existing & 100% on New Royalty Sharing, Baseline Drilling, 12.5% Royalty
(Dollar Amounts in Millions of Constant 2013 Dollars)

Year	Oil Volume (million bbls)	Gas Volume (bcf)	Federal Value	Total Value	State Royalties	Severance Tax	Sales Tax	State Total	Conservation Fee[1]	County Property Taxes	SITLA Royalties
2017	40.5	436.9	$2,081.9	$4,629.5	$138.1	$64.1	$8.5	$210.7	$4.4	$47.2	$70.1
2018	41.1	431.9	$2,059.5	$4,570.5	$147.6	$63.3	$8.4	$219.3	$4.3	$46.6	$70.0
2019	41.6	429.0	$2,038.2	$4,507.6	$154.7	$62.4	$8.3	$225.4	$4.2	$45.9	$69.5
2020	42.0	427.5	$2,012.3	$4,437.2	$159.4	$61.5	$8.1	$229.0	$4.2	$45.2	$68.7
2021	42.2	425.2	$1,981.5	$4,354.7	$163.4	$60.3	$8.0	$231.7	$4.1	$44.4	$68.0
2022	42.5	422.0	$1,951.5	$4,275.1	$164.3	$59.2	$7.9	$231.4	$4.0	$43.5	$67.0
2023	42.8	418.6	$1,915.7	$4,189.6	$164.5	$58.0	$7.7	$230.2	$3.9	$42.7	$65.9
2024	43.0	416.8	$1,881.0	$4,105.6	$163.0	$56.9	$7.5	$227.4	$3.9	$41.8	$64.8
2025	43.0	414.6	$1,840.8	$4,007.1	$161.8	$55.5	$7.4	$224.7	$3.8	$40.8	$63.8
2026	42.9	411.7	$1,792.3	$3,901.7	$159.8	$54.0	$7.2	$221.0	$3.7	$39.7	$62.4
2027	42.9	408.1	$1,752.6	$3,798.4	$157.4	$52.6	$7.0	$217.0	$3.6	$38.7	$61.1
2028	42.7	404.0	$1,705.7	$3,682.7	$154.9	$51.0	$6.8	$212.7	$3.5	$37.5	$59.7
2029	42.8	401.0	$1,657.3	$3,584.1	$152.0	$49.6	$6.6	$208.2	$3.4	$36.5	$58.2
2030	42.7	397.3	$1,613.6	$3,477.7	$148.7	$48.2	$6.4	$203.3	$3.3	$35.4	$56.8
2031	42.6	393.5	$1,565.5	$3,370.5	$145.2	$46.7	$6.2	$198.1	$3.2	$34.3	$55.4
2032	42.3	390.7	$1,515.7	$3,255.6	$141.1	$45.1	$6.0	$192.2	$3.1	$33.2	$54.2
2033	42.0	386.4	$1,465.4	$3,139.1	$137.5	$43.5	$5.8	$186.8	$3.0	$32.0	$52.5
2034	41.7	381.2	$1,410.2	$3,021.2	$132.9	$41.9	$5.5	$180.3	$2.8	$30.8	$50.7
2035	41.4	376.2	$1,357.8	$2,905.1	$129.0	$40.2	$5.3	$174.6	$2.7	$29.6	$49.2
2036	41.1	373.1	$1,304.9	$2,794.6	$124.3	$38.7	$5.1	$168.2	$2.6	$28.5	$47.6

1. Revenues from the oil and gas conservation fee fund the Division of Oil, Gas and Mining.
Source: BEBR analysis.

Table 13.8
Oil and Gas Forecast 8—Low Prices, 50% on Existing & 100% on New Royalty Sharing, Baseline +15% Drilling, 12.5% Royalty
(Dollar Amounts in Millions of Constant 2013 Dollars)

Year	Oil Volume (million bbls)	Gas Volume (bcf)	Federal Value	Total Value	State Royalties	Severance Tax	Sales Tax	State Total	Conservation Fee[1]	County Property Taxes	SITLA Royalties
2017	41.5	449.1	$2,178.3	$4,747.3	$144.9	$65.8	$8.7	$219.4	$4.5	$48.4	$73.3
2018	42.3	446.1	$2,176.5	$4,703.6	$156.7	$65.2	$8.6	$230.5	$4.4	$47.9	$73.6
2019	42.9	445.5	$2,164.9	$4,655.4	$165.8	$64.5	$8.6	$238.8	$4.4	$47.4	$73.5
2020	43.4	445.3	$2,148.2	$4,599.1	$172.1	$63.7	$8.4	$244.2	$4.3	$46.8	$73.2
2021	43.8	444.0	$2,124.9	$4,529.4	$177.3	$62.7	$8.3	$248.3	$4.3	$46.1	$72.8
2022	44.3	442.2	$2,095.5	$4,459.3	$179.5	$61.8	$8.2	$249.5	$4.2	$45.4	$72.0
2023	44.5	439.6	$2,064.3	$4,368.2	$180.3	$60.5	$8.0	$248.8	$4.1	$44.5	$71.0
2024	44.7	438.3	$2,032.5	$4,282.8	$179.2	$59.3	$7.9	$246.4	$4.0	$43.6	$70.1
2025	44.8	436.5	$1,989.1	$4,192.1	$177.7	$58.1	$7.7	$243.5	$3.9	$42.7	$69.0
2026	44.9	434.1	$1,943.8	$4,091.2	$175.8	$56.7	$7.5	$239.9	$3.8	$41.7	$67.6
2027	44.9	430.5	$1,899.6	$3,984.3	$173.6	$55.2	$7.3	$236.1	$3.7	$40.6	$66.4
2028	44.6	427.0	$1,850.3	$3,863.3	$170.8	$53.5	$7.1	$231.4	$3.6	$39.4	$64.7
2029	44.6	424.5	$1,802.5	$3,759.4	$167.8	$52.1	$6.9	$226.7	$3.5	$38.3	$63.2
2030	44.6	420.9	$1,752.6	$3,653.3	$164.2	$50.6	$6.7	$221.5	$3.4	$37.2	$61.8
2031	44.4	417.0	$1,704.1	$3,533.9	$160.6	$49.0	$6.5	$216.0	$3.3	$36.0	$60.3
2032	44.1	413.9	$1,649.1	$3,415.7	$156.5	$47.3	$6.3	$210.1	$3.2	$34.8	$59.0
2033	43.9	410.1	$1,596.6	$3,298.8	$152.4	$45.7	$6.1	$204.1	$3.1	$33.6	$57.5
2034	43.6	404.6	$1,539.6	$3,179.1	$147.5	$44.0	$5.8	$197.4	$3.0	$32.4	$55.5
2035	43.2	399.6	$1,481.4	$3,054.0	$142.8	$42.3	$5.6	$190.8	$2.9	$31.1	$53.7
2036	42.9	396.5	$1,425.6	$2,939.3	$138.0	$40.7	$5.4	$184.1	$2.8	$29.9	$52.1

1. Revenues from the oil and gas conservation fee fund the Division of Oil, Gas and Mining.
Source: BEBR analysis.

Table 13.9
Oil and Gas Forecast 9—Low Prices, 50% on Existing & 100% on New Royalty Sharing, Baseline +15% Drilling, 16.7% Royalty
(Dollar Amounts in Millions of Constant 2013 Dollars)

Year	Oil Volume (million bbls)	Gas Volume (bcf)	Federal Value	Total Value	State Royalties	Severance Tax	Sales Tax	State Total	Conservation Fee[1]	County Property Taxes	SITLA Royalties
2017	41.5	449.4	$2,175.2	$4,744.8	$161.3	$65.7	$8.7	$235.8	$4.5	$48.3	$73.3
2018	41.9	444.6	$2,156.9	$4,674.6	$175.7	$64.8	$8.6	$249.0	$4.4	$47.6	$73.6
2019	42.1	441.7	$2,124.9	$4,584.1	$185.1	$63.5	$8.4	$257.0	$4.3	$46.7	$73.5
2020	42.4	436.9	$2,090.5	$4,500.1	$192.9	$62.3	$8.3	$263.5	$4.2	$45.8	$73.2
2021	42.3	433.7	$2,051.7	$4,391.6	$197.7	$60.8	$8.1	$266.6	$4.1	$44.7	$72.8
2022	42.4	430.2	$2,012.8	$4,295.3	$200.7	$59.5	$7.9	$268.1	$4.0	$43.8	$72.0
2023	42.6	427.1	$1,975.2	$4,202.7	$202.8	$58.2	$7.7	$268.7	$4.0	$42.8	$71.0
2024	42.7	423.4	$1,934.3	$4,106.8	$203.2	$56.9	$7.5	$267.7	$3.9	$41.8	$70.1
2025	42.7	421.0	$1,891.4	$4,007.3	$203.2	$55.5	$7.4	$266.0	$3.8	$40.8	$69.0
2026	42.8	417.4	$1,849.7	$3,912.5	$201.3	$54.2	$7.2	$262.7	$3.7	$39.9	$67.6
2027	42.9	414.3	$1,810.1	$3,814.9	$198.5	$52.8	$7.0	$258.4	$3.6	$38.9	$66.4
2028	42.8	410.9	$1,766.2	$3,708.0	$195.4	$51.4	$6.8	$253.5	$3.5	$37.8	$64.7
2029	42.7	406.6	$1,711.9	$3,599.1	$192.6	$49.9	$6.6	$249.1	$3.4	$36.7	$63.2
2030	42.5	401.5	$1,659.7	$3,480.5	$188.8	$48.2	$6.4	$243.4	$3.3	$35.5	$61.8
2031	42.3	395.9	$1,609.8	$3,364.3	$185.1	$46.6	$6.2	$237.9	$3.2	$34.3	$60.3
2032	42.2	390.8	$1,560.8	$3,250.6	$180.4	$45.0	$6.0	$231.4	$3.1	$33.1	$59.0
2033	41.9	387.9	$1,510.1	$3,140.7	$175.9	$43.5	$5.8	$225.2	$3.0	$32.0	$57.5
2034	41.7	384.4	$1,458.7	$3,030.1	$170.5	$42.0	$5.6	$218.1	$2.9	$30.9	$55.5
2035	41.4	380.3	$1,410.3	$2,915.6	$165.0	$40.4	$5.4	$210.7	$2.7	$29.7	$53.7
2036	41.0	376.4	$1,355.8	$2,803.2	$159.6	$38.8	$5.1	$203.6	$2.6	$28.6	$52.1

1. Revenues from the oil and gas conservation fee fund the Division of Oil, Gas and Mining.

Source: BEBR analysis.

Table 13.10
Oil and Gas Forecast 10—Low Prices, 100% on Existing & 100% on New Royalty Sharing, Baseline +15% Drilling, 16.7% Royalty
(Dollar Amounts in Millions of Constant 2013 Dollars)

Year	Oil Volume (million bbls)	Gas Volume (bcf)	Federal Value	Total Value	State Royalties	Severance Tax	Sales Tax	State Total	Conservation Fee[1]	County Property Taxes	SITLA Royalties
2017	41.5	449.4	$2,175.2	$4,744.8	$303.2	$65.7	$8.7	$377.6	$4.5	$48.3	$73.3
2018	41.9	444.6	$2,156.9	$4,674.6	$304.9	$64.8	$8.6	$378.2	$4.4	$47.6	$73.6
2019	42.1	441.7	$2,124.9	$4,584.1	$303.6	$63.5	$8.4	$375.5	$4.3	$46.7	$73.5
2020	42.4	436.9	$2,090.5	$4,500.1	$301.3	$62.3	$8.3	$371.9	$4.2	$45.8	$73.2
2021	42.3	433.7	$2,051.7	$4,391.6	$297.6	$60.8	$8.1	$366.5	$4.1	$44.7	$72.8
2022	42.4	430.2	$2,012.8	$4,295.3	$293.8	$59.5	$7.9	$361.2	$4.0	$43.8	$72.0
2023	42.6	427.1	$1,975.2	$4,202.7	$289.8	$58.2	$7.7	$355.8	$4.0	$42.8	$71.0
2024	42.7	423.4	$1,934.3	$4,106.8	$285.1	$56.9	$7.5	$349.5	$3.9	$41.8	$70.1
2025	42.7	421.0	$1,891.4	$4,007.3	$279.8	$55.5	$7.4	$342.7	$3.8	$40.8	$69.0
2026	42.8	417.4	$1,849.7	$3,912.5	$274.7	$54.2	$7.2	$336.1	$3.7	$39.9	$67.6
2027	42.9	414.3	$1,810.1	$3,814.9	$269.7	$52.8	$7.0	$329.6	$3.6	$38.9	$66.4
2028	42.8	410.9	$1,766.2	$3,708.0	$263.9	$51.4	$6.8	$322.1	$3.5	$37.8	$64.7
2029	42.7	406.6	$1,711.9	$3,599.1	$256.3	$49.9	$6.6	$312.8	$3.4	$36.7	$63.2
2030	42.5	401.5	$1,659.7	$3,480.5	$248.9	$48.2	$6.4	$303.5	$3.3	$35.5	$61.8
2031	42.3	395.9	$1,609.8	$3,364.3	$241.9	$46.6	$6.2	$294.6	$3.2	$34.3	$60.3
2032	42.2	390.8	$1,560.8	$3,250.6	$234.9	$45.0	$6.0	$285.9	$3.1	$33.1	$59.0
2033	41.9	387.9	$1,510.1	$3,140.7	$227.6	$43.5	$5.8	$276.8	$3.0	$32.0	$57.5
2034	41.7	384.4	$1,458.7	$3,030.1	$220.1	$42.0	$5.6	$267.6	$2.9	$30.9	$55.5
2035	41.4	380.3	$1,410.3	$2,915.6	$213.1	$40.4	$5.4	$258.8	$2.7	$29.7	$53.7
2036	41.0	376.4	$1,355.8	$2,803.2	$205.0	$38.8	$5.1	$248.9	$2.6	$28.6	$52.1

1. Revenues from the oil and gas conservation fee fund the Division of Oil, Gas and Mining.

Source: BEBR analysis.

Table 13.11
Oil and Gas Forecast 11—Reference Prices, 100% on Existing & 100% on New Royalty Sharing, Baseline +15% Drilling, 12.5% Royalty
(Dollar Amounts in Millions of Constant 2013 Dollars)

Year	Oil Volume (million bbls)	Gas Volume (bcf)	Federal Value	Total Value	State Royalties	Severance Tax	Sales Tax	State Total	Conservation Fee[1]	County Property Taxes	SITLA Royalties
2017	41.8	461.9	$2,454.4	$5,252.3	$306.8	$72.8	$9.6	$389.2	$4.9	$53.5	$87.8
2018	42.6	465.2	$2,561.9	$5,433.7	$320.2	$75.3	$10.0	$405.5	$5.1	$55.3	$93.0
2019	43.7	471.7	$2,614.5	$5,521.9	$326.8	$76.5	$10.1	$413.4	$5.2	$56.2	$93.6
2020	45.2	480.3	$2,724.1	$5,745.4	$340.5	$79.6	$10.6	$430.7	$5.4	$58.5	$97.1
2021	46.8	493.9	$2,930.8	$6,128.4	$366.4	$84.9	$11.3	$462.5	$5.8	$62.4	$105.2
2022	48.7	506.9	$3,145.8	$6,514.6	$393.2	$90.2	$12.0	$495.4	$6.1	$66.4	$113.1
2023	51.1	522.5	$3,382.5	$6,961.0	$422.8	$96.4	$12.8	$532.0	$6.5	$70.9	$122.0
2024	53.5	542.9	$3,632.3	$7,440.8	$454.0	$103.1	$13.7	$570.8	$7.0	$75.8	$131.6
2025	56.7	569.0	$3,925.1	$8,004.2	$490.6	$110.9	$14.7	$616.2	$7.5	$81.5	$141.8
2026	59.2	589.0	$4,209.2	$8,495.4	$526.1	$117.7	$15.6	$659.4	$8.0	$86.5	$152.1
2027	62.4	613.4	$4,528.0	$9,081.5	$566.0	$125.8	$16.7	$708.5	$8.5	$92.5	$163.9
2028	65.9	640.5	$4,871.7	$9,717.9	$609.0	$134.6	$17.8	$761.4	$9.1	$99.0	$176.9
2029	69.2	670.8	$5,248.8	$10,426.1	$656.1	$144.4	$19.1	$819.7	$9.8	$106.2	$192.1
2030	72.7	699.6	$5,651.4	$11,152.7	$706.4	$154.5	$20.5	$881.4	$10.5	$113.6	$208.2
2031	76.8	734.6	$6,085.5	$11,978.7	$760.7	$165.9	$22.0	$948.6	$11.3	$122.0	$225.1
2032	80.7	772.5	$6,586.8	$12,861.8	$823.4	$178.2	$23.6	$1,025.1	$12.1	$131.0	$244.6
2033	84.6	809.8	$7,072.4	$13,754.3	$884.0	$190.5	$25.3	$1,099.8	$12.9	$140.1	$264.1
2034	89.4	846.2	$7,589.5	$14,738.2	$948.7	$204.2	$27.1	$1,179.9	$13.9	$150.1	$284.9
2035	94.3	894.3	$8,205.0	$15,857.1	$1,025.6	$219.7	$29.1	$1,274.4	$14.9	$161.5	$310.5
2036	98.7	941.8	$8,764.4	$16,893.6	$1,095.6	$234.0	$31.0	$1,360.6	$15.9	$172.1	$334.6

1. Revenues from the oil and gas conservation fee fund the Division of Oil, Gas and Mining.
Source: BEBR analysis.

Table 13.12
Oil and Gas Forecast 12—Low Prices, 100% on Existing & 100% on New Royalty Sharing, Baseline +15% Drilling, 12.5% Royalty
(Dollar Amounts in Millions of Constant 2013 Dollars)

Year	Oil Volume (million bbls)	Gas Volume (bcf)	Federal Value	Total Value	State Royalties	Severance Tax	Sales Tax	State Total	Conservation Fee[1]	County Property Taxes	SITLA Royalties
2017	41.5	449.1	$2,178.3	$4,747.3	$272.3	$65.8	$8.7	$346.8	$4.5	$48.4	$73.3
2018	42.3	446.1	$2,176.5	$4,703.6	$272.1	$65.2	$8.6	$345.9	$4.4	$47.9	$73.6
2019	42.9	445.5	$2,164.9	$4,655.4	$270.6	$64.5	$8.6	$343.7	$4.4	$47.4	$73.5
2020	43.4	445.3	$2,148.2	$4,599.1	$268.5	$63.7	$8.4	$340.7	$4.3	$46.8	$73.2
2021	43.8	444.0	$2,124.9	$4,529.4	$265.6	$62.7	$8.3	$336.7	$4.3	$46.1	$72.8
2022	44.3	442.2	$2,095.5	$4,459.3	$261.9	$61.8	$8.2	$331.9	$4.2	$45.4	$72.0
2023	44.5	439.6	$2,064.3	$4,368.2	$258.0	$60.5	$8.0	$326.6	$4.1	$44.5	$71.0
2024	44.7	438.3	$2,032.5	$4,282.8	$254.1	$59.3	$7.9	$321.3	$4.0	$43.6	$70.1
2025	44.8	436.5	$1,989.1	$4,192.1	$248.6	$58.1	$7.7	$314.4	$3.9	$42.7	$69.0
2026	44.9	434.1	$1,943.8	$4,091.2	$243.0	$56.7	$7.5	$307.2	$3.8	$41.7	$67.6
2027	44.9	430.5	$1,899.6	$3,984.3	$237.5	$55.2	$7.3	$300.0	$3.7	$40.6	$66.4
2028	44.6	427.0	$1,850.3	$3,863.3	$231.3	$53.5	$7.1	$291.9	$3.6	$39.4	$64.7
2029	44.6	424.5	$1,802.5	$3,759.4	$225.3	$52.1	$6.9	$284.3	$3.5	$38.3	$63.2
2030	44.6	420.9	$1,752.6	$3,653.3	$219.1	$50.6	$6.7	$276.4	$3.4	$37.2	$61.8
2031	44.4	417.0	$1,704.1	$3,533.9	$213.0	$49.0	$6.5	$268.5	$3.3	$36.0	$60.3
2032	44.1	413.9	$1,649.1	$3,415.7	$206.1	$47.3	$6.3	$259.7	$3.2	$34.8	$59.0
2033	43.9	410.1	$1,596.6	$3,298.8	$199.6	$45.7	$6.1	$251.3	$3.1	$33.6	$57.5
2034	43.6	404.6	$1,539.6	$3,179.1	$192.4	$44.0	$5.8	$242.3	$3.0	$32.4	$55.5
2035	43.2	399.6	$1,481.4	$3,054.0	$185.2	$42.3	$5.6	$233.1	$2.9	$31.1	$53.7
2036	42.9	396.5	$1,425.6	$2,939.3	$178.2	$40.7	$5.4	$224.3	$2.8	$29.9	$52.1

1. Revenues from the oil and gas conservation fee fund the Division of Oil, Gas and Mining.
Source: BEBR analysis.

13.2 Economic and Fiscal Impacts of Oil and Gas Scenarios

The essence of economic impact evaluation is the identification of the magnitude and composition of spending in a regional export sector, and the additional spending and income that this generates for a region. The idea of impact analysis is that the export sector generates jobs and spending in the region. These exports support additional business activity (i.e., purchases by the mining operation from in-region firms). In the case of oil and gas and coal production, these activities generate economic impacts when the products are either exported out of state or consumed in-state and that consumption would have otherwise been supplied by imports ("import substitution"). Utah exports about half of its natural gas production, but consumes more petroleum products than its crude oil production can supply. In recent years, the state has also exported one-quarter to one-third of its coal, with the remainder consumed in-state, mostly at electric power plants. Nearly all of this local consumption of oil, gas and coal would have to be supplied by imports if there were no local production.

The model used to calculate the impacts of both oil and gas and coal production scenarios is the 23-sector REMI PI+ model built for the state of Utah. The economic impacts estimated in this report are employment (full- and part-time jobs, counted equally, of wage and salary workers, proprietors, and active partners), earnings (wages and salaries, supplements to wages and salaries, and proprietors' income), and gross state product (the market value of goods and services produced by labor and property in the state). We also estimate state and county revenues from income taxes and retail purchases. The oil and gas production scenarios in Section 13.1 include estimated state revenues from royalties, the oil and gas severance tax, the oil and gas conservation fee, and taxable business investments, and estimated county property tax collections.

In this analysis, impacts are analyzed from 2017 (oil and gas) or 2015 (coal) through 2035. The analytical structure of the REMI model is explained in greater detail in Appendix E: Economic Impact Modeling.

Since production levels drive our economic impacts, there were only three oil and gas production scenarios under each price forecast that would generate different economic impacts: the baseline, a 15 percent increase in wells at the baseline 12.5 percent royalty rate, and a 15 percent increase in wells at a 16.7 percent royalty rate. The other scenarios described in Section 13.1 change only the royalty sharing formula, which does not affect production levels. To calculate the economic impacts of these scenarios, we used the Reference Price and Low Price baseline production forecasts to create baseline economic forecasts in REMI. From each of these we then computed impacts based on the difference in production levels from the baseline. From the earnings impacts generated by REMI, we estimated state income tax revenues and state and local sales tax revenues based on historic ratios of tax collections to earnings.

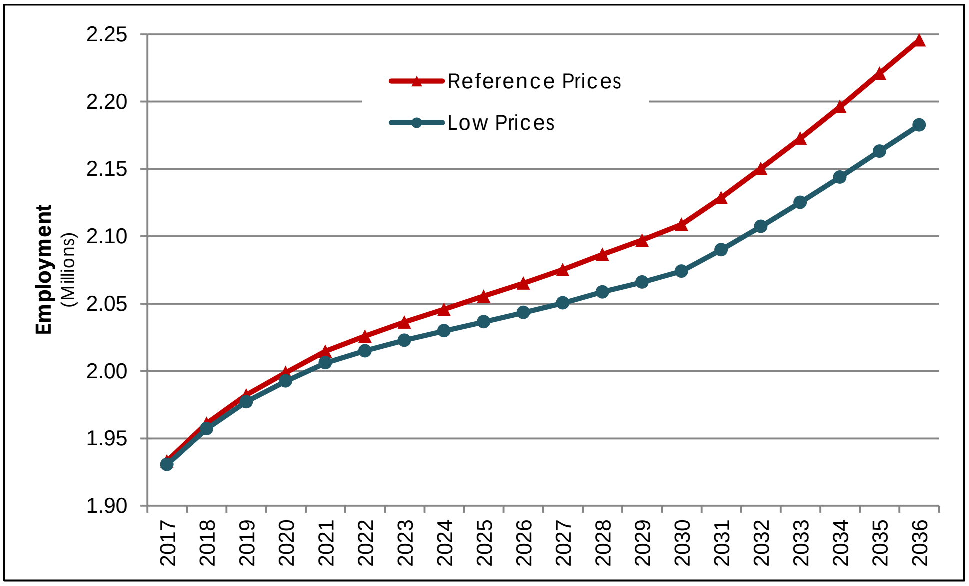
13.2.1 Comparison of Baseline Forecasts

Figures 13.3a through 13.3c compare the Reference Price and Low Price baseline forecasts across employment,[302] earnings[303] and gross state product (GSP).[304] From these figures it be-

[302] Job counts are both full- and part-time jobs, counted equally, and cover wage-and-salary jobs, proprietors and active partners.

comes evident that the differences in the two economic forecasts are relatively small. Total employment in both scenarios begins at 1.93 million in 2017. Under the Reference Price baseline, employment grows 15 percent to 2.22 million in 2036, while under the Low Price baseline it grows 12 percent to 2.16 million. In 2036, forecast employment under the Reference Price baseline is just 3 percent higher than under the Low Price baseline (Figure 13.3a).

Figure 13.3a
Employment Forecasts of Oil and Gas Baseline Production Scenarios,
Reference Prices vs. Low Prices, 2015–2035

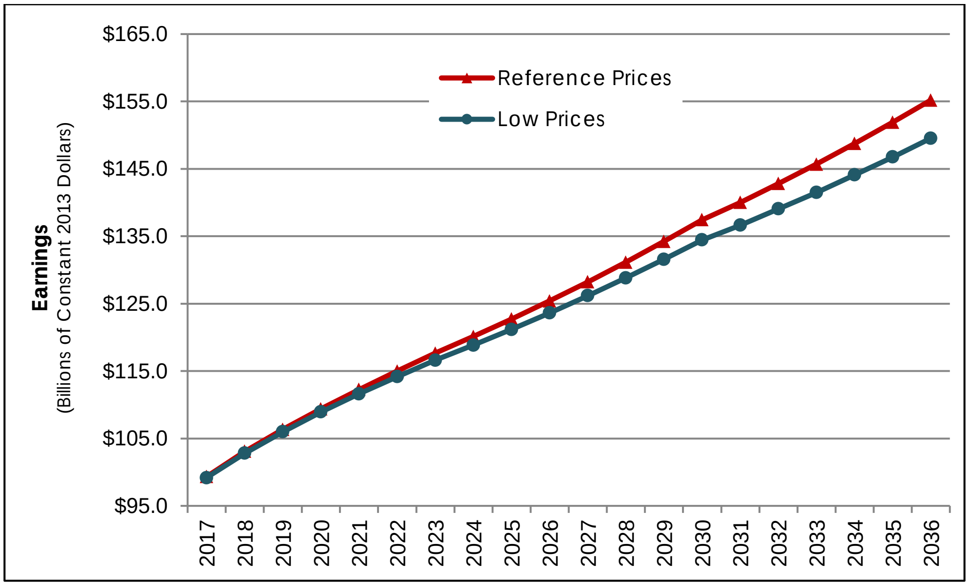


Source: BEBR analysis using the REMI PI+ model.

The differences are only slightly larger for earnings and GSP. After adjusting for inflation, earnings grow 53 percent under the Reference Price baseline from $99.4 billion in 2017 to $151.9 billion in 2036 (measured in 2013 dollars); they increase 48 percent under the Low Price baseline to $146.8 billion, less than 4 percent below the Reference Price baseline (Figure 13.3b). GSP grows by 59 percent under the Reference baseline from about $172 billion in 2017 to $273.2 billion in 2036, and by 51 percent under the Low baseline to $258.6 billion, 5 percent below the Reference forecast (Figure 13.3c).

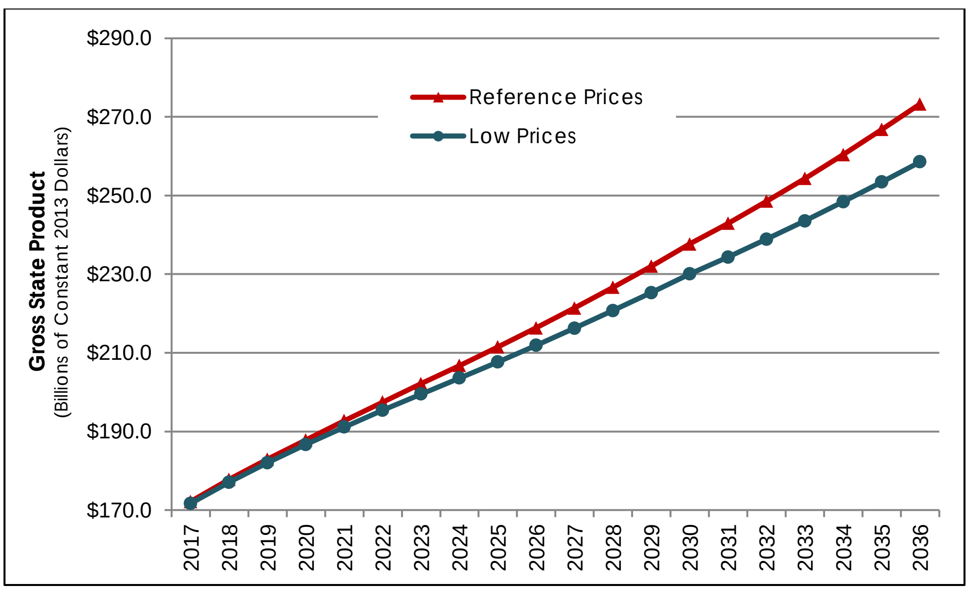
[303] Earnings are wages and salaries, employer supplements to wages and salaries (contributions to pension and insurance funds and to government social insurance), and proprietors' income. All amounts are in inflation-adjusted 2013 dollars.
[304] Gross state product is the market value of goods and services produced by labor and property in the state of Utah. It is analogous to the national measure of gross domestic product. All amounts are in inflation-adjusted 2013 dollars.

Figure 13.3b
Earnings Forecasts of Oil and Gas Baseline Production Scenarios, Reference Prices vs. Low Prices, 2015–2035



Source: BEBR analysis using the REMI PI+ model.

Figure 13.3c
Gross State Product Forecasts of Oil and Gas Baseline Production Scenarios, Reference Prices vs. Low Prices, 2015–2035



Source: BEBR analysis using the REMI PI+ model.

Tables 13.13a through 13.13c show summary forecasts and detailed employment and earnings forecasts for the Reference Price Baseline production scenario. This is our economic baseline under the Reference Price forecast. Tables 13.14a through 13.14c provide this information for the Low Price Baseline production scenario, which serves as our economic baseline under the Low Price forecast.

Table 13.13a
Oil and Gas Reference Price Baseline:
Summary Forecasts, 2017–2036
(Millions of Constant 2013 Dollars)

Year	Employment	Earnings	GSP
2017	1,933,211	$99,355.5	$172,201.7
2018	1,961,120	$103,099.6	$177,801.5
2019	1,982,192	$106,350.1	$182,934.1
2020	1,998,920	$109,399.6	$187,835.0
2021	2,014,686	$112,260.3	$192,753.3
2022	2,025,915	$115,000.4	$197,482.8
2023	2,036,323	$117,653.0	$202,153.8
2024	2,045,862	$120,115.0	$206,748.9
2025	2,055,512	$122,705.2	$211,484.8
2026	2,065,162	$125,388.9	$216,348.8
2027	2,075,258	$128,223.6	$221,395.1
2028	2,086,538	$131,148.3	$226,626.2
2029	2,097,171	$134,223.0	$232,015.0
2030	2,108,902	$137,441.1	$237,665.4
2031	2,128,716	$140,001.7	$242,931.5
2032	2,150,360	$142,815.9	$248,554.7
2033	2,172,757	$145,671.7	$254,318.1
2034	2,196,282	$148,733.8	$260,381.2
2035	2,221,002	$151,910.8	$266,773.3
2036	2,245,628	$155,189.3	$273,242.8

Source: BEBR analysis using the REMI PI+ model.

Table 13.13b
Oil and Gas Reference Price Baseline: Detailed Employment Forecasts, 2017–2035

Sector	2017	2020	2025	2030	2035
Total Employment	1,933,211	1,998,920	2,055,512	2,108,902	2,221,002
Farm Employment	16,843	15,543	13,919	12,485	11,116
Forestry, Fishing, and Related Activities	3,722	3,600	3,509	3,332	3,190
Mining	20,547	21,553	23,465	25,234	28,415
Utilities	4,770	4,809	4,711	4,568	4,525
Construction	143,904	166,943	179,863	194,913	221,963
Manufacturing	129,463	126,832	123,623	120,779	121,729
Wholesale Trade	61,078	61,970	61,744	61,460	62,642
Retail Trade	206,448	212,559	215,063	215,634	221,275
Transportation and Warehousing	58,562	58,267	56,658	55,683	56,845
Information	38,729	38,403	37,232	36,523	36,761
Finance and Insurance	128,639	128,443	126,395	125,505	128,428
Real Estate and Rental and Leasing	105,348	109,945	114,115	117,053	122,843
Professional, Scientific, and Technical Services	134,930	142,984	155,731	169,814	190,153
Management of Companies and Enterprises	24,878	24,583	23,972	23,365	23,271
Administrative and Waste Management Services	111,643	116,350	122,118	127,579	136,638
Educational Services	54,971	56,334	59,608	61,271	63,182
Health Care and Social Assistance	172,213	184,059	201,795	218,194	243,162
Arts, Entertainment, and Recreation	40,833	41,692	43,022	44,232	46,592
Accommodation and Food Services	129,543	136,642	142,048	144,321	148,522
Other Services, except Public Administration	87,942	86,225	85,908	85,660	87,964
Government	258,205	261,184	261,012	261,296	261,786

Note: Employment consists of full- and part-time jobs, counted equally, and covers wage-and-salary employees, sole proprietors and active partners.

Source: BEBR analysis using the REMI PI+ model.

Table 13.13c
Oil and Gas Reference Price Baseline: Detailed Earnings Forecasts, 2017–2035

Sector	2017	2020	2025	2030	2035
Total Earnings	$99,355.5	$109,399.6	$122,705.2	$137,441.1	$151,910.8
Farm Employment	$263.5	$273.0	$289.3	$305.4	$321.4
Forestry, Fishing, and Related Activities	$88.4	$90.6	$95.7	$98.2	$96.9
Mining	$1,889.2	$2,088.4	$2,471.9	$2,884.9	$3,360.2
Utilities	$728.4	$836.8	$997.2	$1,170.1	$1,335.3
Construction	$8,923.3	$11,100.2	$13,159.5	$15,620.7	$18,577.2
Manufacturing	$10,054.4	$10,917.8	$12,266.2	$13,681.5	$14,944.9
Wholesale Trade	$5,161.8	$5,813.2	$6,742.4	$7,788.4	$8,791.8
Retail Trade	$7,612.7	$8,614.9	$9,988.6	$11,440.0	$12,795.4
Transportation and Warehousing	$3,577.9	$3,870.5	$4,224.8	$4,639.9	$5,049.8
Information	$3,186.4	$3,583.4	$4,170.4	$4,870.2	$5,561.7
Finance and Insurance	$6,662.8	$7,209.2	$7,919.3	$8,739.4	$9,465.1
Real Estate and Rental and Leasing	$1,934.0	$2,051.3	$2,153.7	$2,239.9	$2,281.4
Professional, Scientific, and Technical Services	$9,264.7	$10,350.2	$12,044.2	$13,970.6	$15,846.8
Management of Companies and Enterprises	$2,716.5	$3,062.6	$3,634.1	$4,281.4	$4,899.7
Administrative and Waste Management Services	$3,745.4	$4,093.7	$4,562.9	$5,050.7	$5,469.3
Educational Services	$1,959.7	$2,088.4	$2,308.0	$2,467.6	$2,523.1
Health Care and Social Assistance	$8,501.1	$9,427.1	$10,758.4	$12,060.1	$13,279.6
Arts, Entertainment, and Recreation	$779.0	$827.7	$892.4	$956.8	$1,020.6
Accommodation and Food Services	$2,908.3	$3,233.3	$3,587.1	$3,875.0	$4,046.8
Other Services, except Public Administration	$3,275.1	$3,393.3	$3,643.7	$3,908.3	$4,114.8
Government	$16,122.9	$16,474.0	$16,795.7	$17,391.9	$18,128.9

Note: Earnings comprise wages and salaries, supplements to wages and salaries, and proprietors' income.
Source: BEBR analysis using the REMI PI+ model.

Table 13.14a
Oil and Gas Low Price Baseline: Summary Forecasts, 2017–2036
(Millions of Constant 2013 Dollars)

Year	Employment	Earnings	GSP
2017	1,930,596	$99,179.9	$171,723.8
2018	1,957,079	$102,818.7	$177,081.4
2019	1,977,223	$105,994.4	$182,053.5
2020	1,992,520	$108,930.9	$186,678.5
2021	2,006,022	$111,615.1	$191,143.9
2022	2,014,922	$114,166.4	$195,400.2
2023	2,022,770	$116,606.2	$199,535.3
2024	2,029,731	$118,849.3	$203,578.5
2025	2,036,416	$121,183.2	$207,657.9
2026	2,043,353	$123,622.3	$211,903.5
2027	2,050,452	$126,182.4	$216,242.0
2028	2,058,596	$128,814.4	$220,717.6
2029	2,065,915	$131,571.5	$225,284.5
2030	2,074,128	$134,445.3	$230,044.1
2031	2,089,966	$136,642.7	$234,345.5
2032	2,107,190	$139,048.5	$238,882.9
2033	2,125,113	$141,487.2	$243,542.3
2034	2,143,850	$144,096.8	$248,404.4
2035	2,163,138	$146,758.8	$253,422.3
2036	2,182,543	$149,531.8	$258,555.4

Source: BEBR analysis using the REMI PI+ model.

Table 13.14b
Oil and Gas Low Price Baseline: Detailed Employment Forecasts, 2017–2035

Sector	2017	2020	2025	2030	2035
Total Employment	1,930,596	1,992,520	2,036,416	2,074,128	2,163,138
Farm Employment	16,843	15,543	13,919	12,485	11,116
Forestry, Fishing, and Related Activities	3,721	3,597	3,502	3,321	3,176
Mining	20,170	20,722	20,845	20,373	20,262
Utilities	4,762	4,791	4,659	4,477	4,380
Construction	143,587	165,929	176,973	189,805	213,440
Manufacturing	129,363	126,612	123,045	119,826	120,226
Wholesale Trade	61,029	61,861	61,444	60,942	61,811
Retail Trade	206,217	212,005	213,461	212,795	216,684
Transportation and Warehousing	58,502	58,136	56,294	55,070	55,870
Information	38,702	38,339	37,055	36,214	36,262
Finance and Insurance	128,512	128,171	125,664	124,266	126,449
Real Estate and Rental and Leasing	105,256	109,687	113,313	115,549	120,299
Professional, Scientific, and Technical Services	134,751	142,540	154,301	166,943	184,884
Management of Companies and Enterprises	24,817	24,459	23,631	22,790	22,374
Administrative and Waste Management Services	111,523	116,058	121,229	125,949	133,874
Educational Services	54,955	56,290	59,457	60,974	62,669
Health Care and Social Assistance	172,056	183,680	200,611	215,933	239,186
Arts, Entertainment, and Recreation	40,800	41,613	42,792	43,815	45,891
Accommodation and Food Services	129,454	136,399	141,266	142,820	145,989
Other Services, except Public Administration	87,861	86,043	85,397	84,766	86,513
Government	257,715	260,043	257,559	255,014	251,782

Note: Employment consists of full- and part-time jobs, counted equally, and covers wage-and-salary employees, sole proprietors and active partners.

Source: BEBR analysis using the REMI PI+ model.

Table 13.14c
Oil and Gas Low Price Baseline: Detailed Earnings Forecasts, 2017–2035

Sector	2017	2020	2025	2030	2035
Total Earnings	$99,179.9	$108,930.9	$121,183.2	$134,445.3	$146,758.8
Farm Employment	$263.5	$272.8	$289.0	$304.9	$320.6
Forestry, Fishing, and Related Activities	$88.3	$90.5	$95.4	$97.7	$96.1
Mining	$1,845.4	$1,986.3	$2,127.4	$2,202.4	$2,200.2
Utilities	$727.2	$833.4	$984.8	$1,144.2	$1,288.5
Construction	$8,902.4	$11,026.7	$12,926.7	$15,167.4	$17,786.9
Manufacturing	$10,045.5	$10,894.3	$12,194.0	$13,545.1	$14,714.8
Wholesale Trade	$5,157.1	$5,800.4	$6,701.3	$7,706.5	$8,648.2
Retail Trade	$7,603.4	$8,588.9	$9,902.3	$11,266.1	$12,491.9
Transportation and Warehousing	$3,573.8	$3,860.2	$4,192.3	$4,578.8	$4,947.2
Information	$3,183.8	$3,576.0	$4,145.5	$4,818.7	$5,469.2
Finance and Insurance	$6,655.5	$7,190.9	$7,863.9	$8,635.0	$9,290.5
Real Estate and Rental and Leasing	$1,932.1	$2,045.7	$2,135.9	$2,206.4	$2,227.1
Professional, Scientific, and Technical Services	$9,251.4	$10,313.6	$11,918.6	$13,704.6	$15,357.9
Management of Companies and Enterprises	$2,709.6	$3,045.6	$3,576.4	$4,162.9	$4,687.3
Administrative and Waste Management Services	$3,740.9	$4,081.7	$4,524.0	$4,975.5	$5,341.7
Educational Services	$1,959.0	$2,085.8	$2,299.2	$2,450.1	$2,494.3
Health Care and Social Assistance	$8,492.5	$9,403.8	$10,682.6	$11,911.0	$13,023.8
Arts, Entertainment, and Recreation	$778.3	$825.8	$886.6	$945.0	$1,000.7
Accommodation and Food Services	$2,906.1	$3,226.3	$3,563.4	$3,827.3	$3,966.5
Other Services, except Public Administration	$3,271.8	$3,384.7	$3,617.6	$3,859.4	$4,034.5
Government	$16,092.4	$16,397.6	$16,556.2	$16,936.1	$17,370.9

Note: Earnings comprise wages and salaries, supplements to wages and salaries, and proprietors' income.

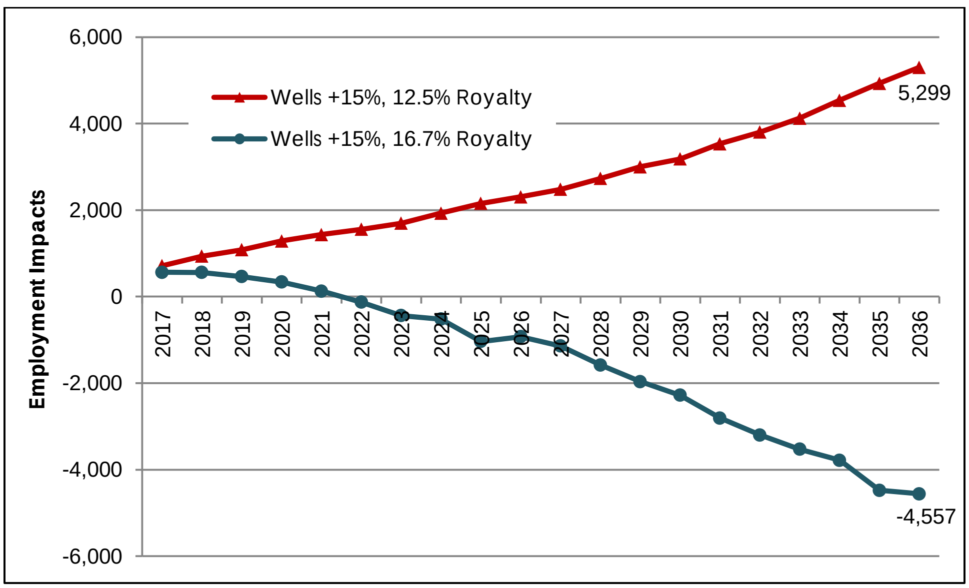
Source: BEBR analysis using the REMI PI+ model.

13.2.2 Reference Price Scenarios

From each of the two baseline forecasts there are two scenarios with economic impacts: (1) a 15 percent increase in the number of wells drilled each year, with the royalty rate remaining at 12.5 percent, and (2) a 15 percent increase in the number of wells *and* an increase in the royalty rate on new wells to 16.7 percent. Figures 13.4a through 13.4c compare the impacts of these two scenarios, relative to the baseline, under the Reference Price forecast. Figures 13.5a through 13.5c repeat the comparison for the Low Price forecast.

The two scenarios produce similar divergences for employment, earnings and GSP under the Reference Price forecast. Increasing the number of wells drilled each year by 15 percent leads to a positive employment impact relative to the baseline that grows from 561 jobs in 2017 to 5,299 jobs in 2036. Increasing wells *and* raising the royalty rate on production from new wells to 16.7 percent has positive impacts on employment for the first few years, but begins reducing total employment relative to the baseline in 2022, reaching a negative impact of 4,557 fewer jobs in 2036 (Figure 13.4a). Note that these impacts are only 0.2 percent of baseline employment in 2036.

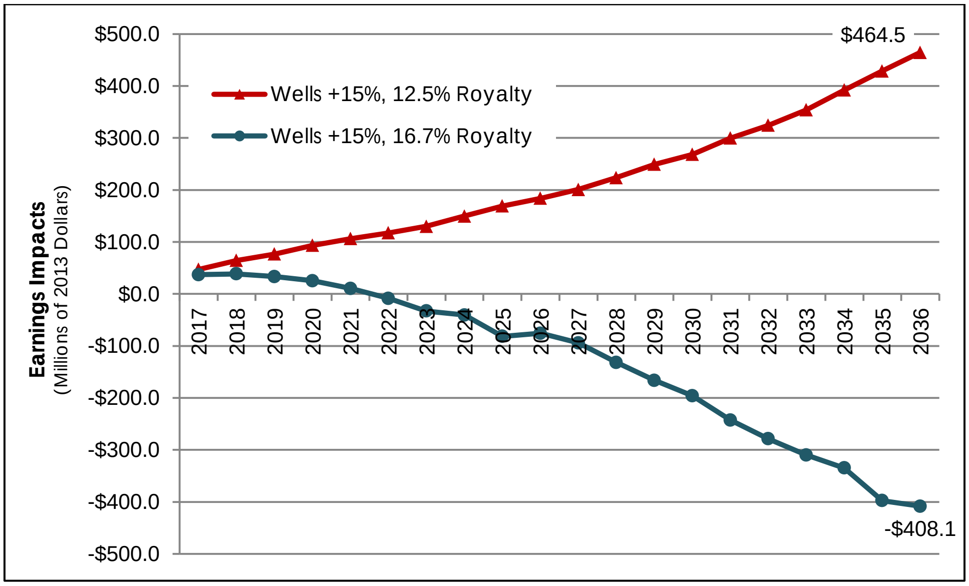
Figure 13.4a
Reference Prices: Employment Impacts of Scenarios Relative to Baseline Forecast, 2017–2035



Source: BEBR analysis using the REMI PI+ model.

Under the Reference Price forecast, increasing well counts by 15 percent each year produces a growing impact on earnings over the baseline that reaches $464.5 million in 2036. Raising the royalty rate on new wells to 16.7 percent, on top of the 15 percent increase in drilling activity, initially has positive earnings impacts; but these disappear in 2022 and reach a net negative impact of $408.1 million less in earnings relative to the baseline (Figure 13.4b). Both of these impacts in 2036 are just 0.3 percent of total earnings.

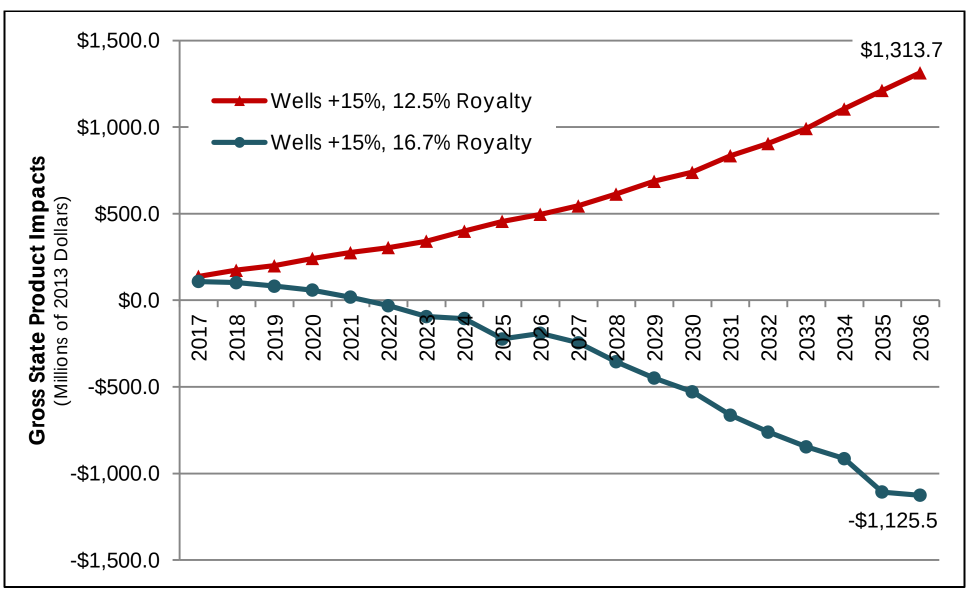
Figure 13.4b
Reference Prices: Earnings Impacts of Scenarios Relative to Baseline Forecast, 2017–2035



Source: BEBR analysis using the REMI PI+ model.

A 15 percent increase in oil and gas drilling activity raises the state's GSP by $108.5 million in 2017, relative to the Reference Price baseline. This positive impact grows to $1.3 billion in 2036. Increasing wells and raising the royalty rate on new production to 16.7 percent has positive, but shrinking, GSP impacts through 2021, but then begins to drag on gross state product. By 2036, the effect of a higher royalty rate is to reduce GSP by $1.1 billion from the baseline (Figure 13.4c). The impacts in 2036, both positive and negative, are less than 0.5 percent of baseline GSP.

Figure 13.4c
Reference Prices: Gross State Product Impacts of Scenarios Relative to Baseline Forecast, 2017–2035



Source: BEBR analysis using the REMI PI+ model.

Table 13.15
Reference Price Scenarios: Estimated Fiscal Impacts vs. Baseline, 2017–2036
(Millions of 2013 Dollars)

	Wells +15%		Wells +15% @16.7%	
Year	State	Local	State	Local
2017	$3.3	$0.3	$2.6	$0.2
2018	$4.6	$0.4	$2.7	$0.2
2019	$5.4	$0.5	$2.4	$0.2
2020	$6.6	$0.6	$1.8	$0.2
2021	$7.5	$0.7	$0.7	$0.1
2022	$8.3	$0.7	–$0.6	–$0.1
2023	$9.2	$0.8	–$2.3	–$0.2
2024	$10.6	$0.9	–$2.9	–$0.3
2025	$12.0	$1.1	–$5.8	–$0.5
2026	$13.0	$1.2	–$5.3	–$0.5
2027	$14.2	$1.3	–$6.7	–$0.6
2028	$15.8	$1.4	–$9.3	–$0.8
2029	$17.6	$1.6	–$11.8	–$1.0
2030	$19.0	$1.7	–$13.9	–$1.2
2031	$21.2	$1.9	–$17.2	–$1.5
2032	$23.0	$2.0	–$19.7	–$1.7
2033	$25.0	$2.2	–$21.9	–$1.9
2034	$27.7	$2.5	–$23.7	–$2.1
2035	$30.3	$2.7	–$28.1	–$2.5
2036	$32.9	$2.9	–$28.9	–$2.6

Note: Fiscal impacts are composed of state income and sales tax revenues and local sales tax revenues.
Source: BEBR analysis.

Fiscal impacts of the scenarios, in addition to those described in Section 13.1, were calculated from the earnings impacts. We estimated state income tax revenues and state and local sales tax revenues based on historic ratios of tax collections to earnings. Because they are generated from earnings, they follow the same paths as the impacts shown above in Figure 13.4b. In 2017, a 15 percent increase in the number of wells drilled raises state income and sales tax revenues by $3.3 million and county sales tax revenues by $0.3 million versus the Reference Price baseline. These impacts grow steadily to $32.9 million for the state and $2.9 million for counties in 2036. Under a 15 percent increase in wells and a royalty rate of 16.7 percent on new production, state and county revenue impacts follow the opposite path. Beginning at $2.6 million for the state and $0.2 million for counties in 2017, they decline steadily to net *decreases* in revenue versus the baseline of $28.9 million and $2.6 million, respectively (Table 13.15).

Tables 13.16a through 13.16c provide the detailed net economic impacts of increasing well counts by 15 percent under the Reference Price forecast; Tables 13.17a through 13.17c show the results for increasing well counts by 15 percent *and* raising the royalty on new production to 16.7 percent. In both scenarios the largest employment impacts—both positive and negative—are in the mining, construction and government sectors. The retail trade and professional, scientific and technical services sectors also see significant impacts (Tables 13.16b and 13.17b). The largest earnings impacts across scenarios are also in the mining, construction and government sectors, with significant impacts also occurring in the professional, scientific and technical services and retail trade sectors (Tables 13.16c and 13.17c).

Table 13.16a
Oil and Gas Scenario—Reference Prices, Baseline + 15% Drilling, 12.5% Royalty: Summary Impacts, 2017–2036
(Millions of Constant 2013 Dollars)

Year	Employment	Earnings	GSP
2017	714	$47.3	$138.2
2018	936	$64.4	$174.0
2019	1,082	$76.7	$199.6
2020	1,285	$93.3	$241.6
2021	1,437	$106.4	$275.2
2022	1,556	$117.4	$304.5
2023	1,697	$130.1	$341.1
2024	1,930	$149.8	$399.4
2025	2,154	$169.3	$455.5
2026	2,306	$184.0	$496.6
2027	2,482	$200.7	$545.7
2028	2,730	$223.6	$613.3
2029	3,000	$249.1	$687.5
2030	3,181	$268.1	$739.6
2031	3,535	$299.6	$834.3
2032	3,804	$324.5	$905.6
2033	4,124	$353.8	$991.8
2034	4,540	$392.1	$1,105.5
2035	4,930	$428.9	$1,211.5
2036	5,299	$464.5	$1,313.7

Source: BEBR analysis using the REMI PI+ model.

Table 13.16b
Oil and Gas Scenario—Reference Prices, Baseline + 15% Drilling, 12.5% Royalty: Detailed Employment Impacts, 2017–2035

Sector	2017	2020	2025	2030	2035
Total Employment	714	1,285	2,154	3,181	4,930
Farm Employment	0	0	0	0	0
Forestry, Fishing, and Related Activities	0	1	1	1	1
Mining	93	148	263	389	592
Utilities	2	4	6	9	13
Construction	89	213	322	455	722
Manufacturing	28	44	65	89	133
Wholesale Trade	13	22	33	47	70
Retail Trade	62	110	180	260	392
Transportation and Warehousing	17	27	42	58	87
Information	7	13	20	29	44
Finance and Insurance	34	53	79	110	166
Real Estate and Rental and Leasing	25	53	93	141	220
Professional, Scientific, and Technical Services	50	91	169	277	473
Management of Companies and Enterprises	18	26	41	57	83
Administrative and Waste Management Services	33	59	101	150	239
Educational Services	4	9	18	29	45
Health Care and Social Assistance	42	75	133	208	340
Arts, Entertainment, and Recreation	9	16	26	38	60
Accommodation and Food Services	24	49	92	144	221
Other Services, except Public Administration	22	36	57	81	123
Government	141	238	413	610	905

Source: BEBR analysis using the REMI PI+ model.

Table 13.16c
Oil and Gas Scenario—Reference Prices, Baseline + 15% Drilling, 12.5% Royalty: Detailed Earnings Impacts, 2015–2035
(Millions of Constant 2013 Dollars)

Sector	2017	2020	2025	2030	2035
Total Earnings	$47.3	$93.3	$169.3	$268.1	$428.9
Farm Earnings	$0.0	$0.0	$0.0	$0.0	$0.1
Forestry, Fishing, and Related Activities	$0.0	$0.0	$0.0	$0.0	$0.1
Mining	$10.6	$17.8	$33.8	$53.3	$82.2
Utilities	$0.3	$0.7	$1.4	$2.4	$4.1
Construction	$5.9	$15.5	$26.1	$40.4	$66.7
Manufacturing	$2.4	$4.8	$8.1	$12.5	$19.9
Wholesale Trade	$1.3	$2.6	$4.6	$7.3	$12.0
Retail Trade	$2.5	$5.2	$9.7	$15.8	$25.7
Transportation and Warehousing	$1.1	$2.1	$3.7	$5.7	$9.0
Information	$0.7	$1.5	$2.9	$4.8	$8.0
Finance and Insurance	$2.0	$3.6	$6.1	$9.2	$14.6
Real Estate and Rental and Leasing	$0.5	$1.2	$2.1	$3.1	$4.6
Professional, Scientific, and Technical Services	$3.7	$7.5	$14.8	$25.4	$43.5
Management of Companies and Enterprises	$2.0	$3.6	$7.0	$11.7	$19.6
Administrative and Waste Management Services	$1.2	$2.4	$4.4	$6.9	$10.9
Educational Services	$0.2	$0.5	$1.0	$1.6	$2.5
Health Care and Social Assistance	$2.3	$4.7	$8.5	$13.6	$21.7
Arts, Entertainment, and Recreation	$0.2	$0.4	$0.7	$1.1	$1.7
Accommodation and Food Services	$0.6	$1.4	$2.8	$4.5	$6.9
Other Services, except Public Administration	$0.9	$1.7	$2.9	$4.4	$6.7
Government	$8.8	$16.0	$28.8	$44.3	$68.5

Source: BEBR analysis using the REMI PI+ model.

Table 13.17a
Oil and Gas Scenario—Reference Prices, Baseline + 15% Drilling, 16.7% Royalty: Summary Impacts, 2017–2036
(Millions of Constant 2013 Dollars)

Year	Employment	Earnings	GSP
2017	561	$37.1	$108.5
2018	560	$38.7	$101.8
2019	464	$33.4	$81.5
2020	338	$25.3	$58.1
2021	127	$10.4	$18.2
2022	–128	–$8.5	–$31.1
2023	–441	–$32.8	–$93.9
2024	–521	–$40.4	–$105.6
2025	–1,039	–$81.6	–$223.5
2026	–928	–$75.6	–$190.8
2027	–1,140	–$94.2	–$245.0
2028	–1,582	–$131.7	–$355.5
2029	–1,965	–$166.2	–$450.0
2030	–2,278	–$195.9	–$528.6
2031	–2,807	–$242.5	–$663.1
2032	–3,199	–$278.6	–$760.8
2033	–3,529	–$309.8	–$845.6
2034	–3,784	–$334.7	–$914.7
2035	–4,476	–$397.4	–$1,107.2
2036	–4,557	–$408.1	–$1,125.5

Source: BEBR analysis using the REMI PI+ model.

Table 13.17b
Oil and Gas Scenario—Reference Prices, Baseline + 15% Drilling, 16.7% Royalty: Detailed Employment Impacts, 2017–2035

Sector	2017	2020	2025	2030	2035
Total Employment	561	338	–1,039	–2,278	–4,476
Farm Employment	0	0	0	0	0
Forestry, Fishing, and Related Activities	0	0	0	–1	–1
Mining	73	32	–133	–281	–548
Utilities	2	1	–3	–6	–11
Construction	70	67	–173	–380	–725
Manufacturing	22	11	–33	–64	–119
Wholesale Trade	10	5	–17	–34	–64
Retail Trade	49	29	–85	–181	–347
Transportation and Warehousing	13	6	–22	–42	–80
Information	6	3	–9	–20	–39
Finance and Insurance	27	13	–42	–82	–153
Real Estate and Rental and Leasing	20	16	–39	–96	–195
Professional, Scientific, and Technical Services	39	24	–75	–187	–416
Management of Companies and Enterprises	14	6	–21	–41	–76
Administrative and Waste Management Services	26	15	–50	–108	–216
Educational Services	3	3	–6	–17	–36
Health Care and Social Assistance	33	19	–61	–140	–291
Arts, Entertainment, and Recreation	7	4	–12	–26	–53
Accommodation and Food Services	19	15	–34	–88	–182
Other Services, except Public Administration	17	9	–27	–57	–108
Government	111	59	–195	–427	–816

Source: BEBR analysis using the REMI PI+ model.

Table 13.17c
Oil and Gas Scenario—Reference Prices, Baseline + 15% Drilling, 16.7% Royalty: Detailed Earnings Impacts, 2015–2035
(Millions of Constant 2013 Dollars)

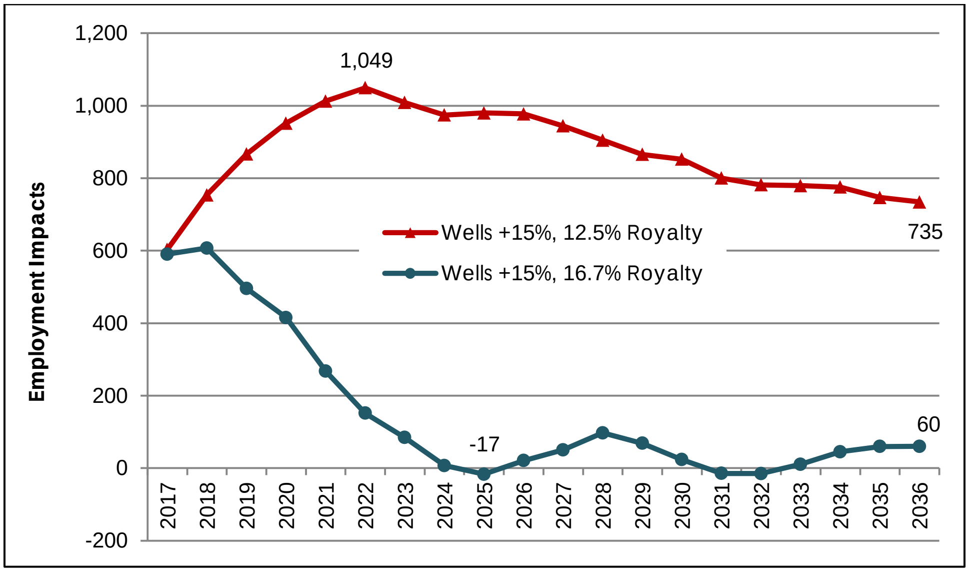
Sector	2017	2020	2025	2030	2035
Total Earnings	$37.1	$25.3	–$81.6	–$195.9	–$397.4
Farm Earnings	$0.0	$0.0	$0.0	$0.0	–$0.1
Forestry, Fishing, and Related Activities	$0.0	$0.0	$0.0	$0.0	–$0.1
Mining	$8.3	$3.9	–$17.1	–$38.5	–$76.0
Utilities	$0.3	$0.2	–$0.7	–$1.7	–$3.7
Construction	$4.6	$4.9	–$13.6	–$33.5	–$67.1
Manufacturing	$1.9	$1.3	–$4.0	–$9.3	–$18.4
Wholesale Trade	$1.0	$0.7	–$2.2	–$5.5	–$11.3
Retail Trade	$2.0	$1.4	–$4.5	–$11.3	–$23.4
Transportation and Warehousing	$0.9	$0.5	–$1.9	–$4.3	–$8.4
Information	$0.6	$0.4	–$1.3	–$3.4	–$7.3
Finance and Insurance	$1.5	$1.0	–$3.1	–$7.1	–$13.8
Real Estate and Rental and Leasing	$0.4	$0.4	–$0.9	–$2.2	–$4.2
Professional, Scientific, and Technical Services	$2.9	$2.1	–$6.5	–$17.6	–$39.0
Management of Companies and Enterprises	$1.6	$0.9	–$3.4	–$8.4	–$18.0
Administrative and Waste Management Services	$1.0	$0.7	–$2.1	–$5.0	–$10.1
Educational Services	$0.2	$0.2	–$0.4	–$1.1	–$2.2
Health Care and Social Assistance	$1.8	$1.3	–$3.9	–$9.5	–$19.2
Arts, Entertainment, and Recreation	$0.2	$0.1	–$0.3	–$0.7	–$1.5
Accommodation and Food Services	$0.5	$0.4	–$1.1	–$2.9	–$5.9
Other Services, except Public Administration	$0.7	$0.5	–$1.4	–$3.2	–$6.1
Government	$6.9	$4.3	–$13.0	–$30.7	–$61.7

Source: BEBR analysis using the REMI PI+ model.

13.2.3 Low Price Scenarios

Under the Low Price forecast the two scenarios produce similar divergences for employment, earnings and GSP. Increasing the number of wells drilled each year by 15 percent leads to a positive employment impact relative to the baseline that grows from 590 jobs in 2017 to 1,049 jobs in 2022. Impacts then decrease to 735 additional jobs in 2036. Increasing wells *and* raising the royalty rate on production from new wells to 16.7 percent has generally positive but very small employment impacts. Beginning with about 600 additional jobs in 2017 and 2018, employment impacts under this scenario drop to near zero in 2024 and 2025, rise to about 100 in 2028 before becoming slightly negative in 2031 and 2031, then rising slightly to 60 jobs in 2036. (Figure 13.5a). The larger impacts are only 0.05 percent of baseline employment in 2022 and just 0.03 percent of the baseline in 2036.

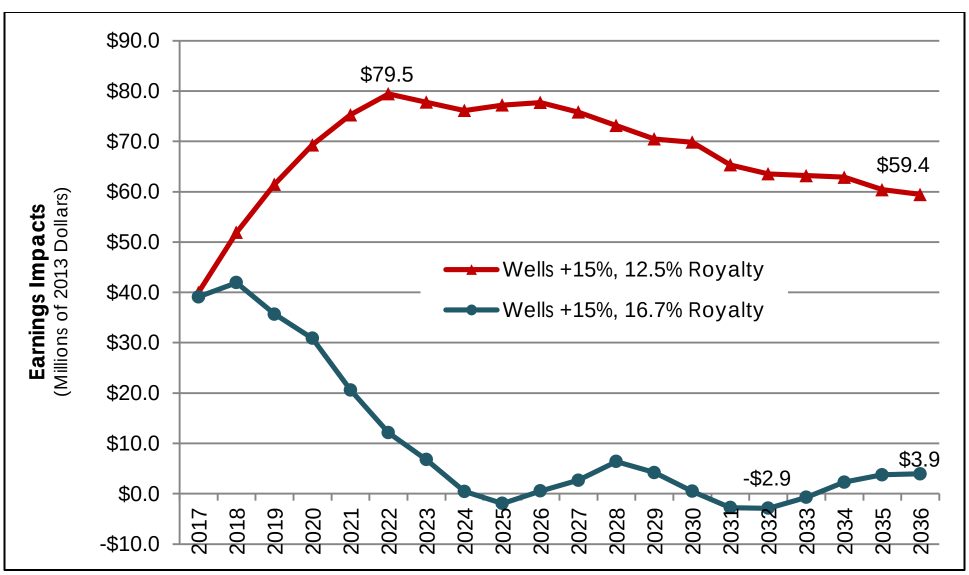
Figure 13.5a
Low Prices: Employment Impacts of Scenarios Relative to Baseline Forecast, 2017–2035



Source: BEBR analysis using the REMI PI+ model.

Under the Low Price forecast, increasing well counts by 15 percent each year produces positive earnings impacts versus the baseline that grow from about $40.0 million in 2017 to a peak of $79.5 million in 2022. From here they shrink to $59.4 million in 2036. Raising the royalty rate on new wells to 16.7 percent, on top of the 15 percent increase in drilling activity, initially has a similar earnings impact as the first scenario. However, by 2024 the impact falls essentially to zero. After increasing to about $6 million in 2028, the earnings impacts of this scenario become slightly negative relative to the baseline in 2031 through 2033, then rise to $3.9 million in 2036 (Figure 13.5b). Under both scenarios, impacts are never more than 0.07 percent of total baseline earnings.

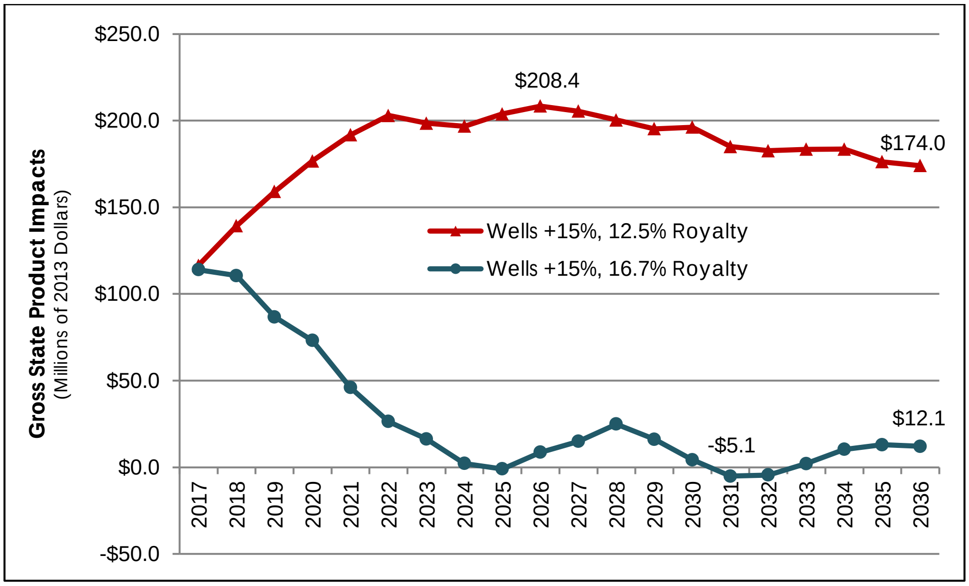
Figure 13.5b
Low Prices: Earnings Impacts of Scenarios Relative to Baseline Forecast, 2017–2035



Source: BEBR analysis using the REMI PI+ model.

A 15 percent increase in oil and gas drilling activity raises the state's GSP by $116.5 million in 2017, relative to the Low Price baseline. This positive impact grows to $208.4 million in 2026, then shrinks to $174.0 million in 2036. Increasing wells and raising the royalty rate on new production to 16.7 percent raises GSP by $114.0 million versus the baseline in 2017, but by 2025 the impacts are slightly negative. Impacts grow to about $25 million in 2028, fall into negative territory again in 2031 and 2032, and by 2036 are just $12.1 million (Figure 13.5c). The impacts of both scenarios under the Low Price forecast are never more than 0.1 percent of baseline GSP.

Figure 13.5c
Low Prices: Gross State Product Impacts of Scenarios Relative to Baseline Forecast, 2017–2035



Source: BEBR analysis using the REMI PI+ model.

Fiscal impacts follow the same paths as the earnings impacts shown above in Figure 13.5b. In 2017, a 15 percent increase in the number of wells drilled raises state income and sales tax revenues by $2.8 million and county sales tax revenues by $0.25 million versus the Low Price baseline. These impacts grow to $5.6 million for the state and $0.5 million for counties in 2022, then shrink to $4.2 million and $0.37 million, respectively, in 2036. Under a 15 percent increase in wells and a royalty rate of 16.7 percent on new production, state and county revenue impacts follow the opposite path. Beginning at $2.6 million for the state and $0.2 million for counties in 2017, they decline steadily to net *decreases* in revenue versus the baseline of $28.9 million and $2.6 million, respectively (Table 13.18).

Tables 13.19a through 13.19c provide the detailed net economic impacts of increasing well counts by 15 percent under the Low Price forecast; Tables 13.20a through 13.20c show the results for increasing well counts by 15 percent *and* raising the royalty on new production to 16.7 percent. Under the first scenario the largest employment impacts are in the mining, construction and government sectors. The retail trade and professional, scientific and technical services sectors also see significant impacts (Table 13.19b). The largest earnings impacts in this scenario are also in the mining, construction and government sectors, with significant impacts also occurring in the professional, scientific and technical services sector (Tables 13.19c). Under the second scenario, increasing well counts by 15 percent *and* raising the royalty on new production to 16.7

Table 13.18
Low Price Scenarios: Estimated Fiscal Impacts vs. Baseline, 2017–2036
(Millions of 2013 Dollars)

	Wells +15%		Wells +15% @16.7%	
Year	State	Local	State	Local
2017	$2.83	$0.25	$2.77	$0.24
2018	$3.67	$0.32	$2.97	$0.26
2019	$4.35	$0.38	$2.52	$0.22
2020	$4.90	$0.43	$2.18	$0.19
2021	$5.33	$0.47	$1.46	$0.13
2022	$5.62	$0.50	$0.86	$0.08
2023	$5.50	$0.49	$0.48	$0.04
2024	$5.39	$0.48	$0.03	$0.00
2025	$5.46	$0.48	–$0.14	–$0.01
2026	$5.50	$0.49	$0.04	$0.00
2027	$5.36	$0.47	$0.19	$0.02
2028	$5.17	$0.46	$0.45	$0.04
2029	$4.99	$0.44	$0.30	$0.03
2030	$4.94	$0.44	$0.03	$0.00
2031	$4.62	$0.41	–$0.20	–$0.02
2032	$4.50	$0.40	–$0.20	–$0.02
2033	$4.47	$0.40	–$0.05	$0.00
2034	$4.45	$0.39	$0.16	$0.01
2035	$4.27	$0.38	$0.27	$0.02
2036	$4.21	$0.37	$0.28	$0.02

Note: Fiscal impacts are composed of state income and sales tax revenues and local sales tax revenues.
Source: BEBR analysis.

percent, the distribution of impacts is slightly different. The largest employment impacts—both positive and negative—are now in construction, accommodation and food services, and government, with significant impacts also occurring in professional, scientific and technical services and health care and social assistance (Table 13.20b). The largest earnings impacts—both positive and negative—are in mining, construction and government. The professional, scientific and technical services and health care and social assistance sectors also experience significant impacts (Table 13.20c).

Table 13.19a
Oil and Gas Scenario—Low Prices, Baseline + 15% Drilling, 12.5% Royalty: Summary Impacts, 2017–2036
(Millions of Constant 2013 Dollars)

Year	Employment	Earnings	GSP
2017	604	$40.0	$116.5
2018	754	$51.9	$139.3
2019	866	$61.5	$159.1
2020	952	$69.3	$176.7
2021	1,013	$75.3	$191.7
2022	1,049	$79.5	$202.9
2023	1,009	$77.8	$198.5
2024	974	$76.1	$196.7
2025	980	$77.2	$203.9
2026	977	$77.7	$208.4
2027	944	$75.8	$205.4
2028	905	$73.1	$200.4
2029	866	$70.5	$195.3
2030	852	$69.8	$196.2
2031	800	$65.3	$185.0
2032	782	$63.5	$182.6
2033	779	$63.2	$183.4
2034	776	$62.9	$183.5
2035	747	$60.4	$176.3
2036	735	$59.4	$174.0

Source: BEBR analysis using the REMI PI+ model.

Table 13.19b
Oil and Gas Scenario—Low Prices, Baseline + 15% Drilling, 12.5% Royalty: Detailed Employment Impacts, 2017–2035

Sector	2017	2020	2025	2030	2035
Total Employment	604	952	980	852	747
Farm Employment	0	0	0	0	0
Forestry, Fishing, and Related Activities	0	0	0	0	0
Mining	79	108	120	109	92
Utilities	2	3	3	2	2
Construction	75	161	138	89	64
Manufacturing	23	33	29	23	21
Wholesale Trade	11	16	15	12	11
Retail Trade	53	81	83	72	64
Transportation and Warehousing	14	20	18	15	13
Information	6	9	9	8	7
Finance and Insurance	29	39	35	28	24
Real Estate and Rental and Leasing	21	40	45	40	36
Professional, Scientific, and Technical Services	42	67	79	79	78
Management of Companies and Enterprises	15	19	18	15	12
Administrative and Waste Management Services	28	43	45	40	36
Educational Services	3	7	9	9	9
Health Care and Social Assistance	36	55	62	61	62
Arts, Entertainment, and Recreation	8	12	12	11	10
Accommodation and Food Services	20	37	46	47	45
Other Services, except Public Administration	18	27	26	23	21
Government	119	175	188	168	139

Source: BEBR analysis using the REMI PI+ model.

Table 13.19c
Oil and Gas Scenario—Low Prices, Baseline + 15% Drilling, 12.5% Royalty: Detailed Earnings Impacts, 2015–2035
(Millions of Constant 2013 Dollars)

Sector	2017	2020	2025	2030	2035
Total Earnings	$40.0	$69.3	$77.2	$69.8	$60.4
Farm Earnings	$0.0	$0.0	$0.0	$0.0	$0.0
Forestry, Fishing, and Related Activities	$0.0	$0.0	$0.0	$0.0	$0.0
Mining	$9.0	$13.1	$15.5	$15.0	$12.8
Utilities	$0.3	$0.5	$0.7	$0.7	$0.6
Construction	$4.9	$11.7	$11.3	$8.0	$5.9
Manufacturing	$2.0	$3.6	$3.7	$3.1	$2.7
Wholesale Trade	$1.1	$1.9	$2.1	$1.8	$1.6
Retail Trade	$2.1	$3.9	$4.5	$4.2	$3.8
Transportation and Warehousing	$1.0	$1.6	$1.7	$1.4	$1.2
Information	$0.6	$1.1	$1.3	$1.3	$1.2
Finance and Insurance	$1.6	$2.7	$2.7	$2.2	$1.9
Real Estate and Rental and Leasing	$0.4	$0.9	$1.0	$0.8	$0.7
Professional, Scientific, and Technical Services	$3.1	$5.6	$6.9	$7.1	$6.7
Management of Companies and Enterprises	$1.7	$2.6	$3.1	$3.1	$2.8
Administrative and Waste Management Services	$1.0	$1.8	$2.0	$1.8	$1.5
Educational Services	$0.2	$0.4	$0.5	$0.5	$0.4
Health Care and Social Assistance	$2.0	$3.5	$4.0	$3.8	$3.5
Arts, Entertainment, and Recreation	$0.2	$0.3	$0.3	$0.3	$0.3
Accommodation and Food Services	$0.5	$1.1	$1.4	$1.4	$1.3
Other Services, except Public Administration	$0.8	$1.3	$1.3	$1.2	$1.0
Government	$7.4	$11.8	$13.4	$12.2	$10.4

Source: BEBR analysis using the REMI PI+ model.

Table 13.20a
Oil and Gas Scenario—Low Prices,
Baseline + 15% Drilling, 16.7% Royalty:
Summary Impacts, 2017–2036
(Millions of Constant 2013 Dollars)

Year	Employment	Earnings	GSP
2017	590	$39.1	$114.0
2018	607	$41.9	$110.6
2019	496	$35.7	$86.7
2020	415	$30.9	$73.2
2021	267	$20.6	$46.0
2022	152	$12.1	$26.4
2023	85	$6.8	$16.3
2024	7	$0.5	$2.2
2025	–17	–$1.9	–$0.9
2026	21	$0.5	$8.7
2027	51	$2.7	$14.9
2028	97	$6.4	$24.9
2029	68	$4.2	$16.2
2030	23	$0.5	$4.4
2031	–15	–$2.8	–$5.1
2032	–15	–$2.9	–$4.4
2033	11	–$0.7	$2.1
2034	45	$2.3	$10.3
2035	60	$3.8	$13.0
2036	60	$3.9	$12.1

Source: BEBR analysis using the REMI PI+ model.

Table 13.20b
Oil and Gas Scenario—Low Prices, Baseline + 15% Drilling,
16.7% Royalty: Detailed Employment Impacts, 2017–2035

Sector	2017	2020	2025	2030	2035
Total Employment	590	415	–17	23	60
Farm Employment	0	0	0	0	0
Forestry, Fishing, and Related Activities	0	0	0	0	0
Mining	77	42	–1	1	6
Utilities	2	1	0	0	0
Construction	74	78	–20	–8	1
Manufacturing	23	14	–1	1	2
Wholesale Trade	11	7	–1	0	1
Retail Trade	51	35	0	3	6
Transportation and Warehousing	14	8	–1	0	1
Information	6	4	0	0	1
Finance and Insurance	28	16	–2	0	2
Real Estate and Rental and Leasing	21	19	1	2	3
Professional, Scientific, and Technical Services	41	30	2	4	6
Management of Companies and Enterprises	15	7	0	0	1
Administrative and Waste Management Services	27	18	–1	1	3
Educational Services	3	3	1	1	1
Health Care and Social Assistance	35	24	1	4	7
Arts, Entertainment, and Recreation	7	5	0	1	1
Accommodation and Food Services	20	18	4	4	4
Other Services, except Public Administration	18	12	0	1	2
Government	117	74	2	5	10

Source: BEBR analysis using the REMI PI+ model.

Table 13.20c
Oil and Gas Scenario—Low Prices, Baseline + 15% Drilling, 16.7% Royalty: Detailed Earnings Impacts, 2015–2035
(Millions of Constant 2013 Dollars)

Sector	2017	2020	2025	2030	2035
Total Earnings	$39.1	$30.9	–$1.9	$0.5	$3.8
Farm Earnings	$0.0	$0.0	$0.0	$0.0	$0.0
Forestry, Fishing, and Related Activities	$0.0	$0.0	$0.0	$0.0	$0.0
Mining	$8.8	$5.1	–$0.1	$0.2	$0.9
Utilities	$0.3	$0.2	$0.0	$0.0	$0.0
Construction	$4.8	$5.8	–$1.5	–$0.7	$0.0
Manufacturing	$2.0	$1.6	–$0.2	$0.0	$0.2
Wholesale Trade	$1.1	$0.9	–$0.1	$0.0	$0.1
Retail Trade	$2.1	$1.8	–$0.1	$0.1	$0.3
Transportation and Warehousing	$0.9	$0.7	–$0.1	$0.0	$0.1
Information	$0.6	$0.5	$0.0	$0.0	$0.1
Finance and Insurance	$1.6	$1.2	–$0.2	$0.0	$0.1
Real Estate and Rental and Leasing	$0.4	$0.4	$0.0	$0.0	$0.0
Professional, Scientific, and Technical Services	$3.0	$2.6	$0.1	$0.2	$0.4
Management of Companies and Enterprises	$1.7	$1.1	$0.0	$0.1	$0.2
Administrative and Waste Management Services	$1.0	$0.8	–$0.1	$0.0	$0.1
Educational Services	$0.2	$0.2	$0.0	$0.0	$0.0
Health Care and Social Assistance	$1.9	$1.6	$0.0	$0.2	$0.3
Arts, Entertainment, and Recreation	$0.2	$0.1	$0.0	$0.0	$0.0
Accommodation and Food Services	$0.5	$0.5	$0.1	$0.1	$0.1
Other Services, except Public Administration	$0.7	$0.6	$0.0	$0.0	$0.1
Government	$7.2	$5.2	$0.2	$0.4	$0.7

Source: BEBR analysis using the REMI PI+ model.

13.2.4 Conclusions

Under both price forecasts, Reference Prices and Low Prices, increasing the number of wells drilled each year by 15 percent has positive effects on employment, earnings, gross state product and state and local tax revenues versus the baseline. However, raising the royalty rate to 16.7 percent on new production, in addition to increasing wells by 15 percent, significantly reduces the positive impacts of the increased drilling (in the case of low forecast oil and gas prices) or makes employment, earnings, GSP and state and local tax revenues *less* than they would have been under the baseline (in the case of Reference prices). Under all scenarios examined here, for both price forecasts, the net impacts at their largest are nearly insignificant relative to the size of the state's economy, never measuring more than one-half of one percent of the total.

13.3 Flaring and Venting of Natural Gas

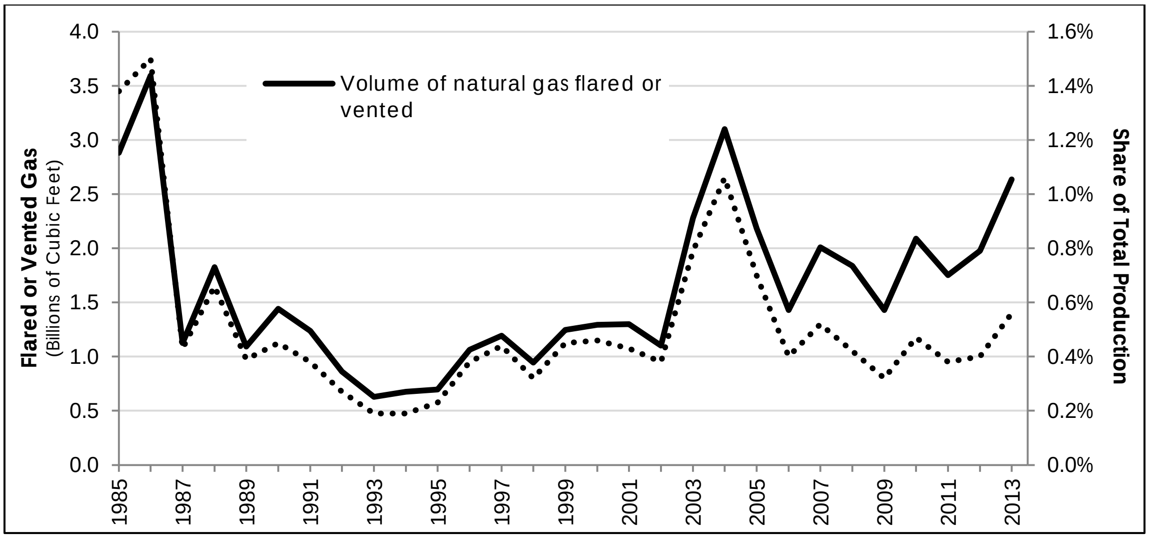
The production of natural gas, either through natural gas wells or as associated gas through oil wells, may be accompanied by the flaring (burning) or venting (releasing unburned methane into the atmosphere) of natural gas.[305] Natural gas flared or vented is generally not subject to royalties. At least a portion of flared or vented natural gas may represent lost royalty revenue. A de-

[305] The term "associated gas" refers to natural gas that is mingled with crude oil and produced along with it. In the ground, where pressure is greater, the gas is dissolved in the oil. As the crude oil reaches the surface, the pressure reduction releases gas out of solution.

tailed analysis of the additional royalty revenue which might be available to the state if some or all flared or vented natural gas was subject to royalties was not carried out for this study.

Between 1985 and 2013, the average annual volume of natural gas reported to the Utah Division of Oil, Gas and Mining has been about 1.6 billion cubic feet—about 0.5 percent of the natural gas produced (Figure 13.6).

Figure 13.6
Natural Gas Flaring and Venting at the Wellsite



Source: BEBR Analysis of data published by the Utah Division of Oil, Gas and Mining.

A 2010 study by the Government Accountability Office (Government Accountability Office, 2010), suggests, however, that actual volumes of flaring and venting may far exceed the reported volumes such as those given above. It appears that numerous previously unknown or, in any case, unaccounted for sources contribute to actual volumes exceeding reported volumes by as much as 30 times. The GAO report estimates, based on studies by the EPA and the Western Regional Air Partnership, that actual flared or vented natural gas in Utah's Uinta Basin amounted to 9.2 billion cubic feet in 2006. By contrast, the reported volume for the entire state during 2006 amounted to 1.4 billion cubic feet.

The GAO believes that perhaps 40 percent of the natural gas actually flared or vented could be recovered economically and subject to royalties. From this they estimate that royalties levied on this portion of flared or vented natural gas could yield $23 million per year in additional federal royalties and prevent emissions of greenhouse gases by an amount equivalent to removing 3.1 million cars from the road.[306]

As only a very rough estimate, if the state could assess royalties on 40 percent of actual emissions, and those emissions amounted to, say, 48 billion cubic feet of natural gas per year, with perhaps half that amount coming from lands currently federal, and natural gas prices were at $4 per Mcf, then the royalties generated would amount to around $4.8 million per year.[307]

[306] Flaring natural gas results in the emission of carbon dioxide, a greenhouse gas; but venting natural gas releases methane, a far more potent greenhouse gas.

[307] This back-of-the-envelope calculation assumes that actual emissions are 30 times greater than the average annual rate of 1.6 billion cubic feet, that 40 percent of such volume becomes subject to royalties, that the share of such

The Bureau of Land Management is currently considering various options aimed at reducing flaring and venting on federal and tribal lands, both for the purpose of generating additional revenues and to reduce greenhouse gas emissions. The state might consider further analysis of this issue in the event federal lands are transferred to the state.

13.4 COAL PRODUCTION SCENARIOS

The future of coal mining in Utah is dependent on a complex set of economic, geological, technical, and political factors. The Utah Geological Survey (UGS) provided three coal production scenarios for this study: Low, Middle and High. In all three scenarios the UGS assumed that there would be steady depletion at existing mines. In the Low scenario, demand for coal declines due to greenhouse gas regulations, retirement of coal-fired power plants, industrial power plants converting to natural gas, and the lack of development of successful carbon-capture technology. In addition, new mines have problems with leasing and permitting, the Alton mine in Kane County fails to secure a federal coal lease, export markets do not materialize, and the IPP power plant converts to natural gas in 2027. Under the Middle scenario demand remains steady, then slowly decreases as no new coal-fired power plants are built and old plants are shut down. However, there is an increase in the export market, new reserves are leased and some new mines are opened, and the Alton mine gets a federal coal lease. IPP converts to natural gas in 2027. The High scenario assumes that coal demand increases due to the development of successful carbon-capture technology, which leads to the construction of new coal-fired power plants and new coal-to-liquids and coal-to-gas plants, and because of an increase in the export market. New reserves are leased and new mines are opened, and the Alton mine gets a federal coal lease. This scenario also assumes that IPP is sold and not converted to natural gas and the state gets control of Grand Staircase–Escalante National Monument and a mine is opened in the Kaiparowits coal field.

All three scenarios follow the same production path from 2014 through 2017, with annual production growing slightly from 16.1 million tons to 16.4 million (Table 13.21 and Figure 13.7). In 2018 the paths begin to diverge, although production in both the Middle and High scenarios is 15.8 million tons versus 15.3 million in the Low scenar-

Table 13.21
Utah Coal Production Scenarios, 2000–2035
(Thousands of Tons)

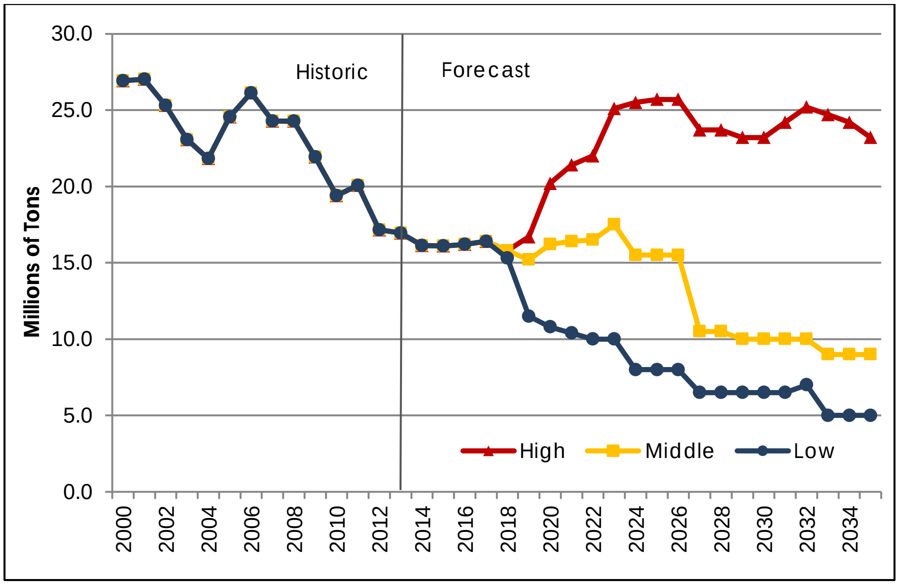
Year	Low	Middle	High
2000	26,920	26,920	26,920
2001	27,024	27,024	27,024
2002	25,299	25,299	25,299
2003	23,069	23,069	23,069
2004	21,817	21,817	21,817
2005	24,556	24,556	24,556
2006	26,131	26,131	26,131
2007	24,288	24,288	24,288
2008	24,275	24,275	24,275
2009	21,927	21,927	21,927
2010	19,406	19,406	19,406
2011	20,073	20,073	20,073
2012	17,155	17,155	17,155
2013	16,953	16,953	16,953
2014	16,130	16,130	16,130
2015	16,100	16,100	16,100
2016	16,200	16,200	16,200
2017	16,400	16,400	16,400
2018	15,300	15,800	15,800
2019	11,500	15,200	16,700
2020	10,800	16,200	20,200
2021	10,400	16,400	21,400
2022	10,000	16,500	22,000
2023	10,000	17,500	25,100
2024	8,000	15,500	25,500
2025	8,000	15,500	25,700
2026	8,000	15,500	25,700
2027	6,500	10,500	23,700
2028	6,500	10,500	23,700
2029	6,500	10,000	23,200
2030	6,500	10,000	23,200
2031	6,500	10,000	24,200
2032	7,000	10,000	25,200
2033	5,000	9,000	24,700
2034	5,000	9,000	24,200
2035	5,000	9,000	23,200

Note: Historical data through 2013, projections from 2014 through 2035.
Source: Utah Geological Survey.

emissions from wells on lands currently federal is and remains at 50 percent, that the royalty rate is 12.5 percent, and that natural gas prices are $4 per thousand cubic feet.

io. Production in the Low scenario drops to 11.5 million tons in 2019 and continues a slow, stepwise decline to eventually reach 5.0 million tons in 2033 through 2035. Under the Middle scenario, production dips to 15.2 million tons in 2019 then grows to 17.5 million in 2023. From here it declines to 15.5 million tons in 2024 through 2026, drops to 10.5 million tons in 2027 and then to 9.0 million in 2033 through 2035. The High scenario projects rapid growth from 16.7 million tons in 2019 to 25.1 million tons in 2023. Growth is much slower over the next few years, with production reaching a high of 25.7 million tons in 2025. Over the next ten years coal production fluctuates, falling to 23.2 million tons in 2029, then growing to 25.2 million tons in 2032, and finally declining again to 23.2 million tons in 2035.

Figure 13.7
Utah Coal Production Scenarios, 2000–2035



Note: Historical data through 2013, projections from 2014 through 2035.
Source: Utah Geological Survey.

13.5 Economic and Fiscal Impacts of Coal Scenarios

Given the unique nature of Utah's coal mines (i.e., very deep underground mines), it was necessary to calibrate the REMI model to generate more accurate impact estimates. Given known coal production in 2013, we adjusted labor productivity in the mining sector until total employment, mining employment, total earnings and mining earnings were within less than 5 percent of the known values published by the U.S. Bureau of Economic Analysis. From this adjusted baseline we input the Utah Geological Survey's low, middle and high production forecasts valued at the U.S. Energy Information Administration's reference case projected minemouth prices for Rocky Mountain bituminous coal. The REMI model then calculated impacts on employment and earnings by industry, gross state product, and population.

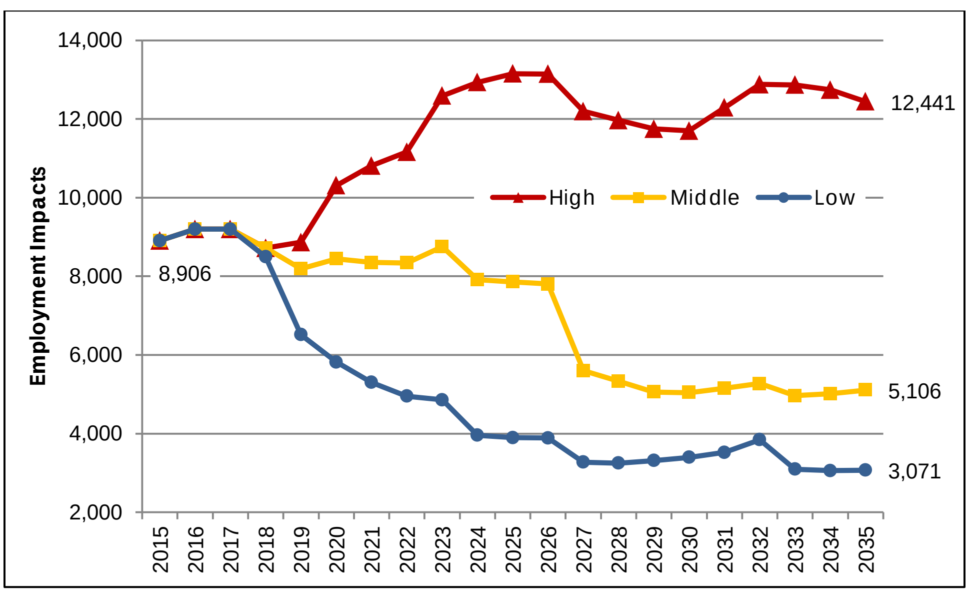
From coal production values under each scenario we estimated royalty revenues based on a royalty rate of 8.0 percent of the value of production. Using information from UGS we estimated the share of annual production from (current) federal leases and from SITLA leases. The state currently receives 49 percent of federal coal royalty revenues. Under various land-transfer scenarios the state could receive 100 percent of the royalties from new production from former federal leases and continue to receive 49 percent of the royalties from existing leases, or it could receive 100 percent of the royalties from both current and future "federal" leases. The royalty numbers presented here make no assumptions about how they are shared.

We also estimated state sales tax revenues from taxable business investments in the coal mining sector and county tax revenues from property taxes on coal mines. These estimates were based on historical relationships between tax receipts and production values. From the earnings impacts generated by REMI, we estimated state income and state and local sales tax revenues based on historic ratios of tax collections to earnings.

Tables 13.22a through 13.24d show summary impacts, detailed employment and earnings impacts, and fiscal impacts for the three production scenarios. Tables 13.22a through 13.22d cover the Low production scenario, Tables 13.23a through 13.23d provide results for the Middle scenario, and Tables 13.24a through 13.24d provide High scenario impacts. Figures 13.8a through 13.8f compare impacts across scenarios in the major impact categories.

Employment impacts grow from 8,096 jobs[308] in 2015 to 9,197 in 2016 and 2017 under all three production scenarios (Figure 13.8a). Impacts then decline under the Low and Middle scenarios to 3,071 and 5,106 jobs, respectively, in 2035. Under the High scenario, employment impacts decline in 2018 then climb to a peak of 13,153 in 2025, fall and rise again, then end at 12,441 in 2035.

Figure 13.8a
Employment Impacts of Coal Production Scenarios, 2015–2035

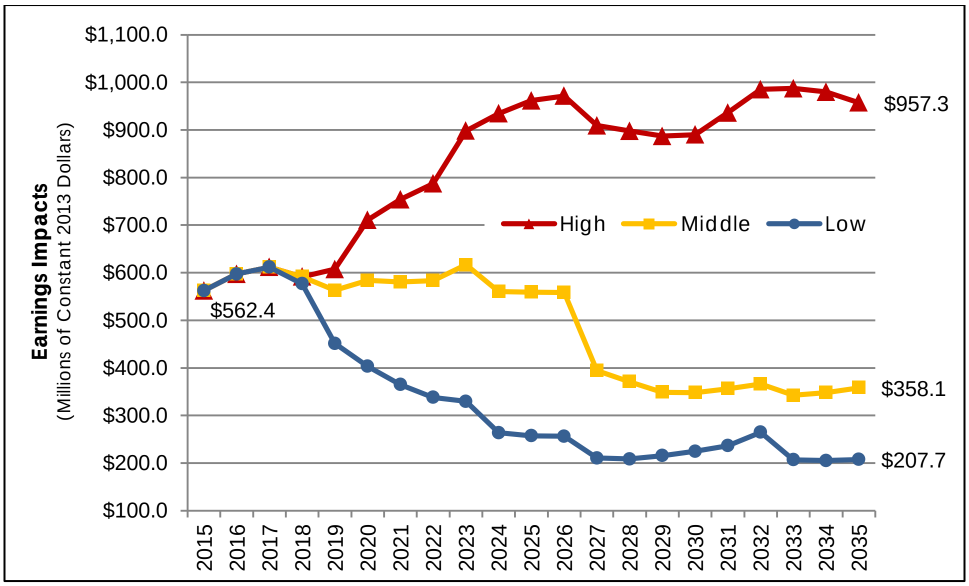


Source: BEBR analysis of Utah Geological Survey coal production forecasts using the REMI PI+ model.

308 Job counts are both full- and part-time jobs, counted equally, and cover wage-and-salary jobs, proprietors and active partners.

Real, inflation-adjusted earnings[309] impacts follow the same path from 2015 to 2017 under all three scenarios: impacts rise from $562.4 million to $611.6 million (in constant 2013 dollars) (Figure 13.8b). From here earnings impacts decline under the Low scenario to reach $207.7 million in 2035. Under the Middle scenario, earnings impacts are generally flat through 2026 when they are $558.0 million. They then drop to $394.5 million in 2027, and remain relatively constant to end at $358.1 million in 2035. In the High scenario earnings impacts climb steadily from 2018 to $971.5 million in 2026, dip to $886.9 million in 2029, then reach $957.3 million in 2035.

Figure 13.8b
Earnings Impacts of Coal Production Scenarios, 2015–2035



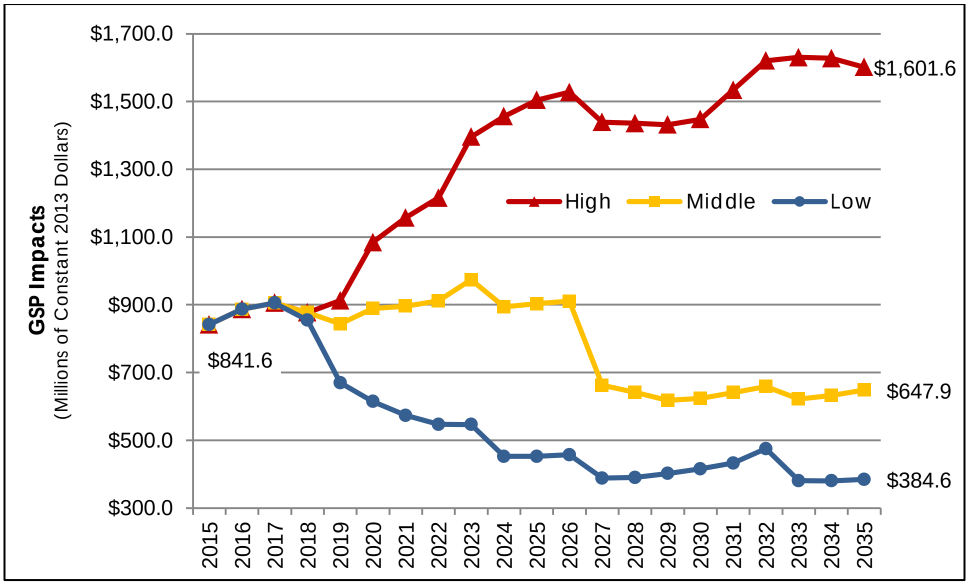
Source: BEBR analysis of Utah Geological Survey coal production forecasts using the REMI PI+ model.

Inflation-adjusted impacts to gross state product[310] (GSP) increase from $841.6 million in 2015 to $905.5 million in 2017 (in constant 2013 dollars) in all scenarios (Figure 13.8c). Under the Low and Middle scenarios GSP impacts are smaller in 2035 than in 2015. In the Low scenario impacts shrink pretty steadily to $384.6 million in 2035. Under the Middle scenario they remain fairly steady at around $900.0 million through 2026, then drop to $662.0 million in 2027 and remain at that level through 2035, when the impacts are $647.9 million. Under the High scenario, GSP impacts grow to over $1.5 billion in 2026, dip slightly in 2027 and remain steady for a few years, then rise again to $1.6 billion in 2035.

309 Earnings are wages and salaries, employer supplements to wages and salaries (contributions to pension and insurance funds and to government social insurance), and proprietors' income. All amounts are in inflation-adjusted 2013 dollars.

310 Gross state product is the market value of goods and services produced by labor and property in the state of Utah. It is analogous to the national measure of gross domestic product. All amounts are in inflation-adjusted 2013 dollars.

Figure 13.8c
Gross State Product Impacts of Coal Production Scenarios, 2015–2035

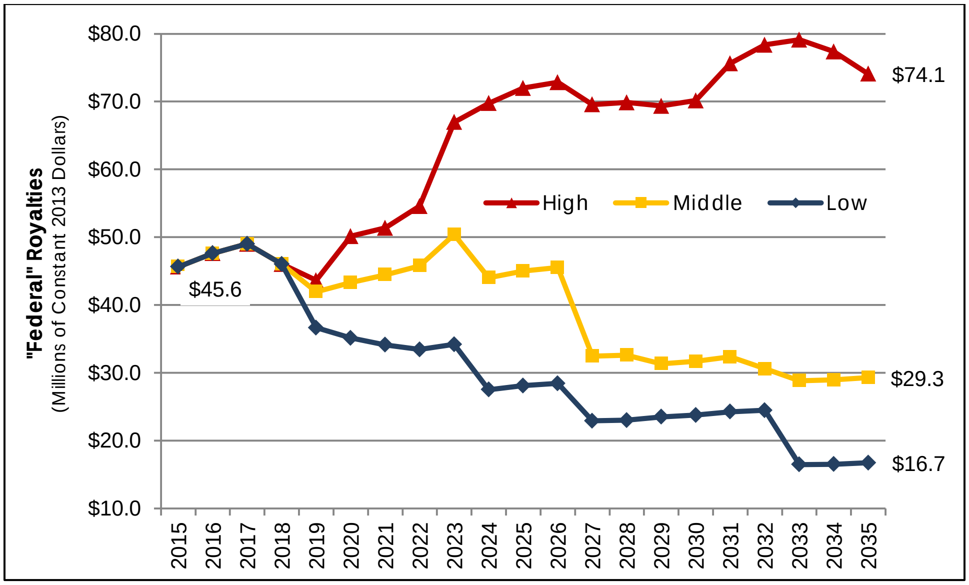


Source: BEBR analysis of Utah Geological Survey coal production forecasts using the REMI PI+ model.

For fiscal impacts we assumed an 8.0 percent royalty rate on the value of production. Using information from UGS we estimated the share of annual production from what are currently federal leases. Under a land transfer as described in H.B. 148, some of all of these leases could become the property of the State of Utah. Although Utah does not now assess a royalty on coal production from county- or privately owned mineral rights, we assume it would continue to and/or assess a new royalty on coal production from (former) federal mineral rights. We did not attempt to estimate revenues from rental and bonus payments.

Under all three scenarios, inflation-adjusted coal royalties increase from $45.6 million in 2017 to $49.0 million in 2017 (in constant 2013 dollars; Figure 13.8d). Royalties then decline under the Low scenario to $18.4 million in 2035. Under the Middle scenario, they are essentially flat through 2026, when they are $45.5 million. They then drop to $32.5 million in 2027, then decrease slowly to $29.3 million in 2035. The High scenario sees royalties increase to $72.8 million in 2026, level off at $70.0 million for a few years, then rise and fall again to reach $74.1 million in 2035.

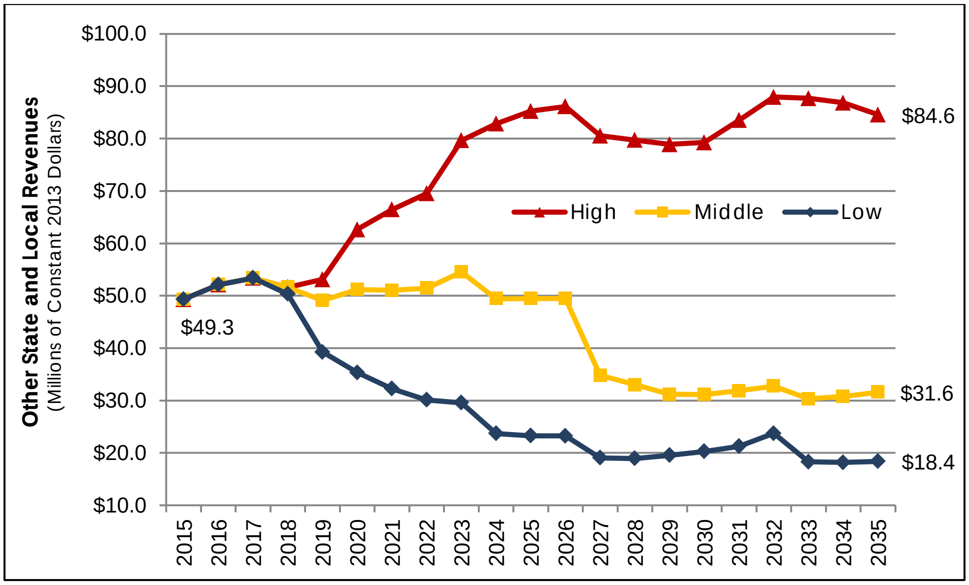
Figure 13.8d
Royalty Impacts of Coal Production Scenarios, 2015–2035



Source: BEBR analysis of Utah Geological Survey coal production forecasts using the REMI PI+ model.

Other state and county revenue impacts we estimated consist of state sales tax revenues from taxable business investment purchases in the coal mining sector, state income and sales taxes generated by people spending the earnings impacts, county property taxes on coal mines, and county sales taxes from spending earnings. Under all three scenarios, these revenues grow from $49.3 million in 2015 to $53.4 million in 2017 in inflation-adjusted 2013 dollars (Figure 13.8e). Under the Low scenario, other revenues decline to $18.4 million in 2035. Under the Middle scenario, annual revenues remain at around $50.0 million through 2026, drop to $34.8 million in 2027, and are essentially flat through 2035, when they reach $31.6 million. The High scenario sees other revenues grow to $86.1 million in 2026, dip slightly in 2027, then reach $84.6 million in 2035.

Figure 13.8e
Other Revenue Impacts of Coal Production Scenarios, 2015–2035



Note: Other revenues consist of income taxes, sales taxes and property taxes.
Source: BEBR analysis of Utah Geological Survey coal production forecasts using the REMI PI+ model.

Table 13.22a
Low Coal Scenario Summary Impacts, 2015–2035
(Millions of Constant 2013 Dollars)

Year	Employment	Earnings	GSP
2015	8,906	$562.4	$841.6
2016	9,197	$597.4	$886.7
2017	9,197	$611.6	$905.5
2018	8,493	$576.7	$854.3
2019	6,516	$451.4	$669.8
2020	5,821	$403.3	$614.3
2021	5,301	$364.9	$573.1
2022	4,950	$337.9	$546.7
2023	4,859	$329.6	$546.3
2024	3,959	$263.8	$452.5
2025	3,899	$257.3	$452.5
2026	3,890	$256.3	$457.0
2027	3,272	$210.4	$388.4
2028	3,249	$208.7	$389.8
2029	3,317	$215.5	$402.0
2030	3,396	$224.7	$415.3
2031	3,524	$236.5	$432.7
2032	3,843	$264.6	$474.8
2033	3,093	$206.7	$380.8
2034	3,060	$205.3	$380.1
2035	3,071	$207.7	$384.6

Note: Employment consists of full- and part-time jobs, counted equally.
Source: BEBR analysis of Utah Geological Survey coal production forecasts using the REMI PI+ model.

In all scenarios the largest employment impacts are in the mining, construction and government sectors. The retail trade; professional, scientific and technical services; and health care and social assistance sectors also see significant impacts (Tables 13.22b, 13.23b and 13.24b). The largest earnings impacts across scenarios are also in the mining, construction and government sectors, with significant impacts also occurring in the professional, scientific and technical services; retail trade; manufacturing; and health care and social assistance sectors (Tables 13.22c, 13.23c and 13.24c).

Table 13.22b
Low Coal Scenario Detailed Employment Impacts, 2015–2035

Sector	2015	2020	2025	2030	2035
Total Employment	8,906	5,821	3,899	3,396	3,071
Farm Employment	0	0	0	0	0
Forestry, Fishing, and Related Activities	4	1	1	1	1
Mining	2,148	1,475	1,120	909	731
Utilities	16	12	9	7	6
Construction	1,304	660	110	68	123
Manufacturing	340	157	92	86	81
Wholesale Trade	170	97	61	53	47
Retail Trade	751	491	339	303	276
Transportation and Warehousing	217	125	85	71	59
Information	80	50	35	31	29
Finance and Insurance	391	191	114	106	99
Real Estate and Rental and Leasing	332	271	189	162	148
Professional, Scientific, and Technical Services	449	330	251	236	233
Management of Companies and Enterprises	88	46	30	26	22
Administrative and Waste Management Services	327	208	144	134	126
Educational Services	63	64	57	54	51
Health Care and Social Assistance	496	354	299	314	318
Arts, Entertainment, and Recreation	106	68	52	50	46
Accommodation and Food Services	316	311	267	240	213
Other Services, except Public Administration	273	157	112	103	94
Government	1,034	751	533	442	368

Note: Employment consists of full- and part-time jobs, counted equally, and covers wage-and-salary employees, sole proprietors and active partners.

Source: BEBR analysis of Utah Geological Survey coal production forecasts using the REMI PI+ model.

Table 13.22c
Low Coal Scenario Detailed Earnings Impacts, 2015–2035
(Millions of Constant 2013 Dollars)

Sector	2015	2020	2025	2030	2035
Total Earnings	$562.4	$403.3	$257.3	$224.7	$207.7
Farm Earnings	$0.1	$0.1	$0.0	–$0.1	–$0.1
Forestry, Fishing, and Related Activities	$0.2	$0.1	$0.0	$0.0	$0.0
Mining	$159.3	$119.3	$96.5	$83.5	$67.9
Utilities	$2.6	$2.4	$1.8	$1.8	$1.7
Construction	$84.0	$52.0	$10.4	$5.3	$9.7
Manufacturing	$30.8	$17.7	$8.9	$8.1	$8.4
Wholesale Trade	$16.5	$11.3	$6.5	$5.8	$5.7
Retail Trade	$30.4	$23.0	$15.3	$14.6	$14.5
Transportation and Warehousing	$14.9	$10.0	$6.4	$5.5	$4.8
Information	$7.9	$6.0	$3.8	$3.5	$3.7
Finance and Insurance	$23.2	$13.3	$6.8	$6.2	$6.2
Real Estate and Rental and Leasing	$7.2	$5.8	$3.5	$2.8	$2.5
Professional, Scientific, and Technical Services	$35.3	$27.8	$19.1	$17.8	$17.8
Management of Companies and Enterprises	$10.8	$7.9	$5.7	$5.4	$5.3
Administrative and Waste Management Services	$12.9	$8.9	$5.3	$4.7	$4.5
Educational Services	$3.4	$3.1	$2.1	$1.9	$1.8
Health Care and Social Assistance	$28.8	$21.3	$15.4	$15.7	$15.9
Arts, Entertainment, and Recreation	$2.4	$1.6	$1.0	$1.2	$1.1
Accommodation and Food Services	$8.4	$8.4	$6.6	$6.0	$5.4
Other Services, except Public Administration	$11.9	$7.4	$4.6	$4.2	$3.9
Government	$71.5	$55.7	$37.5	$30.8	$26.8

Note: Earnings comprise wages and salaries, supplements to wages and salaries, and proprietors' income.

Source: BEBR analysis of Utah Geological Survey coal production forecasts using the REMI PI+ model.

Table 13.22d
Low Coal Scenario Fiscal Impacts
(Millions of Constant 2013 Dollars)

Year	Federal Royalties	Taxable Investments	State Income & Sales Taxes	Property Taxes	Local Sales Taxes	SITLA Royalties
2015	$45.6	$1.44	$39.8	$4.6	$3.5	$1.5
2016	$47.6	$1.50	$42.3	$4.6	$3.7	$1.6
2017	$49.0	$1.54	$43.3	$4.7	$3.8	$1.6
2018	$46.0	$1.46	$40.8	$4.4	$3.6	$1.6
2019	$36.6	$1.12	$31.9	$3.4	$2.8	$1.7
2020	$35.1	$1.07	$28.5	$3.2	$2.5	$1.7
2021	$34.1	$1.04	$25.8	$3.1	$2.3	$1.7
2022	$33.5	$1.03	$23.9	$3.1	$2.1	$1.8
2023	$34.2	$1.05	$23.3	$3.1	$2.1	$1.8
2024	$27.5	$0.85	$18.7	$2.5	$1.7	$1.8
2025	$28.1	$0.87	$18.2	$2.6	$1.6	$1.9
2026	$28.5	$0.88	$18.1	$2.6	$1.6	$1.9
2027	$22.9	$0.72	$14.9	$2.1	$1.3	$1.9
2028	$23.0	$0.73	$14.8	$2.2	$1.3	$1.9
2029	$23.5	$0.74	$15.2	$2.2	$1.3	$2.0
2030	$23.8	$0.75	$15.9	$2.2	$1.4	$2.0
2031	$24.3	$0.77	$16.7	$2.3	$1.5	$2.0
2032	$24.5	$0.83	$18.7	$2.5	$1.7	$4.1
2033	$16.5	$0.60	$14.6	$1.8	$1.3	$4.1
2034	$16.5	$0.60	$14.5	$1.8	$1.3	$4.1
2035	$16.7	$0.61	$14.7	$1.8	$1.3	$4.2

Source: BEBR analysis of Utah Geological Survey coal production forecasts.

Table 13.23a
Middle Coal Scenario Summary
Impacts, 2015–2035
(Millions of Constant 2013 Dollars)

Year	Employment	Earnings	GSP
2015	8,906	$562.4	$841.6
2016	9,197	$597.4	$886.7
2017	9,197	$611.6	$905.5
2018	8,719	$591.4	$877.2
2019	8,193	$563.0	$843.3
2020	8,446	$583.8	$888.7
2021	8,351	$580.7	$896.0
2022	8,338	$583.4	$911.5
2023	8,754	$616.9	$973.9
2024	7,911	$560.4	$893.8
2025	7,860	$559.1	$903.0
2026	7,805	$558.0	$910.5
2027	5,601	$394.5	$662.0
2028	5,331	$371.0	$641.5
2029	5,057	$348.8	$617.6
2030	5,041	$348.1	$623.4
2031	5,156	$356.0	$641.0
2032	5,272	$365.9	$658.4
2033	4,964	$342.4	$621.9
2034	5,012	$348.0	$632.0
2035	5,106	$358.1	$647.9

Note: Employment consists of full- and part-time jobs, counted equally.

Source: BEBR analysis of Utah Geological Survey coal production forecasts using the REMI PI+ model.

Table 13.23b
Middle Coal Scenario Detailed Employment Impacts, 2015–2035

Sector	2015	2020	2025	2030	2035
Total Employment	8,906	8,446	7,860	5,041	5,106
Farm Employment	0	0	0	0	0
Forestry, Fishing, and Related Activities	4	3	2	1	2
Mining	2,148	2,219	2,184	1,398	1,316
Utilities	16	16	16	11	10
Construction	1,304	985	637	127	232
Manufacturing	340	245	202	119	128
Wholesale Trade	170	145	125	77	77
Retail Trade	751	708	655	437	440
Transportation and Warehousing	217	193	173	103	101
Information	80	72	66	45	45
Finance and Insurance	391	299	250	148	160
Real Estate and Rental and Leasing	332	359	349	242	238
Professional, Scientific, and Technical Services	449	460	472	351	377
Management of Companies and Enterprises	88	71	62	37	37
Administrative and Waste Management Services	327	308	293	194	206
Educational Services	63	80	92	78	78
Health Care and Social Assistance	496	504	538	439	490
Arts, Entertainment, and Recreation	106	98	96	71	73
Accommodation and Food Services	316	399	434	350	334
Other Services, except Public Administration	273	227	212	147	149
Government	1,034	1,053	1,004	665	613

Note: Employment consists of full- and part-time jobs, counted equally, and covers wage-and-salary employees, sole proprietors and active partners.
Source: BEBR analysis of Utah Geological Survey coal production forecasts using the REMI PI+ model.

Table 13.23c
Middle Coal Scenario Detailed Earnings Impacts, 2015–2035
(Millions of Constant 2013 Dollars)

Sector	2015	2020	2025	2030	2035
Total Earnings	$562.4	$583.8	$559.1	$348.1	$358.1
Farm Earnings	$0.1	$0.1	$0.0	–$0.1	–$0.1
Forestry, Fishing, and Related Activities	$0.2	$0.1	$0.1	$0.0	$0.0
Mining	$159.3	$179.3	$189.0	$128.7	$122.5
Utilities	$2.6	$3.3	$3.6	$2.7	$2.8
Construction	$84.0	$75.5	$54.2	$12.1	$19.8
Manufacturing	$30.8	$26.8	$23.1	$12.4	$14.1
Wholesale Trade	$16.5	$16.7	$15.4	$9.0	$9.8
Retail Trade	$30.4	$32.9	$32.6	$21.9	$23.8
Transportation and Warehousing	$14.9	$15.0	$14.2	$8.4	$8.6
Information	$7.9	$8.6	$8.4	$5.5	$6.1
Finance and Insurance	$23.2	$20.3	$17.4	$9.4	$10.5
Real Estate and Rental and Leasing	$7.2	$7.7	$7.1	$4.4	$4.1
Professional, Scientific, and Technical Services	$35.3	$38.6	$39.5	$27.7	$29.7
Management of Companies and Enterprises	$10.8	$11.5	$11.8	$8.2	$8.9
Administrative and Waste Management Services	$12.9	$13.0	$12.1	$7.2	$7.6
Educational Services	$3.4	$4.0	$4.1	$2.9	$2.8
Health Care and Social Assistance	$28.8	$30.2	$30.8	$22.8	$25.0
Arts, Entertainment, and Recreation	$2.4	$2.3	$2.2	$1.8	$1.8
Accommodation and Food Services	$8.4	$10.9	$11.6	$9.0	$8.6
Other Services, except Public Administration	$11.9	$10.6	$9.8	$6.3	$6.5
Government	$71.5	$76.1	$72.2	$47.7	$45.0

Note: Earnings comprise wages and salaries, supplements to wages and salaries, and proprietors' income.
Source: BEBR analysis of Utah Geological Survey coal production forecasts using the REMI PI+ model.

Table 13.23d
Middle Coal Scenario Fiscal Impacts
(Millions of Constant 2013 Dollars)

Year	Federal Royalties	Taxable Investments	State Income & Sales Taxes	Property Taxes	Local Sales Taxes	SITLA Royalties
2015	$45.6	$1.44	$39.8	$4.6	$3.5	$1.5
2016	$47.6	$1.50	$42.3	$4.6	$3.7	$1.6
2017	$49.0	$1.54	$43.3	$4.7	$3.8	$1.6
2018	$46.0	$1.51	$41.8	$4.6	$3.7	$3.3
2019	$42.0	$1.47	$39.8	$4.3	$3.5	$8.7
2020	$43.3	$1.61	$41.3	$4.6	$3.7	$11.9
2021	$44.5	$1.65	$41.1	$4.7	$3.6	$12.1
2022	$45.8	$1.69	$41.3	$4.8	$3.7	$12.3
2023	$50.4	$1.83	$43.6	$5.2	$3.9	$12.6
2024	$44.1	$1.66	$39.7	$4.6	$3.5	$12.8
2025	$45.0	$1.69	$39.6	$4.7	$3.5	$13.1
2026	$45.5	$1.71	$39.5	$4.8	$3.5	$13.3
2027	$32.5	$1.17	$27.9	$3.2	$2.5	$7.6
2028	$32.6	$1.17	$26.3	$3.3	$2.3	$7.7
2029	$31.3	$1.14	$24.7	$3.2	$2.2	$7.8
2030	$31.7	$1.15	$24.6	$3.2	$2.2	$7.9
2031	$32.4	$1.18	$25.2	$3.3	$2.2	$8.1
2032	$30.6	$1.19	$25.9	$3.4	$2.3	$10.2
2033	$28.8	$1.08	$24.2	$2.9	$2.1	$8.2
2034	$29.0	$1.08	$24.6	$2.9	$2.2	$8.3
2035	$29.3	$1.10	$25.3	$2.9	$2.2	$8.4

Source: BEBR analysis of Utah Geological Survey coal production forecasts.

Table 13.24a
High Coal Scenario Summary
Impacts, 2015–2035
(Millions of Constant 2013 Dollars)

Year	Employment	Earnings	GSP
2015	8,906	$562.4	$841.6
2016	9,197	$597.4	$886.7
2017	9,197	$611.6	$905.5
2018	8,719	$591.4	$877.2
2019	8,863	$607.3	$912.6
2020	10,311	$711.0	$1,084.5
2021	10,811	$753.8	$1,157.2
2022	11,160	$787.3	$1,215.8
2023	12,589	$898.2	$1,395.7
2024	12,933	$934.3	$1,456.0
2025	13,153	$961.5	$1,504.2
2026	13,145	$971.5	$1,527.3
2027	12,193	$909.2	$1,439.0
2028	11,968	$897.8	$1,435.5
2029	11,746	$886.9	$1,431.6
2030	11,700	$890.0	$1,447.8
2031	12,290	$936.2	$1,534.1
2032	12,879	$985.4	$1,620.6
2033	12,866	$987.1	$1,630.6
2034	12,740	$979.8	$1,627.5
2035	12,441	$957.3	$1,601.6

Note: Employment consists of full- and part-time jobs, counted equally.

Source: BEBR analysis of Utah Geological Survey coal production forecasts using the REMI PI+ model.

Table 13.24b
High Coal Scenario Detailed Employment Impacts, 2015–2035

Sector	2015	2020	2025	2030	2035
Total Employment	8,906	10,311	13,153	11,700	12,441
Farm Employment	0	0	0	0	0
Forestry, Fishing, and Related Activities	4	3	4	3	3
Mining	2,148	2,769	3,633	3,263	3,403
Utilities	16	20	25	22	23
Construction	1,304	1,194	1,353	924	987
Manufacturing	340	308	353	283	294
Wholesale Trade	170	180	213	178	183
Retail Trade	751	864	1,077	952	995
Transportation and Warehousing	217	243	296	244	247
Information	80	88	107	95	100
Finance and Insurance	391	377	438	358	374
Real Estate and Rental and Leasing	332	418	551	518	554
Professional, Scientific, and Technical Services	449	551	759	755	876
Management of Companies and Enterprises	88	90	105	86	87
Administrative and Waste Management Services	327	379	493	444	485
Educational Services	63	91	133	141	158
Health Care and Social Assistance	496	611	852	866	1,013
Arts, Entertainment, and Recreation	106	120	155	146	160
Accommodation and Food Services	316	460	640	651	702
Other Services, except Public Administration	273	277	345	310	330
Government	1,034	1,268	1,621	1,459	1,468

Note: Employment consists of full- and part-time jobs, counted equally, and covers wage-and-salary employees, sole proprietors and active partners.
Source: BEBR analysis of Utah Geological Survey coal production forecasts using the REMI PI+ model.

Table 13.24c
High Coal Scenario Detailed Earnings Impacts, 2015–2035
(Millions of Constant 2013 Dollars)

Sector	2015	2020	2025	2030	2035
Total Earnings	$562.4	$711.0	$961.5	$890.0	$957.3
Farm Earnings	$0.1	$0.1	$0.1	$0.0	$0.0
Forestry, Fishing, and Related Activities	$0.2	$0.1	$0.2	$0.1	$0.1
Mining	$159.3	$223.6	$315.0	$301.7	$318.0
Utilities	$2.6	$4.0	$6.0	$6.2	$7.0
Construction	$84.0	$90.6	$113.0	$85.5	$93.1
Manufacturing	$30.8	$33.2	$42.4	$36.3	$39.0
Wholesale Trade	$16.5	$20.4	$27.3	$24.9	$27.3
Retail Trade	$30.4	$39.9	$55.4	$53.4	$59.3
Transportation and Warehousing	$14.9	$18.7	$24.9	$22.1	$23.3
Information	$7.9	$10.3	$14.4	$14.0	$16.0
Finance and Insurance	$23.2	$25.3	$31.8	$27.2	$28.9
Real Estate and Rental and Leasing	$7.2	$9.0	$11.6	$10.5	$10.7
Professional, Scientific, and Technical Services	$35.3	$46.1	$65.8	$66.4	$76.0
Management of Companies and Enterprises	$10.8	$14.1	$19.9	$19.7	$22.4
Administrative and Waste Management Services	$12.9	$15.8	$21.1	$19.1	$20.4
Educational Services	$3.4	$4.6	$6.5	$6.4	$6.7
Health Care and Social Assistance	$28.8	$36.4	$50.9	$50.6	$56.8
Arts, Entertainment, and Recreation	$2.4	$2.8	$3.7	$3.9	$4.2
Accommodation and Food Services	$8.4	$12.6	$17.9	$18.3	$19.6
Other Services, except Public Administration	$11.9	$12.9	$16.7	$15.2	$16.1
Government	$71.5	$90.2	$116.9	$108.3	$112.4

Note: Earnings comprise wages and salaries, supplements to wages and salaries, and proprietors' income.
Source: BEBR analysis of Utah Geological Survey coal production forecasts using the REMI PI+ model.

Table 13.24d
High Coal Scenario Fiscal Impacts
(Millions of Constant 2013 Dollars)

Year	Federal Royalties	Taxable Investments	State Income & Sales Taxes	Property Taxes	Local Sales Taxes	SITLA Royalties
2015	$45.6	$1.44	$39.8	$4.6	$3.5	$1.5
2016	$47.6	$1.50	$42.3	$4.6	$3.7	$1.6
2017	$49.0	$1.54	$43.3	$4.7	$3.8	$1.6
2018	$46.0	$1.51	$41.8	$4.6	$3.7	$3.3
2019	$43.6	$1.62	$43.0	$4.7	$3.8	$12.0
2020	$50.1	$2.01	$50.3	$5.9	$4.5	$18.8
2021	$51.4	$2.15	$53.3	$6.3	$4.7	$22.4
2022	$54.6	$2.26	$55.7	$6.6	$4.9	$22.9
2023	$67.0	$2.63	$63.5	$7.8	$5.6	$23.4
2024	$69.7	$2.73	$66.1	$8.1	$5.8	$23.9
2025	$72.0	$2.81	$68.0	$8.4	$6.0	$24.4
2026	$72.8	$2.84	$68.7	$8.5	$6.1	$24.7
2027	$69.6	$2.64	$64.3	$7.9	$5.7	$19.1
2028	$69.9	$2.65	$63.5	$7.9	$5.6	$19.2
2029	$69.4	$2.65	$62.8	$7.9	$5.6	$19.6
2030	$70.2	$2.68	$63.0	$8.0	$5.6	$19.8
2031	$75.6	$2.85	$66.2	$8.5	$5.9	$20.2
2032	$78.4	$2.99	$69.7	$9.0	$6.2	$22.4
2033	$79.1	$2.96	$69.8	$8.7	$6.2	$20.6
2034	$77.4	$2.91	$69.3	$8.5	$6.1	$20.7
2035	$74.1	$2.83	$67.7	$8.0	$6.0	$20.9

Source: BEBR analysis of Utah Geological Survey coal production forecasts.

13.6 GRAZING SCENARIOS

The scenarios presented here assume a transfer of public lands from the Bureau of Land Management (BLM) and U.S. Forest Service (Forest Service) to state agencies in Utah, and include an additional month on the range in all regions, and an increase in grazing fees to levels currently charged by the School and Institutional Trust Lands Administration (SITLA).

The rationale for increasing the time ranchers graze on public lands is based on personal communication with Utah Department of Agriculture and Food personnel who estimate that, on average, rangelands and forests in Utah can support an additional month of grazing (Forrest 2014).

The AUM fee increase mirrors the fees charged by SITLA. SITLA currently administers nearly all grazing permits on state lands, and has a two-tiered system for its grazing fees. The standard fee in 2012–13 was $4.22 per AUM. Grazing permits issued at this rate include grazing on lands owned by SITLA and rangelands managed by the BLM that are adjacent to SITLA lands, on which BLM charges of $1.35 per AUM.

Selected “blocks” of high-quality SITLA lands are subject to an even greater fee of $7.34 per AUM. These lands are typically improved lands owned by SITLA. The rationale for including a scenario at the higher rate is the assumption that the state will take action to improve the overall health and quality of its rangelands and forests, thereby justifying the higher AUM fee.

This analysis builds on baseline estimates presented in Chapter 7, Section 6. As such, the scenarios only include the economic and fiscal effects of changing the production costs of ranchers and livestock producers now holding permits to graze on federal lands. The study assumes that Utah will allow current permit holders the right to graze on state lands.

The economic impacts of three grazing scenarios are explored in this analysis. Each scenario is summarized below:

- Scenario I:
  - In each region, cattle will spend an additional month on rangelands and forests. Grazing on public lands is extended from 4.5 months to 5.5 months in the Eastern region, from 7 months to 8 in the Southern region, and from 6 months to 7 months in the Western region.
  - The grazing fee remains at $1.35 per AUM and will be paid to the state of Utah.
- Scenario II:
  - In each region, cattle will spend an additional month on rangelands and forests. Grazing on public lands is extended from 4.5 months to 5.5 months in the Eastern region, from 7 months to 8 in the Southern region, and from 6 months to 7 months in the Western region.
  - The grazing fee is increased to $4.22 per AUM and is paid to the state of Utah.
  - Ranchers will not adjust production costs to hold income steady. Rather, the increased AUM fees will reduce net income to the rancher.
- Scenario III:
  - In each region, cattle will spend an additional month on rangelands and forests. Grazing on public lands is extended from 4.5 months to 5.5 months in the Eastern region, from 7 months to 8 in the Southern region, and from 6 months to 7 months in the Western region.
  - The grazing fee is increased to $7.34 per AUM and is paid to the state of Utah.
  - Ranchers will not adjust production costs to hold income steady. Rather, the increased AUM fees will reduce net income to the rancher.

In all scenarios, forage on public lands substituted for private pasture or purchased feed in equal amounts (i.e., in the Eastern district private pasture was reduced from four months to 3.5 months and purchased feed was reduced from 3.5 months to three months). In all cases non-fee costs of grazing on public lands were held constant at $13.75 per AUM.

To estimate the economic effects of these scenarios, changes were made to the baseline livestock budgets described in Appendix G: Grazing Cattle Budgets. These budgets were used to estimate the current or baseline economic impacts of cattle livestock grazing and have been adjusted to reflect the additional month of grazing and the higher grazing permit fee.

13.6.1 Estimated Change in Production Costs

Under all scenarios, ranchers graze cattle for an extra month on state lands. This reduces the overall production costs in all regions to varying degrees. The new production costs feed into the economic impact model developed for the baseline analysis and produce different impacts depending on the scenario.

The forage provided by state public lands is an important input in cattle production. Because ranchers will graze their animals on the range for a longer period of time, they will need less hay and alfalfa and will use private pastures for shorter periods. For these reasons purchases from crop producers and households providing private pasture grazing drop by $6.0 million. In addition, labor purchases (in some regions) also decline, although only slightly.

The livestock budgets developed by agricultural experts and used in this analysis, assume certain relationships between the current cost of grazing on federal public lands and the time animals spend on those lands. Therefore, as the time on the range increases, so do costs associated with grazing on public lands. These increased costs include infrastructure maintenance and animal losses; purchases of salt and minerals; equipment and machinery; and fuel. How those costs might change under state management of the lands is unknown so the cost relationship between federal public land grazing and time on the range was held constant.

Overall, the net effect of an additional month of grazing on state-owned lands was a 4.1 percent decline in production costs and an increase of 10.5 percent in ranchers' income.

Table 13.25 shows the new production costs that result from increasing the time on range by an additional month. These costs were used to estimate the economic contributions of each scenario.

Changing the mix of industry purchases made by ranchers also changes the economic contributions associated with grazing. These contributions were estimated using RIMS II, an input-output model developed by the Bureau of Economic Analysis. RIMS II shows how changes in economic activity result in diminishing rounds of new rounds of spending. The subsequent impacts of this spending are expressed in terms of value-added (or gross state or regional product), earnings and employment.[311]

Table 13.25
Summary of New Production Costs by Region:
Extra Month on Range
(Dollars in Thousands)

Purchases, Receipts and Income	Western Region	Eastern Region	Southern Region	Total
Hay and alfalfa	$5,346.2	$12,443.3	$2,580.6	$20,370.2
Cattle ranching and farming	$5,552.3	$6,196.1	$10,902.8	$22.651.2
Agricultural services	$1,555.3	$1,677.0	$1,663.7	$4,896.1
Utilities	$15.9	–	–	$15.9
Construction	$1,164.6	$1,027.2	$1,428.7	$3,620.5
Wholesale trade	$384.9	$362.7	$416.7	$1,164.3
Retail trade	$5,925.0	$3,489.4	$4,837.6	$14,252.0
Transportation	$925.8	$256.0	$236.0	$1,417.8
Insurance	$829.5	$512.1	$472.0	$1,813.6
Veterinary services	$918.8	$601.7	$540.1	$2,060.6
Hired labor	$3,273.5	$4,179.5	$2,715.7	$10,168.7
Private pasture leasing	$3,031.9	$2,457.9	$1,699.1	$7,188.9
Property taxes, depreciation, other	$810.0	$11.4	$826.0	$1,647.4
Grazing	$454.9	$403.0	$533.3	$1,391.2
Totals	$30,188.7	$33,617.4	$28,852.3	$92,658.4
Rancher's Cash Receipts	$41,776.3	$48,281.5	$44,078.5	$134,136.3
Rancher's Net Income	$14,619.5	$17,122.0	$16,925.4	$7,188.9

Source: BEBR analysis of livestock budgets from Utah State University Extension Economists.

311 For a discussion of the RIMS II model, please see Appendix E: Economic Impact Modeling.

It is important to emphasize that changes in the economic outputs discussed in the following scenarios are specific to the activities and purchases of this group of ranchers. Regional I-O models, such as RIMS II, are static models in the sense they do not simultaneously estimate how producers might respond to changes. For example, the decline in rancher purchases of hay and alfalfa may or may not result in a decline in crop production. Crop producers may find other buyers for their hay and alfalfa and thereby sustain no loss. However, the extent to which they are able to do so cannot be estimated with an I-O model. Therefore, the "losses" or negative changes from the baseline presented in this analysis should be viewed as the change in demand tied directly to the activities of the study group.

13.6.2 Scenario I: Extra Month Grazing on Range @ $1.35/AUM

Assumptions

Under Scenario I, ranchers will graze their cattle on state public lands for an extra month. Ranchers would continue to pay a fee of $1.35 per AUM, and that fee would be paid to the state of Utah.

Economic Effects on Ranchers

The economic effects of Scenario I provide a significant benefit to the ranchers. Statewide, livestock production costs drop by $3.9 million (4.1%) and net income increases by 10.5 percent over the baseline estimate (Table 13.26).

To varying degrees, all regions benefit under this scenario. The largest benefits accrue to ranchers in the Eastern Region while the smallest are realized in the Southern Region.

The degree to which livestock producers in a specific region benefit by an additional month on the range is based on their dependence for feed (hay and alfalfa) and private pasturing.

Table 13.26
Change in Ranchers' Total Costs and Net Income: Extra Month of Grazing @ $1.35/AUM

Region	Costs	Net Income
Western	–4.1%	12.6%
Eastern	–5.5%	15.5%
Southern	–2.3%	4.6%
State Total	–4.1%	10.5%

Source: BEBR analysis of livestock budgets from Utah State University Extension Economics.

The original baseline estimates produced for each region show that livestock producers in the Eastern Region graze cattle for fewer months than in other regions and spend more per AUM for feed and private pasturing. Under Scenario I, livestock producers in the Eastern region realize a comparatively large benefit because the extra time spent on range reduces purchased feed and private pasture rents by $2.7 million, or about $12 per AUM, dropping the average production cost to $138 per AUM.

This savings translates to a large gain in net income for the ranchers. An extra month on the range in the Eastern region increases net income by $2.0 million, producing a total region-wide net income estimate of $17.1 million. This translates to net income $70 per AUM.

Producers in the Southern region gain a smaller benefit from grazing an additional month because they currently spend seven months on the range and therefore spend less for private pastures and purchased feed than producers in other regions. Hence, grazing for an additional month reduces feed and pasture rights purchases by $1.4 million, or about $4.00 per AUM, lowering the total production cost to $83 per AUM. Under Scenario I, net income to ranchers increases $16.9 million, or $49 per AUM.

Grazing on state public lands for an extra month in the Western region reduces feed and private pasture purchases by $2.0 million or $7.00 per AUM. Under Scenario I, net income for ranchers in the Western region increases to $14.6 million, or $51 per AUM. Production costs drop to about $30.2 million. This results in an average production cost of $105 per AUM.

Economic Effects on the Utah Economy

Under Scenario I, ranching purchases support a total of 2,745 jobs throughout the state, including 1,370 direct jobs (livestock producers and their employees) and 1,375 jobs in other industry sectors. Earnings totaled $90.6 million and included $7.2 million wages paid to employees of livestock producers, $41.4 million in rancher's income and $42 million in wages for workers in industries that supply to livestock grazers. The contribution to gross regional product (GRP) is $108.9 million. The economic impacts of the new baseline production costs are presented in Table 13.27.

Table 13.27
Estimated Economic Impacts of Scenario I:
Grazing for an Extra Month on Range @ $1.35/AUM
(Dollar Amounts in Millions)

	Direct			Indirect & Induced			Total		
Region	**Earnings**	**Jobs**	**GRP**	**Earnings**	**Jobs**	**GRP**	**Earnings**	**Jobs**	**GRP**
Western	$14.6	662	$7.1	$16.8	522	$33.2	$31.4	1,184	$40.4
Eastern	$17.1	431	$8.3	$12.4	432	$28.1	$29.6	863	$36.3
Southern	$16.9	277	$7.5	$12.7	421	$24.7	$29.7	698	$32.2
State Total	$48.7	1,370	$22.9	$42.0	1,375	$86.0	$90.6	2,745	$108.9

Note: Totals may not add due to rounding.
Source: BEBR analysis of livestock budgets from Utah State University Extension Economics using BEA's RIMS II multipliers.

Fiscal Effects and AUM Fee Receipts

The fiscal impacts and AUM fee receipts generated under Scenario I are presented in Table 13.28. The fiscal impacts include almost $6.6 million in state tax revenue and $600,000 in revenue for local governments. Under this scenario, the state will collect an estimated $1.4 million in grazing fees.

Table 13.28
Estimated Fiscal Impacts of Scenario I:
Grazing for an Extra Month on Range
@ $1.35/AUM

Region	State	Grazing Fees	Local
Western	$2,128,714	$454,916	$139,327
Eastern	$2,448,517	$403,026	$217,299
Southern	$1,994,885	$533,270	$241,224
Total	$6,572,116	$1,391,213	$597,850

Note: State fiscal impacts are income tax revenues and sales & gross receipts tax revenues. Local fiscal impacts are total general sales and use tax revenues and tourism restaurant tax revenues.
Source: BEBR analysis.

13.6.3 Scenario II: Extra Month Grazing on Range @ $4.22/AUM

Assumptions

Under Scenario II, ranchers will graze their cattle on state public lands for an extra month. Ranchers would pay an increased fee of $4.22 per AUM, and that fee would be paid to the state of Utah.

Economic Effects on Ranchers

Under Scenario II, the increase in grazing fees starts offsetting the financial benefits ranchers realize from an additional month of rangeland grazing.

Under this scenario, production costs, overall, are still lower than the original baseline estimate, but the premium decreases from 4.1 percent to 1.0 percent. Likewise, net income, overall, is still 2.6 percent higher than the baseline estimate, but substantially below the 10.5 percent realized under Scenario I (Table 13.29).

Because of their reliance on purchased feed and private pastures and the economic gains from foraging cattle for an extra month on state lands, producers in the Eastern region still achieve a modest reduction in production costs and a modest gain in net income despite the higher AUM fee. Under Scenario II net income for livestock producers in the Eastern region is estimated to be $16.3 million ($67 per AUM) with production costs of $141 per AUM.

Producers in the Western region also continue enjoy a net reduction in production costs and increase in net income. Production costs per AUM for ranchers in this region are estimated to be $108 under Scenario II. Net income increases to $13.7 million, or $47 per AUM.

Table 13.29
Change in Ranchers' Total Costs and Net Income: Extra Month of Grazing @ $4.22/AUM

Region	Costs	Net Income
Western	–1.0%	3.2%
Eastern	–3.1%	8.7%
Southern	1.6%	-3.2%
State Total	–1.0%	2.6%

Source: BEBR analysis of livestock budgets from Utah State University Extension Economics.

Increasing the grazing fee to $4.22 per AUM completely offsets the benefit provided by an extra month on the range for livestock producers in the Southern region. For these producers, the benefit of public land grazing an additional month quickly diminishes when other costs increase. Under Scenario II, rancher's income in the Southern region is estimated to be $15.8 million, or $46 per AUM. Production costs are estimated to be $87 per AUM.

Economic Effects on the Utah Economy

Under Scenario II, ranching purchases support a total 2,720 jobs and generate $86.9 million in earnings, which includes $7.4 million in hired labor, $38.5 million in producer income and $41.2 million in earnings for workers in other industries. The contribution to GRP is $107.2 million. The economic impacts of spending under Scenario II are shown in Table 13.30.

Table 13.30
Estimated Economic Effects of Scenario II:
Grazing for an Extra Month on Range @ $4.22/AUM
(Dollar Amounts in Millions)

	Direct			Indirect & Induced			Total		
Region	Earnings	Jobs	GRP	Earnings	Jobs	GRP	Earnings	Jobs	GRP
Western	$13.7	662	$7.1	$16.4	511	$32.5	$30.1	1,172	$39.6
Eastern	$16.3	431	$8.3	$12.3	427	$27.7	$28.6	858	$35.9
Southern	$15.8	277	$7.5	$12.5	413	$24.1	$28.3	690	$31.6
State Total	$45.7	1,370	$22.9	$41.2	1,350	$84.2	$86.9	2,720	$107.2

Note: Totals may not add due to rounding.
Source: BEBR analysis of livestock budgets from Utah State University Extension Economics using BEA's RIMS II multipliers.

Fiscal Effects and AUM Fee Receipts

The fiscal effects and fee receipts generated under Scenario II are presented in Table 13.31. The fiscal impacts include $6.3 million in state tax revenue and more than $570,000 in revenue for local governments. Under this scenario, the state will also collect an estimated $4.3 million in grazing fees.

Table 13.31
Estimated Fiscal Impacts of Scenario II:
Grazing for an Extra Month on Range
@$4.22/AUM

Region	State	Grazing Fees	Local
Western	$2,038,278	$1,422,035	$133,408
Eastern	$2,364,199	$1,259,830	$209,816
Southern	$1,900,963	$1,666,962	$299,867
State Total	$6,303,440	$4,348,827	$573,091

Source: BEBR analysis.

A comparison of the fiscal effects for the state for Scenarios I and II shows that under Scenario II, fiscal revenues decline by $268,676. This is primarily the result of a lower earnings impact which reduces the amount the state collects in income tax. The net increase in AUM fees in $2,957,614.

13.6.4 Scenario III: Extra Month Grazing on Range @ $7.34/AUM

Assumptions

Under Scenario III, ranchers will graze their cattle on state public lands for an extra month. Ranchers would pay an increased fee of $7.34 per AUM, and that fee would be paid to the state of Utah.

Economic Effects on Ranchers

Under Scenario III, only producers in the Eastern region continue to realize a benefit from an additional month of grazing on the range. Overall, production costs are higher than the baseline estimate and net income is 6 percent lower. At $7.34 per AUM, the benefit of adding the additional month on the range is completely offset in every region (Table 13.32).

Table 13.32
Change in Ranchers' Total Costs and Net Income:
Extra Month of Grazing
@ $7.34/AUM

Region	Costs	Net Income
Western	2.3%	–7.0%
Eastern	–0.5%	1.4%
Southern	5.8%	–11.7%
State Total	2.3%	–6.0%

Source: BEBR analysis of livestock budgets from Utah State University Extension Economics.

For producers in the Eastern region, the increase in AUM fees almost raises production costs to the baseline level, although ranchers still realize an increase (albeit small) in net income. Under Scenario III, production costs in the Eastern region are estimated to be $35.4 million or $145 per AUM. Net income is $15.3 million or $63 per AUM.

In the Western region livestock producers experience a 2.3 percent increase in costs over the baseline estimate, with a corresponding decline of 7 percent in net income. Under Scenario III, production costs in the Western region increase to $32.2 million ($112 per AUM) and income declines to $12.6 million ($44 per AUM).

The effects of Scenario III on the Southern Region are especially severe. In that region, production costs are almost 6 percent higher with the grazing fee increase, and net income drops by almost 12 percent. Under Scenario III production costs in the Southern region are projected to increase to $31.2 million, resulting in an average production cost of $90 per AUM. The net income of ranchers drops to $14.6 million, $42 dollars per AUM.

Economic Effects on the Utah Economy

Under Scenario III, ranching purchases support a total of 2,693 jobs throughout the state and generate $82.8 million in earnings, which includes $7.2 million in wages to workers employed the cattle ranchers, $42.5 million in ranchers' income and $40.3 million in earnings for workers in other industries that support livestock producers. The contribution to total GSP is $105.3 million. The economic impacts of changes in costs under Scenario III are summarized in Table 13.33.

Table 13.33
Estimated Economic Effects of Scenario III:
Grazing for an Extra Month on Range @ $7.34/AUM
(Dollar Amounts in Millions)

	Direct			Indirect & Induced			Total		
Region	Earnings	Jobs	GRP	Earnings	Jobs	GRP	Earnings	Jobs	GRP
Western	$12.6	662	$7.1	$16.0	498	$31.6	$28.6	1,160	$38.8
Eastern	$15.3	431	$8.3	$12.1	421	$27.2	$27.4	852	$35.5
Southern	$14.6	277	$7.5	$12.2	403	$23.5	$26.7	680	$31.0
State Total	$42.5	1,370	$22.9	$40.3	1,323	$82.3	$82.8	2,693	$105.3

Note: Totals may not sum due to rounding.
Source: BEBR analysis of livestock budgets from Utah State University Extension Economics using BEA's RIMS II multipliers.

Fiscal Impacts and Fee Receipts

The fiscal effects and fee receipts generated under Scenario III are shown in Table 13.34. The fiscal impacts include $6 million in state tax revenue and about $546,000 in revenue for local governments. In addition to fiscal revenue, the state will receive an estimated $7.6 million in grazing fees.

Table 13.34
Estimated Fiscal Effects of Scenario II:
Grazing for an Extra Month on Range
@ $7.34/AUM

Region	State	Grazing Fees	Local
Western	$1,939,964	$2,473,397	$126,974
Eastern	$2,272,536	$2,191,269	$201,681
Southern	$1,798,860	$2,899,408	$217,520
Totals	$6,011,360	$7,564,074	$546,175

Source: BEBR analysis.

Under Scenario III, the state will collect about $300,000 less in tax revenue because the earnings produced in this scenario are lower than the amount produced in Scenario II. Lower earnings translate to less income tax collected.

The net gain in AUM fee receipts is $3.2 million.

13.6.5 Summary of Scenario Outputs

The individual economic outputs of each scenario are summarized in Table 13.35. The baseline generated in Section 7.6 is also provided for context.

Table 13.36 summarizes the economic and fiscal effects of the baseline and scenario outputs. As shown there, the changes proposed under Scenario I provide the greatest benefit to livestock producers—rancher's net income increases from about $37.6 million to $41.4 million. Under this scenario, fiscal benefits to the state (not including grazing fees) are slightly higher than the baseline estimate, and Scenarios II and III. This increase results from the projected $3.4 million increase in earnings. The decline in earnings under Scenarios II and III, produces less fiscal revenue for Utah because the state will collect less income tax.

The number of jobs created by livestock purchases is lower than the baseline estimate in all three scenarios. This occurs because ranchers will purchase less feed which affects crop producers' incomes. Although ranchers will have more income, the impacts of spending by households (in this case, ranchers' incomes) are lower than one dollar spent in the crop production industry. Therefore, the initial change in production costs reduces the number of jobs generated in Scenario I. This loss grows larger when ranchers pay the higher AUM fee. Payments to the state, in economic theory, represent leakage—money that no longer circulates through the economy. As ranchers pay higher AUM fees, they have less to spend on goods and services that generate economic benefit. For the same reason, all scenarios contribute less to GPS than the baseline estimate.

Table 13.35
Estimated Economic Contributions of Livestock Grazing Operations: Baseline and Scenario Analysis
(Dollars in Millions, except costs per AUM)

	Western Region	Eastern Region	Southern Region	Total
		Baseline Estimates		
Production Costs	$31.5	$35.6	$29.5	$96.6
Production Costs per AUM	$109	$146	$85	$110
Net Income	$13.3	$15.3	$16.3	$37.6
Net income per AUM	$46	$63	$47	$43
Earnings	$30.2	$27.9	$29.0	$87.2
Jobs	1,188	878	701	2,767
Gross Regional Product	$40.8	$36.8	$32.4	$110
State taxes	$2.0	$2.3	$1.9	$6.3
AUM fee receipts	$0	$0	$0	$0
County taxes	$0.134	$0.205	$0.236	$0.576
		Scenario I		
Production Costs	$30.2	$33.6	$28.8	$92.7
Production Costs per AUM	$105	$138	$83	$105
Net Income	$14.6	$17.1	$16.9	$48.7
Net income per AUM	$51	$70	$49	$55
Earnings	$31.4	$29.6	$29.7	$90.6
Jobs	1,184	863	698	2,745
Gross Regional Product	$40.4	$36.3	$32.2	$108.9
State taxes	$2.1	$2.4	$2.0	$6.6
AUM fee receipts	$.455	$.403	$.533	$1.4
County taxes	$.139	$.217	$.241	$.598
		Scenario II		
Production Costs	$31.2	$34.5	$30.0	$95.6
Production Costs per AUM	$108	$141	$87	$109
Net Income	$13.7	$16.3	$15.8	$45.7
Net income per AUM	$47	$67	$46	$52
Earnings	$30.1	$28.6	$28.3	$89.6
Jobs	1,172	858	690	2,720
Gross Regional Product	$39.6	$35.9	$31.6	$107.2
State taxes	$2.0	$2.4	$1.9	$6.3
AUM fee receipts	$1.4	$1.3	$1.7	$4.3
County taxes	$.133	$.209	$.229	$.573
		Scenario III		
Production Costs	$32.2	$35.4	$31.2	$98.8
Production Costs per AUM	$111	$145	$90	$112
Net Income	$12.6	$15.3	$14.6	$42.5
Net income per AUM	$44	$63	$42	$48
Earnings	$28.6	$27.4	$26.7	$82.8
Jobs	1,160	852	680	2,692
Gross Regional Product	$38.8	$35.5	$31.0	$105.3
State taxes	$1.9	$2.3	$1.8	$6.0
AUM fee receipts	$2.5	$2.2	$2.9	$7.6
County taxes	$.126	$.201	$.218	$.546

Source: BEBR analysis.

Table 13.36
Economic and Fiscal Effects Comparison:
Baseline and Scenario Analysis
(Dollar Amounts in Thousands)

Economic Measure	Baseline	Scenario I	Scenario II	Scenario III
Total Earnings Effect	$79,682.6	$83,100.6	$79,353.1	$75,277.2
Direct Earnings	$44,894.4	$48,666.9	$45,710.3	$42,494.0
Indirect Earnings	$34,788.2	$34,433.7	$33,642.9	$32,783.2
Total Jobs Effect	2,518	2,495	$2,471	2,443
Direct Jobs	1,378	1,370	1,370	1,370
Indirect Jobs	1,140	1,125	1,101	1,073
Total GSP Effect	$171,816.9	$170,704.0	$168,954.7	$167,052.9
Direct GSP	$99,188.4	$99,188.4	$99,188.4	$99,188.4
Indirect GSP	$72,628.5	$71,515.6	$69,766.2	$67,864.5
State Tax Revenue and Fees	$5,854.8	$7,425.8	$10,114.7	$13,037.9
Fiscal	$5,778.8	$6,034.6	$5,765.9	$5,473.8
Grazing Fees[1]	–	$1,391.2	$4,348.8	$7,564.1
Local Tax Revenue	$523.3	$545.5	$520.7	$493.8
Rancher's Net Income	$37,551.8	$41,368.0	$38,520.3	$35,305.1
Net Income per AUM	$43	$47	$44	$40
Change in net income from baseline	–	10.5%	2.6%	–6.0%
Change in production costs from baseline	–	–4.1%	–1.0%	2.3%

1. The baseline amount for grazing fees is $76,000 and is an estimate of the state's portion of the BLM grazing fee.

Source: BEBR analysis.

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Government Accountability Office, 2004, *Natural Gas Flaring and Venting—Opportunities to Improve Data and Reduce Emissions*, www.gao.gov/products/GAO-04-809, accessed October 2014.

Government Accountability Office, 2010, *Federal Oil and Gas Leases—Opportunities Exist to Capture Vented and Flared Natural Gas, Which Would Increase Royalty Payments and Reduce Greenhouse Gases*, www.gao.gov/products/GAO-11-34, accessed October 2014.

Appendix A: Glen Canyon National Recreation Area Operations

The National Park Service (NPS) manages Glen Canyon National Recreation Area (Glen Canyon NRA), which covers 1,250,250 acres of Lake Powell and surrounding areas in Utah and Arizona (see Figure A.1). The Utah portion is 1,203,656 surface acres, 96.3 percent of Glen Canyon. The river beds of the Colorado River and other rivers and tributaries cover 10,318 acres of Glen Canyon, sovereign lands belonging to Forestry, Fire and State Lands. Federal land ownership within the Utah portion of Glen Canyon NRA amounts to 1,193,338 acres.[91]

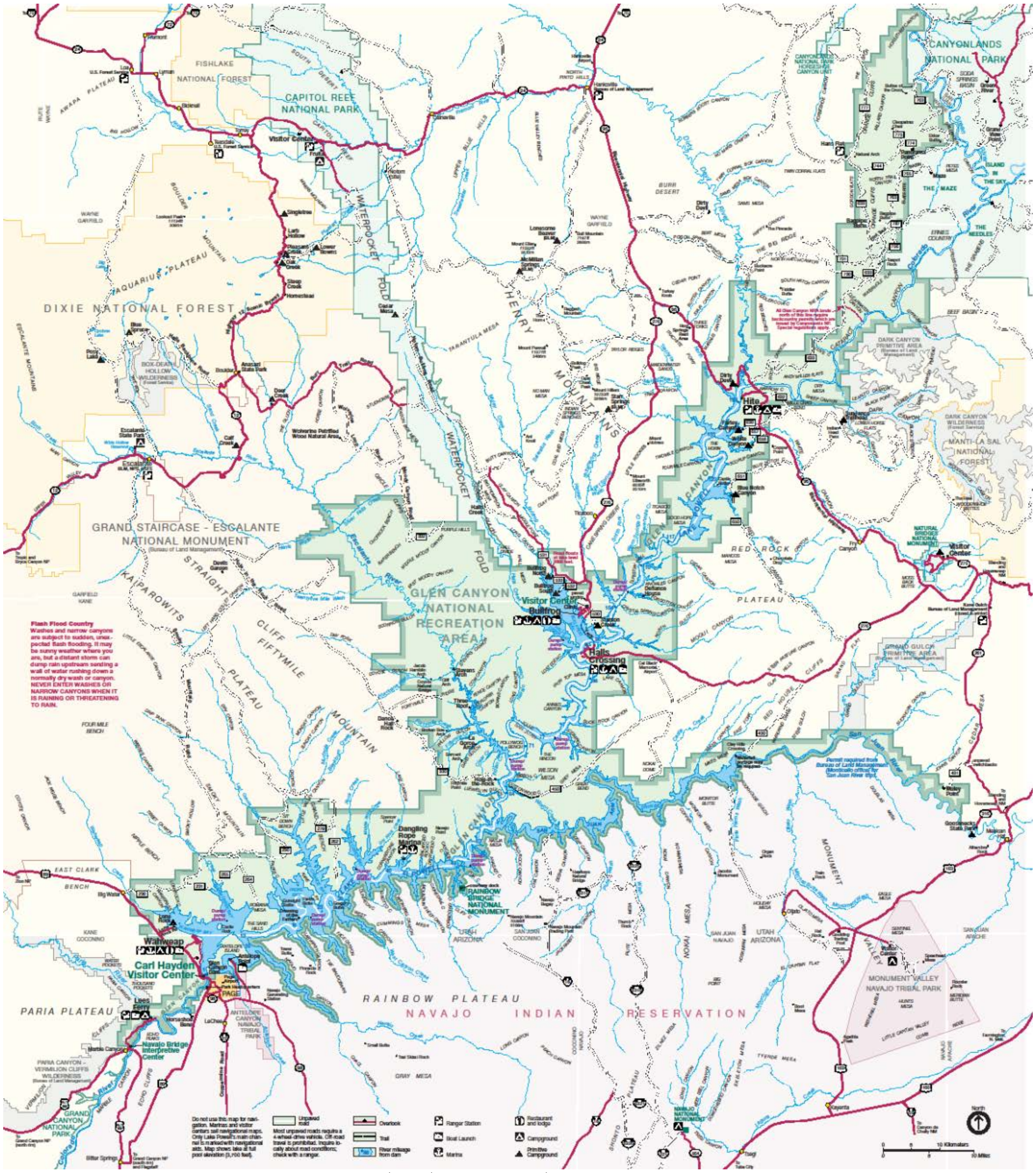
The most frequented marina on the Utah portion of Lake Powell is Bullfrog in Kane County (see Figure A.1). The Lone Rock Beach campground, Hole-in-the-Rock entry point, and Dangling Rope marina are also located in Kane County. Roads to Bullfrog and Hole-in-the-Rock lie largely in Garfield County, as does extensive backcountry bordering Grand Staircase–Escalante National Monument. Northeast of the lake, the scenic Orange Cliffs area near Canyonlands National Park reaches into Wayne County. San Juan County contains the Halls Crossing and Hite marinas, as well as the San Juan River and the arm of Lake Powell it helps create. All of these are part of Glen Canyon NRA in Utah.

The 1956 Colorado River Storage Project Act by Congress authorized the U.S. Bureau of Reclamation to construct Glen Canyon Dam near Page, Arizona (Reed and Harrison 2014). The extensive river development was completed in 1963. A 1972 act designated Glen Canyon Dam, Lake Powell and surrounding areas as a National Recreation Area (NRA) (Public Law 92-952). The National Park Service was charged with protecting, developing, operating and maintaining the NRA. The 1972 law provided for grazing to continue as governed by the Bureau of Land Management, and the removal of minerals was permitted as directed by the Department of the Interior (DOI) without adversely affecting recreation opportunities (16 U.S.C. § 460dd). Hunting and fishing were allowed to continue under state management.

Focusing on the Utah portion of Glen Canyon NRA, this document describes recreation activity at the NRA in recent years. Existing facilities are identified, and revenues and expenses for recent years are presented. We discuss NPS management of the NRA as it affects Southern Utah. The purpose is to consider Glen Canyon NRA's resources and needs should federal land transfer cede the area to Utah as envisioned in Utah H.B. 148 from 2012.

[91] Bureau of Economic and Business Research analysis of Utah's State Geographic Information Database.

Figure A.1
Map of Glen Canyon National Recreation Area

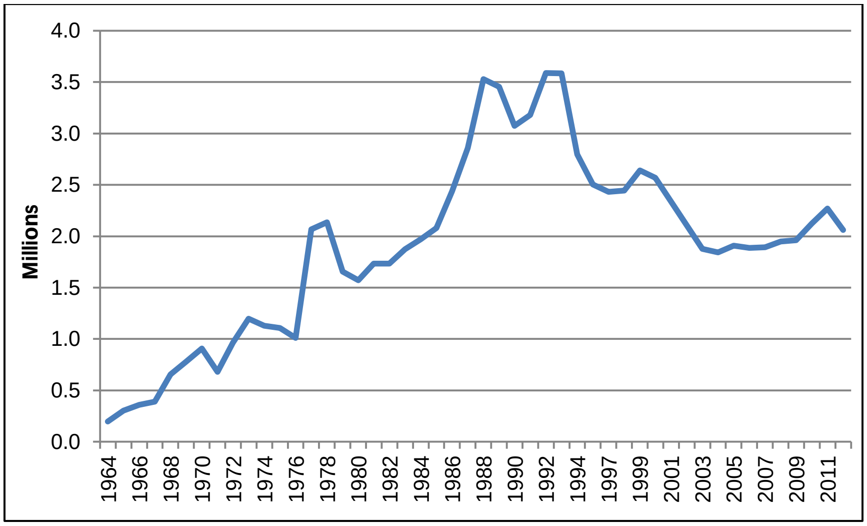


Source: National Park Service,www.nps.gov/glca/planyourvisit/maps.htm

A.1 RECREATION USE

Glen Canyon NRA attracted 2.1 million recreation visitors in calendar year 2012, slightly above its ten-year average from 2003 to 2012 (Figure A.2). The highest number of visitors since the dam was completed in 1963 was 3.6 million in 1992. Visitors are attracted to Lake Powell and its vicinity for its water-based and backcountry recreation offerings, such as boating, swimming, camping, hiking and fishing.

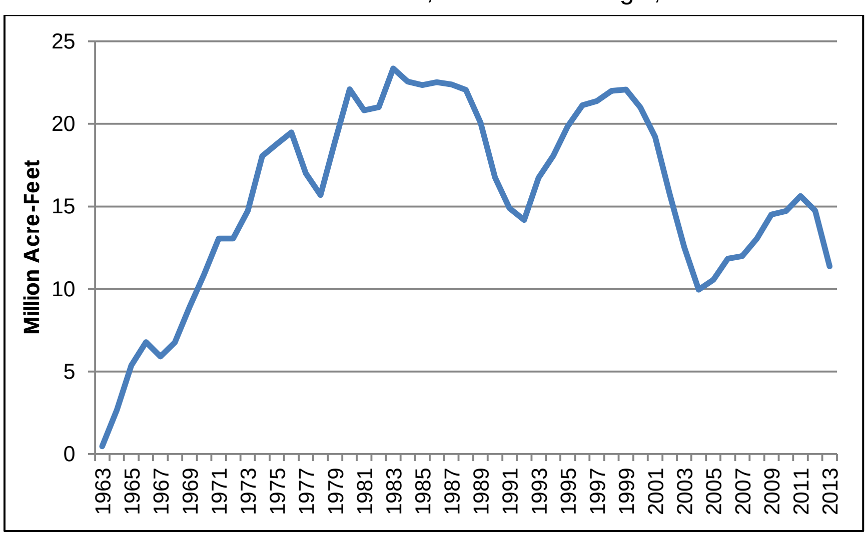
Figure A.2
Recreation Visitors to Glen Canyon National Recreation Area, 1964–2012



Source: National Park Service, Park Visitor Use Statistics

Lake Powell's fluctuating water levels likely have affected visitation there. The five-year average water level for 2009-2013 was 3,623, which is 77 feet below the lake's full level of 3,700 feet (Figure A.3). This corresponds to average volume during 2009-2013 of 14.2 million acre-feet, 58.4 percent of Lake Powell's 24.3 million acre-feet capacity. In contrast, Lake Powell averaged 90.1 percent of capacity during the 1980s. As recently as 1999, the lake reached just above 90 percent of capacity with 22.1 million acre-feet. Low water levels allow access to areas previously underwater, but on the whole, water shortages are not expected to make the lake a more attractive destination. The supply and demand for water are determined primarily by considerations other than recreation.

Figure A.3
Lake Powell Water Content, Annual Average, 1963–2013



Source: Bureau of Reclamation (Summit Technologies 2014).

In fiscal year 2013, 12.8 percent of Glen Canyon NRA visitors entered from one of the four Utah districts, but that share from FY2003 to FY2013 averaged 18.1 percent and 355,563 visitors (Table A.1 and Table A.2). Most visitors enter via Arizona, where they do most of their spending, while they spend most of their time in Southern Utah (Matson 2014, Shultz 2014).

Table A.1
Glen Canyon NRA Visitors by State of Entry, 2003–2013

Fiscal Year	Utah		Arizona		Total	
	Number	Share	Number	Share	Number	Share
2003	400,534	21.3%	1,482,111	78.7%	1,882,644	100%
2004	318,532	17.5%	1,499,515	82.5%	1,818,048	100%
2005	350,178	18.1%	1,582,816	81.9%	1,932,994	100%
2006	442,333	22.8%	1,497,424	77.2%	1,939,757	100%
2007	365,599	19.8%	1,485,414	80.2%	1,851,013	100%
2008	369,950	18.9%	1,582,458	81.1%	1,952,408	100%
2009	342,613	17.6%	1,601,537	82.4%	1,944,149	100%
2010	381,930	18.2%	1,718,563	81.8%	2,100,493	100%
2011	317,733	14.5%	1,868,386	85.5%	2,186,119	100%
2012	359,908	17.4%	1,705,151	82.6%	2,065,060	100%
2013	261,884	12.8%	1,790,363	87.2%	2,052,247	100%
Average	355,563	18.1%	1,619,431	81.9%	1,974,994	100%

Source: National Park Service, Park Visitor Use Statistics

Spending by visitors entering Glen Canyon NRA at Bullfrog, Halls Crossing, Hite and Escalante is more likely to occur in Utah than spending by visitors entering at Wahweap and Lees Ferry in Arizona (Shultz 2014). A nationwide study of national parks, monuments and recreation areas estimated average spending in Glen Canyon NRA and surrounding areas to be $56 per visitor in 2012 (Thomas, Huber and Koontz 2014).[92] However, spending per visitor in Utah is expected to be lower than spending per visitor in Arizona (Larsen 2014, Pratt 2014). From lodging to boat rentals to restaurants, consumption opportunities near Lake Powell in Arizona are qualitatively different and quantitatively more plentiful than those located near the NRA in Utah (Bremner 2014). Existing research does not establish the amount of spending that occurs in Utah due to Glen Canyon NRA, much less the associated economic contribution to the state.

[92] This nationwide study may not incorporate the spending patterns of Glen Canyon NRA visitors in Utah. Its methodology suggests that the study constructs nationwide spending patterns based on interviews mostly at National Parks and National Monuments throughout the country. These estimates are then fit to Glen Canyon NRA based primarily on the number of visitors there, not based on local economic realities. For this reason, the $56 estimate and other figures on job creation and economic contribution from the study may not reflect activity in the Utah portion of Glen Canyon NRA.

Table A.2
Glen Canyon NRA Visitors by District, 2003–2013

Fiscal Year	Utah districts				Arizona districts		Total
	Bullfrog	Hite	Halls Crossing	Escalante	Wahweap	Lees Ferry	UT & AZ
2003	216,134	67,618	72,491	44,291	1,287,221	194,889	1,882,644
2004	199,372	50,656	51,441	17,063	1,298,653	200,862	1,818,048
2005	215,331	60,712	55,016	19,120	1,380,022	202,794	1,932,994
2006	218,632	79,172	128,996	15,533	1,303,569	193,855	1,939,757
2007	205,178	88,219	62,155	10,046	1,276,249	209,165	1,851,013
2008	214,005	90,950	57,642	7,354	1,383,420	199,037	1,952,408
2009	199,206	71,786	61,792	9,828	1,418,370	183,167	1,944,149
2010	220,014	73,696	84,220	4,000	1,512,178	206,385	2,100,493
2011	180,771	69,519	60,415	7,028	1,689,464	178,922	2,186,119
2012	160,837	132,377	56,335	10,359	1,499,801	205,350	2,065,060
2013	162,889	41,136	55,587	2,271	1,630,669	159,694	2,052,247
Average	199,306	75,076	67,826	13,354	1,425,420	194,011	1,974,994

Source: National Park Service, Park Visitor Use Statistics

A.2 NRA Facilities

Marinas, lodging, boat rentals and other facilities are available at several sites within the Utah portion of Glen Canyon NRA. Many of these are concessionaire-operated. In the event that this area were transferred to Utah, the state would have the opportunity and challenge of making arrangements to operate these facilities and designate the use of their revenues, if any.

Concessionaires, principal of which is Aramark, pay Glen Canyon NRA franchise fees and reimburse NPS for utilities (see Table A.5).[93] Under the name Lake Powell Resorts and Marinas, Aramark operates the 48-room Defiance House Lodge and Anasazi Restaurant, which accommodates 100 guests, at Bullfrog. It also provides indoor lodging at Halls Crossing and Hite marinas, with 11 and 5 family units, respectively.

Aramark operates the two developed campgrounds within the Utah portion of Glen Canyon NRA, at Bullfrog, with 78 campsites and 24 spaces with RV hookups, and Halls Crossing, with 43 campsites, 32 RV spaces and 2 group sites.[94] At Hite, Aramark provides primitive camping, without showers, RV hookups, or the other conveniences offered at Bullfrog and Halls Crossing. The same concessionaire operates a 112-site campground at Wahweap in Arizona, plus 90 RV spaces, and 6 group sites.

NPS operates five primitive campgrounds located within ten miles of the Hite or Bullfrog marinas.[95] Beach camping is available at Lone Rock, across the state line from Wahweap. Backcountry camping is free of charge along the shores of Lake Powell and throughout Glen Canyon

[93] Total concessionaire revenues and expenses were not obtained for this report. The state would need to do further research in order to determine the economic contribution of concessioners and whether concessionaire offerings and contract terms are appropriate going forward.

[94] "Glen Canyon National Recreation Area: Campgrounds," National Park Service, accessed October 17, 2014, www.nps.gov/glca/planyourvisit/campgrounds.htm.

[95] NPS directly manages primitive campgrounds Stanton Creek near Bullfrog, as well as Dirty Devil, Farley Canyon, White Canyon and Blue Notch Canyon near Hite. We have noted the concessionaire-run primitive campground there apart from these. In Arizona, NPS offers six primitive campsites between Glen Canyon Dam and Lees Ferry.

NRA. In Arizona, besides the Aramark campground at Wahweap, NPS offers 54 campsites at Lees Ferry.

One fourth or more of Glen Canyon NRA's camping facilities are in Utah: 42.2 percent of its developed campsites (121 of 287), 38.4 percent of its RV spaces (56 of 146), 25.0 percent of its group camping sites (2 of 8), and 50.0 percent of its designated primitive campgrounds (6 of 12).

There are boat ramps at Bullfrog, Halls Crossing and Hite marinas. Ranger stations are located at Dangling Rope and the other three marinas. Visitors can purchase gasoline at Bullfrog, Dangling Rope and Hite. Concessionaire boat rentals are available at Bullfrog.[96] Small convenience stores or gift shops are available at or near all four marinas, including Halls Crossing. The store at Bullfrog has limited grocery offerings, more than at the other marinas.

The Utah Department of Transportation (UDOT) operates a ferry that transports passengers and vehicles across Lake Powel between Bullfrog and Hite, linking the two segments of Highway 276.[97]

A.3 CURRENT OPERATIONS

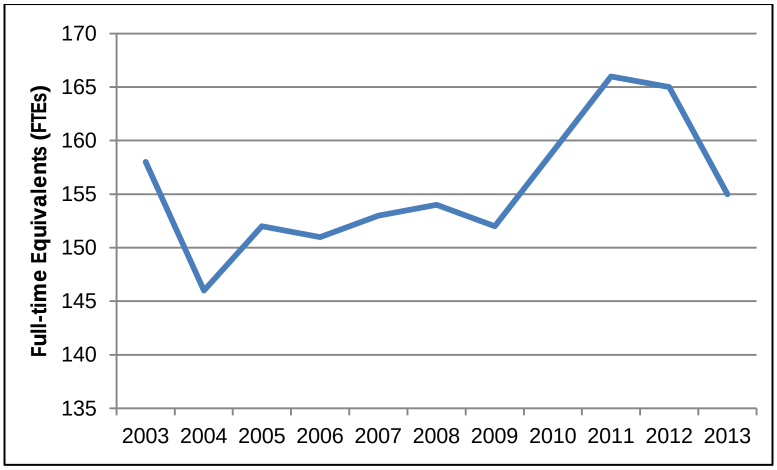
This section describes Glen Canyon NRA finances and operations.

A.3.1 Base Operating Budget and Employment

As shown in Figure A.4, Glen Canyon NRA supported 155 jobs (full-time equivalents) in FY2013, matching its ten-year average since FY2004 of 155.3 FTEs (DOI, 2014). Most NPS employees live and work in the vicinity of Page, Arizona (Shultz 2014). Glen Canyon staff estimate that about 20 of these jobs correspond to Utah in FY2013, while the remaining 135 are Arizona jobs.[98]

[96] Houseboats, powerboats, personal watercraft, kayaks, wakeboard and other boats and equipment can be rented from Aramark at Bullfrog.
[97] The ferry typically makes four round trips daily during the summer. The ferry was out of commission for repairs during part of 2013 and 2014 (see www.udot.utah.gov/main/f?p=100:pg::::1:T,V:2257).
[98] The estimate is based on where visitors enter Glen Canyon NRA (12.8 percent in Utah in FY2013), which is a better proxy for where NPS operations occur than acreage (96.3 percent in Utah). Still this is a rough estimate made in the absence of data on actual expenditures in Utah and Arizona. The National Park Service manages Glen Canyon NRA and accounts for its revenues and expenditures as a unit, not by state.

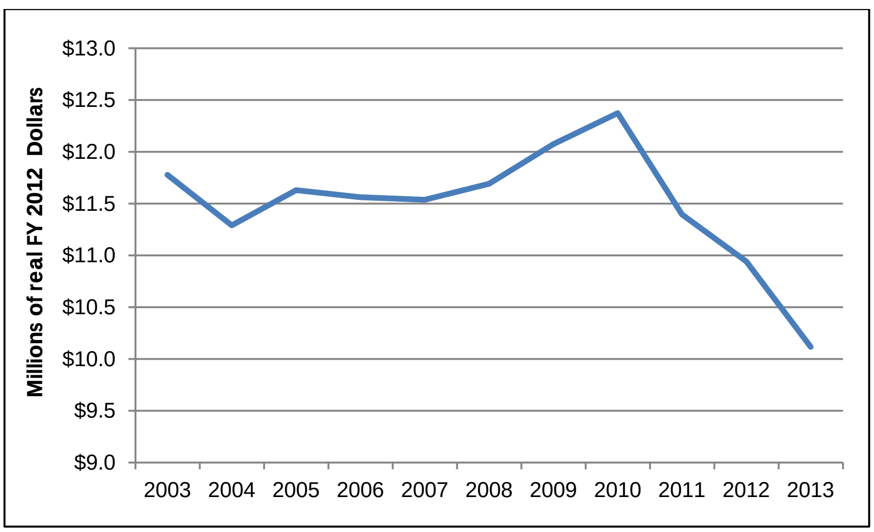
Figure A.4
Glen Canyon NRA Employment, FY2003–2013



Source: Department of the Interior, Budget Justifications 2005–2015

In real terms, the base operating budget Congress appropriated for Glen Canyon National Recreation Area, including the Utah and Arizona portions, fluctuated between $11.3 million and $12.4 million from FY2003 to FY2010, before falling 16.2 percent to $10.1 million in FY2013 (Figure A.5) (DOI 2014).[99] Recent budget cuts have required NPS management to trim certain operating activities that cannot be carried out with limited resources (Larsen 2014). The base operating budget does not reflect additional independent revenue generated by the NRA, as well as additional federal funding for designated projects and programs.[100]

Figure A.5
Glen Canyon NRA Operating Budget, FY2003–2013



Source: Department of the Interior, Budget Justifications FY2005–2015

[99] Amounts are adjusted for inflation to federal fiscal year 2012 dollars.

[100] Budget numbers in Figure A.5 and Table A.3 also do not include spending of sister agencies to NPS, most notably the U.S. Bureau of Reclamation (USBR), which operates Glen Canyon Dam and has independent revenue from selling hydroelectric power. USBR activity is not emphasized in this section because most of its activities center around the dam, which is in Arizona, and its oversight of water levels, water quality and other issues may continue in the event of a land transfer (Reed 2014).

Table A.3 gives real expenditures in Utah and Arizona from Glen Canyon NRA's operating budget for FY2003 to FY2013, as well as employment. During FY2011 and FY2012, NPS managed to avoid employment cuts in spite of the decline in its budget, although its employment did decline in FY2013.

In FY2007, the most recent year available, Glen Canyon NRA's operating budget was spent as shown in Table A.4. Visitor services and facilities each comprised one-third of the budget. Visitor services relate to safety and education, among other items detailed in the table notes. Expenses for facilities include activities such as building maintenance, grounds keeping and utilities provision. Administrative support, almost one-fourth of the annual budget, includes expenses at the main Page office, including human resources and telecommunications. "Resources management and preservation" captures research, grazing and a variety of other activities accounting for less than 10 percent of the base operating expenses. Water quality and operating NPS's fleet of boats are divided between two categories.

Table A.3
Glen Canyon NRA Employment and Base Budget, FY2003–2013

Fiscal Year	Employment[1]	Base Operating Budget[2]
2003	158	$11,779,506
2004	146	$11,290,290
2005	152	$11,630,110
2006	151	$11,562,219
2007	153	$11,538,794
2008	154	$11,691,477
2009	152	$12,073,714
2010	159	$12,373,064
2011	166	$11,396,766
2012	165	$10,941,000
2013	155	$10,116,291
Average	155.5	$11,490,294

1. Employment figures reflect the number of full-time equivalent (FTE) employees employed by NPS at Glen Canyon NRA.
2. Base operating budgets comprised 59.5 percent of total Glen Canyon NRA expenditures in FY2013 rising from 57.2 percent in FY2007, the only other year for which we obtained data on all funding sources. In source documents, these values were labeled "enacted budget" for 2004, 2005, 2007 and 2012; "actual budget" for 2006; and "final budget" for 2008-2011. Values are adjusted for inflation by the BLS Consumer Price Index to FY2012 dollars.
Source: U.S. Department of the Interior (DOI 2014)

Table A.4
Glen Canyon NRA Base Operating Budget Expenditures, FY2007

Expenditure Category	Amount	Share
Visitor Services[1]	$3,895,233	33.8%
Facilities Operation & Maintenance[2]	$3,895,233	33.8%
Administrative Support[3]	$2,745,583	23.8%
Resources Management & Preservation[4]	$1,001,631	8.7%
Total Operating Budget[5]	$11,537,681	100%

Note: Dollar amounts are given in real FY2012 dollars, adjusted for inflation by the BLS Consumer Price Index, to allow direct comparisons with Table A.3 and Table A.5.
1. Visitor Services includes "law enforcement, search and rescue, dispatch, lake pollution control, emergency medical services, visitor center operations, ranger programs, education, resource protection and business management."
2. Facilities Operation and Maintenance includes "buildings, grounds, roads, utilities, boats, solid waste management, water treatment, water quality, the dive program, and maintenance related [to] resource preservation."
3. Administrative Support includes "the superintendent's office and other administrative services to support park operations. This includes the park's safety program, telecommunications, human resources, aviation, fleet management, boat and vehicle fuel and information technology support."
4. Resources Management and Preservation includes "resource preservation for natural and cultural resources, grazing management, water quality assessment, cultural liaison activities, and research and science programs."
5. Operating Budget does not account for $8.6 million in additional funds from other federal funding ($2.5 million) and independent park revenue ($6.0 million), detailed in Table A.5.
Source: National Park Service (NPS 2008).

Unfortunately, NPS was unable to separate the amount of Glen Canyon NRA's expenditures that happened in Utah as requested, due to the integrated nature of its accounting system. One reasonable estimation method is to assume that expenditures in Utah and Arizona are proportional to the number of visitors entering from each state (Shultz 2014). With 12.8 percent of visitors entering Glen Canyon NRA from Utah during FY2013, the result would be $1,290,923 in federal spending and 20 federal jobs (FTE's) in Utah, down from $2,636,592 in federal spending and 34 FTE's in FY2007, when 18.1 percent of visitors entered Glen Canyon NRA from Utah.

The NPS office jointly manages the 160 adjoining acres of Rainbow Bridge National Monument, accessed via Lake Powell. The monument's operating budget was $0.1 million in FY2013, 1.0 percent of Glen Canyon NRA's budget. Money appropriated for both places is pooled in the NPS management effort in the area.[101]

Funding Sources

Table A.5 itemizes federal and park (NRA) revenue sources received by Glen Canyon NRA in addition to its base operating budget. BEBR submitted an information request to obtain this unpublished data. Most independent revenue received by the NRA remains within Glen Canyon NRA, contributing 32.6 percent of $17.1 million in FY2013 spending ($16.8 million in FY2012 dollars). The importance of independent revenue at Glen Canyon NRA was greater in FY2013 than in FY2007, rising by 2.5 percent from 30.1 percent and offsetting somewhat the 19.0 percent decline in federal allocations.

These NPS amounts leave aside the revenue and expenses from the dam, visitors center and other operations funded through the Bureau of Reclamation. Most USBR expenses do not happen in Utah, although they are critical to Lake Powell.

Most federal sources of funding are likely to discontinue in the event of land transfer in Utah, requiring state funding to supply the other two thirds of the budget. The need for Utah to cover 67.4 percent of the operating budget of Glen Canyon NRA in Utah post-transfer assumes the shares of independent revenue and federal funding for the Utah portion of Glen Canyon NRA are similar to those shares for the entire NRA.

[101] Rainbow Bridge National Monument is located in San Juan County shoreline within Utah. Utah's land transfer proposal does not include any national monuments, and Rainbow Bridge is generally omitted from this section, except that expenditure data from Denise Shultz may include small amounts of spending related to the monument, since the same office, staff and equipment are used to administer Rainbow Bridge National Monument and Glen Canyon NRA.

Table A.5
NPS Glen Canyon NRA Funding Sources

Funding Source	FY2007	FY2013
Federal Sources:[1]		
Allocation from base operating budget[2]	$11,446,402	$9,994,573
Projects with dedicated NPS funding	$1,881,529	$1,300,342
Federal highways	$653,363	$22,123
Wildland fire	$11,070	$10,816
Total Federal Funding	$13,992,365	$11,327,854
Federal Share of NRA Funding	69.9%	67.4%
Independent revenue sources:		
Recreation fees (FLREA)[3]	$3,224,864	$2,575,402
Entrance fees and passes	$1,949,563	$1,804,424
Boat use fees	$1,040,470	$548,943
Campground fees	$234,831	$222,035
Utilities paid by concessioners	$1,364,812	$1,612,924
Concession franchise fees	$763,228	$597,726
Employee living quarters	$397,937	$353,471
Various NRA receipts[4]	$180,991	$222,631
Donations and grants	$23,137	$48,256
Agreements and miscellaneous	$57,663	$34,338
Commercial filming	$14,392	$23,478
Total Independent Revenue	$6,027,023	$5,468,226
Independent Share of NRA Funding	30.1%	32.6%
Grand Total NPS Glen Canyon NRA Funding	$20,019,388	$16,796,080

Note: Dollar amounts were adjusted for inflation to FY2012 dollars using the BLS Consumer Price Index by federal fiscal year. Similar data for other years were not readily available. Expenditures in current year dollars are available in Table A.6 in the appendix.
1. Federal amounts aside from the allocated budget were authorized in the fiscal year indicated, even if cash flows from expenditures and reimbursement were not completed in the period.
2. Allocation amounts here are somewhat lower than base operating budget amounts shown in Table A.3. Allocations are net of assessments and other adjustments made to Congress' appropriations before they reach Glen Canyon NRA.
3. These recreation fee amounts represent the 80 percent of visitor recreation fees received by Glen Canyon NRA that are returned from NPS's Washington headquarters to the NRA for recreation-related expenditures per the Federal Lands Recreation Enhancement Act (FLREA). Total recreation fees are estimated to be $4,031,080 for FY2007 and $3,219,252 for FY2013 in real dollars.
4. Various receipts include: commercial use authorization permits (CUA), rights of way (ROW), special use permits (SUP), and construction set aside (CSA). CUA permits for tours and other commercial recreation are by far the largest component of these receipts.

Source: National Park Service, Larsen (2014), Shultz (2014), NPS (2008).

Federal Funding

As noted, most Glen Canyon NRA funding is from federal sources. Allocations from the base operating budget covered 59.5 percent of the NRA's spending in FY2013 (Shultz 2014). In addition, the NPS put forward $1.3 million for a variety of projects approved at the national or regional level based on a competitive review process, mostly one- or two-year projects related to NRA facilities, installations and equipment (Larsen 2014).

The Federal Highway Administration (FHWA) through its Federal Lands Access Program (FLAP) assists with NPS road maintenance expenses, which most years (except FY2007) are quite low since only a few miles of Highway 276 near Bullfrog Marina are maintained by the NPS, with state and county governments maintaining most roads in and around the NRA (Bremner 2014, Larsen 2014).

Wildfire is not a major threat at Glen Canyon NRA due to the predominant desert and lake landscape. Any fire suppression expenditures are billed to a special account covered by NPS at the regional or national level. A small fire near the dam was extinguished in FY2013.

Independent Revenue

One-third of Glen Canyon NRA's FY2013 funding came from revenue generated at the NRA, with visitor recreation fees being the largest component. Totals of $4.0 million in FY2007 and $3.2 million in FY2013 were collected from recreational visitors at Glen Canyon NRA, of which 20 percent was customarily retained at NPS headquarters (Larsen 2014, Shultz 2014).[102] NPS returned 80 percent of the revenue for use at Glen Canyon for certain recreation-related expenditures authorized by the Federal Lands Recreation Enhancement Act (FLREA). Of $2.6 million in FLREA funds returned to the NRA in FY2013, 28.9 percent was applied to recreation fee collection costs, an expense covered by user fees without drawing from the base operating budget. Efforts to address invasive zebra and quagga mussels consumed 32.3 percent of FLREA expenditures that year, and a variety of other projects accounted for the remaining 38.8 percent of the recreation fees NPS returned to Glen Canyon NRA.

Recreation fees collected by NPS at Glen Canyon NRA are for entry (60.5 percent of recreation fees in FY2013), boat launching (32.3 percent) and camping (7.3 percent). Substantial undisclosed camping, lodging and other fees are received by concessionaires who pay franchise fees to the NPS for facilities documented in the previous section.

If entrance, boating and camping receipts are proportional to the number of visitors entering the NRA from Utah and Arizona, a reasonable estimate of the share of receipts collected in Utah during FY2013 would be $410,803 of the $2,575,402 total, expressed in real FY2012 dollars and based on 12.8 percent of visitors arriving to Utah entry points in FY2013. That estimate will be inaccurate to the extent that more visitors arriving in Arizona take their boats onto Lake Powell or to the extent that camping is more common among visitors arriving via Utah.[103] At the least, Utah's share of NRA entrance fees can be inferred quite reliably as being about $356,397 in FY2013.

Over half of entrance fees are from daily passes, while nearly one-fourth are from annual passes, the remainder coming from special use fees, commercial tours and senior passes (Larsen 2014). To elaborate on recreation fees, entrance fees are $7 per individual and $15 per vehicle for up to a week or $30 per individual for an annual pass with unlimited access.[104] Other fees and discounts apply to commercial tours. Entrance fees at Antelope Point Marina are collected by the Navajo Nation (Larsen 2014). Boating fees are generally $16 per motorized vessel for up to a week or $30 for the year. Fees are $10 or $12 per vehicle at primitive campgrounds.

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[102] For comparability and consistency with Table A.5, these two figures for recreation fees are expressed in real FY2012 dollars. In nominal or current dollars, total recreation fee receipts at Glen Canyon NRA were $2,897,650 in FY2007 and $2,617,333 in FY2013.

[103] Whereas Utah's share of visitor arrivals was 12.8 percent in FY2013, as noted, and an average of 18.0 percent during FY2003 to FY2013, one fourth or more of Glen Canyon NRA's various types of camping facilities are in Utah (see the "NRA Facilities" section for details). Three of the four developed campgrounds are concessionaire-operated. NPS manages one developed campground in Arizona, while all five primitive campsites where fees are assessed are located in Utah. It is possible that more than 12.8 percent of camping activity happens in Utah, making our FY2013 estimate of $410,803 for Utah conservative in terms of camping fees, while the same estimate may overstate the amount of boating fees collected in Utah.

[104] "Glen Canyon National Recreation Area: Fees & Reservations," National Park Service, accessed May 2014, www.nps.gov/glca/planyourvisit/feesandreservations.htm.

Glen Canyon NRA has many smaller sources of independent revenue besides recreation fees. In FY2013, $2.2 million was received from concessionaires for water and electricity (73 percent) and franchise fees (27 percent) (NPS 2008). These amounts were primarily devoted to operate electrical generators, supply water, and maintain facilities concessionaires operated (Shultz 2014).

Employee living quarters are for NPS staff with responsibilities at locations distant from Wahweap and Page (Larsen 2014). There are 82-85 units. The strategic round-the-clock presence of emergency medical personnel, law enforcement agents and maintenance staff at several points on the lake permits timely responses to needs that arise.

Donations and grants come to the park from organizations and individuals. One contributor is the private National Park Foundation. In FY2013, Glen Canyon NRA spent a portion of the amount the State of Utah disbursed in order to keep the NRA open during the October 2013 federal shutdown.

Funds from agreements are paid by partners who the NPS assists in Glen Canyon NRA. The largest agreement there in FY2007 governed ambulance services NPS provides to Banner Health, a private company (NPS 2008). That year 18.5 percent of the NRA's receipts from agreements came from the BLM for dispatcher services.[105] Miscellaneous revenue sources include court ordered restitution and unclaimed money.

Bureau of Reclamation

The U.S. Bureau of Reclamation operates Glen Canyon's dam and hydroelectric plant (Reed and Harrison 2014). Reclamation's typical water management operations include water conservation, meeting water delivery needs, such as irrigation and downstream obligations, and maintaining partnerships with public and private entities. Reclamation has established agreements to provide tours near the dam, visitor center staff support, and tunnel access for river runners. Reclamation owns some land at Glen Canyon NRA, mainly at the dam. Most of its efforts, personnel and outlays for the NRA happen in Arizona to operate the dam and power plant. Three Reclamation staff members at the Salt Lake City regional office help address recreation and realty issues that arise periodically. Upon request, Reclamation's Upper Colorado Region staff could research and disclose how much the agency spends within Utah in support of Glen Canyon NRA.

A.4 COUNTY PERSPECTIVES

Completion of Glen Canyon Dam in the 1960s brought development and visitors to parts of the county that previously did not have much activity. However, economic benefits from tourism accruing to Garfield and Kane counties due to the NRA can easily be overstated. Unfunded obligations accompany these counties' proximity to Glen Canyon NRA, Grand Staircase–Escalante National Monument, three national parks, and Bureau of Land Management (BLM) land.

[105] This amount belongs in the federal funding section, but it cannot be separated in our FY2013 data, so it remains grouped under the independent revenue section. Most receipts in the "agreements and miscellaneous" category were paid by companies or individuals and can be considered independent revenue.

Glen Canyon NRA facilities are maintained well, and fees are reasonable. This National Recreation Area is managed like a National Park, without sufficient public access to public roads, grazing pasture and natural resources (Pratt 2014).

The counties in which Glen Canyon NRA is located pay for road maintenance, law enforcement (including search and rescue off-lake), solid waste management, and emergency medical care for visitors over large portions of the NRA (Bremner 2014). Counties bear added expenses for these programs to support the NRA while receiving only a portion of the economic benefit from visitor spending, much of which occurs outside the counties, and without having control over roads or being compensated with a share of park revenue for their services. Federal Payments in Lieu of Taxes (PILT) help defray some of these types of costs, which for private lands would typically be funded at least partially by property taxes.

This section includes input from Nick Sandberg, San Juan County Public Lands Coordinator; Brian Bremner, Garfield County Public Lands Coordinator; Jim Matson, Kane County Commissioner; Gil Miller, Economic Associates of Utah, long-time consultant to Kane County; and Louis Pratt, Kane County Transportation System Director.

A.4.1 Visitor Spending

The share of spending by Glen Canyon NRA visitors is likely to be distributed widely between visitors' permanent residences and their destinations at the NRA. Most of it does not happen in Utah.

Some boaters who enter Lake Powell at Wahweap in Arizona refuel at Utah marinas, such as Dangling Rope or Bullfrog (Matson 2014). Gasoline is much more expensive out on the lake compared to regular gas stations away from the lake (Pratt 2014). Often boaters bring many gas containers with them, filled in Las Vegas, Salt Lake City, or Page, in order to limit fuel purchases on the lake.

Most spending by visitors to Glen Canyon NRA happens in Arizona (Matson 2014). Even visitors entering the NRA from Utah may deliver minimal economic benefits to local communities and even negative fiscal impacts for local government (Bremner 2014). Most trip expenditures for food, equipment and supplies are made before arriving in the Glen Canyon area. For example, visitors buy equipment at REI in Salt Lake City and pack groceries from Walmart in Richfield before arriving at their destinations. Tourists from California or Las Vegas travelling to the NRA do much of their shopping and lodging out of state (Pratt 2014). On Highway 89 between Kanab, Utah and Page, Arizona, there are few visitors for visitors to make routine purchases. Big Water does not have lodging or a gas station, mainly residences and boat storage facilities. People travelling through Kane County on Hwy 89 generally spend their money in Arizona, as soon as Greenhaven or closer to Page.

On their return trips, visitors may purchase a tank of gas, bag of chips, or hamburger in Garfield, Kane or even San Juan or Wayne counties, in places like Panguitch, Escalante, Hanksville, Ticaboo, or Kanab (Bremner 2014). Yet, due to the distance from the Wasatch Front, some spending on food and fuel in the area surrounding Glen Canyon NRA is common (Miller 2014). Also, lodging and boat storage generate significant spending by some visitors (Bremner 2014). On the other hand, when visitors become lost, experience sickness or an accident, drive on roads, and dispose of garbage, they create costs for the counties.

Law Enforcement

Southern Utah counties pay for law enforcement within Glen Canyon NRA and associated with visitors to the NRA (Miller 2014). Counties are not compensated by NPS for their responsibility to respond to off-lake search and rescue calls (Bremner 2014). For example, a County Sheriff's department responds on its own budget when someone is lost or injured in a remote slot canyon. Searches may involve helicopters or rope teams. They may be expensive and protracted. A successful rescue in the Henry Mountains with air support cost $75,000.

Search and rescue out on Lake Powell and probably within a half-mile perimeter of the lake is handled by NPS, covered by federal funding and personnel (Bremner 2014). The responsibility of county law enforcement and emergency medical staff is for search and rescue in the primitive areas off-lake, which represent a lot of space, part of the NRA that the county actually manages, although it may carry the NRA designation. There have been difficulties in the past with federal cooperation in joint law enforcement efforts with counties. Mike Noel's HB 149 in 2014 addressed under what circumstances federal law enforcement agents should be permitted to enforce state laws.

Recreation and Fees

County representatives were not concerned about fees charged for recreation at Glen Canyon NRA (Bremner 2014, Pratt 2014). In particular, the annual pass for an individual at $30 is affordable.

Additional revenue-neutral recreation opportunities could be expanded within Glen Canyon NRA (Bremner 2014). For example, an OHV park could be created near Bullfrog. There could be dunes to ride their four wheelers, jeeps and dirt bikes, space to play besides the back roads between places. ATV use has become more common over the past few decades. A nominal fee charged for OHV recreation, perhaps $3, would allow upkeep of the OHV area and fund a portion of county-wide road maintenance associated with the NRA.

Roads

Access is being denied on public roads (Miller 2014). For example, Kane County pays to maintain the Lone Rock Road from Hwy 89 into the Lone Rock beach area inside Glen Canyon NRA (Pratt 2014). This class B road is maintained without NPS, BLM or other direct federal participation. Formerly gravel, the county paved Lone Rock Road some time ago. Yet the public is not permitted free use of this public road within Glen Canyon NRA without paying fees to NPS, even if drivers are not using any of the NRA facilities.

During the government shutdown in 2013, road blocks and armed guards were present on roads maintained and paid for by the counties (Pratt 2014). Entry was permitted only for county personnel on official business, to the exclusion of the broader public. As a National Recreation Area, Glen Canyon should not be locked up like a National Park.

Garfield County maintains Hole-in-the-Rock Road from Escalante under an agreement with Kane County that is more feasible than Kane County maintenance (Miller 2014). Garfield County receives UDOT funds to maintain the road from Escalante all the way to Hole-in-the-Rock, even the part inside Glen Canyon NRA (Pratt 2014). Garfield County also maintains Burr Trail Road that runs from Boulder through Capitol Reef National Park and down to 276 and Bullfrog

(Bremner 2014). The county graded Burr Trail Road 19 times last year, an example of an expense the county bears as a public service, even on segments within Capitol Reef National Park and Glen Canyon NRA, without funding from NPS.

Highway 276 from Hanksville to Bullfrog is managed by the state, including the fork that leads to Hite, Highway 95 (Bremner 2014). NPS manages a few miles of Hwy 276 that lie within Glen Canyon NRA near Bullfrog Marina, the only stretch of road inside the NRA that is not maintained by the state of Utah or its counties.

The part of Kane County near Glen Canyon NRA did not see much economic activity until the dam was built and Glen Canyon NRA and Page, Arizona were developed (Pratt 2014). Some cattle grazed at Lone Rock before Highway 89 was built as a state road and before Lake Powell was created. The rancher did the best he could for road access. The area has improved significantly due to the NRA.

In terms of federal funding for state and county roads, the Federal Highway Administration (FHWA) distributes funds to Utah annually via UDOT for transportation projects that meet criteria of the Federal-Aid Highway Program, about 20 percent of which is used for purposes selected by cities and counties (Hull 2014). Also, the Federal Land Access Program provides additional funding for roads that are near or within National Recreation Areas, National Monuments, or National Parks. Finally, counties receive revenue from the federal Payments in Lieu of Taxes (PILT) program intended to offset property taxes that would be assessed if the lands were not federally owned. PILT funds are not designated for roads per se, but they can be used to offset somewhat a wide range of costs associated with county government, including transportation and law enforcement.

Grazing and Mining

Grazing was permitted under the 1972 act that created the Glen Canyon National Recreation Area, as was mineral extraction (Sandberg 2014). Kane and Garfield counties are contesting BLM's approach to managing grazing within Glen Canyon NRA and other federal lands within the counties (Matson 2014). In the 1990s, Andalex Coal Mine's proposal to operate in Kane County near the westernmost part of Glen Canyon NRA was denied, traded for opportunities in Carbon County (Miller 2014).

NRA Maintenance

In the vicinity of NPS facilities, Glen Canyon NRA is maintained well (Bremner 2014). The National Park Service is proficient at maintaining campsites and boat facilities (Pratt 2014). At Bullfrog, Hite, Dangling Rope and Halls Crossing, the marinas, campgrounds and such are kept in good order. NPS seems to also do well at managing Lake Powell and boating (Bremner 2014). However, most of the NRA's acreage is primitive and not within half a mile of the lake. That area is generally left alone by NPS. In these areas counties take care of roads and visitors in distress.

For a time, Lake Powell's low water level made it more cumbersome to get a boat to certain parts of the lake near Wahweap Marina (Pratt 2014). People had to drive their boats around to a different ramp. Water levels have not improved, but passage was opened by NPS by blasting and digging in the lake bed to eliminate the access problem.

A.5 DISCUSSION

Glen Canyon National Recreation Area is important to Utah's economy, particularly in Kane, Garfield and San Juan counties. The NRA provides extraordinary recreation opportunities. A small share of visitor spending happens in Utah.

Under state management, Utah could choose to provide stable funding for Glen Canyon NRA, avoiding the significant budget cuts like those experienced from FY2011 to FY2013. The state could create more recreation opportunities, such as OHV access.

A portion of the $11.5 million in spending from Glen Canyon NRA's operating budget (average for FY2003-2013) supports jobs and creates an economic impact in Utah. Transfer of the NRA to Utah would result in a loss of a portion of that amount, perhaps $2.1 million in federal funding and 28 NPS jobs. Replacing those with Utah funding and jobs would create a smaller economic contribution, since they would be funded within the state.

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Appendix B: A Comparison of North Dakota's Shale Oil and Utah's Oil Shale

Discussions of the transfer of public lands often include talk of the potential increase in state revenue from oil and gas production and how this additional revenue will benefit education funding in Utah. An example cited at times is the good fortune of North Dakota. Since 2005 shale oil development in North Dakota has substantially boosted state revenue and, ultimately, funding for education. The production of oil from the shale oil deposits in the Bakken Shale formation in western North Dakota has increased from 3,000 barrels a day in 2005 to 1.1 million barrels a day in 2014. This remarkable increase has pushed revenues from oil and gas production and extraction to $2.5 billion in 2013, with a portion of this revenue designated for education funding.[106] Is North Dakota's shale oil bonanza, even on a smaller scale, replicable in Utah?

The answer to this question requires a twofold approach. The first compares the characteristics of the resource, North Dakota's shale oil to Utah's oil shale, and the second compares the commercial viability and size of North Dakota's Bakken shale oil reserve to Utah's Green River oil shale resource.

B.1 Resource Characteristics

In most cases, confusion and misplaced comparisons of North Dakota's oil boom and Utah's oil resources are due to terminology. The terms shale oil (North Dakota) and oil shale (Utah) may seem synonymous, but in fact the terms are specific and refer to two very different hydrocarbon resources. Consequently, the comparison of the shale oil production in North Dakota to the potential for oil shale development in Utah is a classic case of apples and oranges.

B.1.1 Shale Oil – North Dakota

Shale oil is found in low-porosity, permeable shale or tight limestone or dolomite rock. These rocks have been buried deep enough to create sufficient pressure and heat to convert the kerogen in the rock to oil and gas. The oil however, is locked in place so tightly it cannot be released in economic quantities simply by conventional drilling. To release the oil, producers have improved two existing technologies to unlock the oil resources: horizontal drilling and hydraulic fracturing. Once the oil is recovered and pumped to the surface it is refined in the same way as oil from conventional drilling.

[106] Spending on public education has increased from $715 million in the 2007–2009 biennium to $1.7 billion in the 2013–2015 biennium due to increased tax revenues generated from oil production.

B.1.2 Oil Shale – Utah

Oil shale is a sedimentary rock that contains some kerogen; however, unlike shale oil, the kerogen has not been converted to oil. The oil shale deposit was not subjected to sufficient heat and pressure to transform the kerogen into oil; it is an "immature" hydrocarbon. The kerogen is a solid within the sedimentary rock and cannot be pumped to the surface. To release the oil from the kerogen the sedimentary rock must be heated to 650 to 700 degrees Fahrenheit. This process is called retorting. Two retorting methods have been developed, surface retorting and in-situ retorting. Surface retorting usually involves mining (surface or underground) the oil shale and then feeding the mined rock into a kiln for heating and removal of the oil. In-situ retorting leaves the oil shale bed in the ground. Bore holes from the surface are drilled into the oil shale, which is then heated, releasing the oil underground. The extracted oil is then pumped to the surface.

The quality of oil shale is highly variable depending on location. On average the yield is about 15 gallons of oil per ton of oil shale. The depth of oil shale deposits are from surface outcroppings to 3,000 feet, much shallower depths than shale oil deposits.

B.2 COMMERCIAL VIABILITY

B.2.1 Bakken Shale

The Bakken Shale formation has an estimated 150 billion barrels of oil "in place." According to the United States Geological Survey the proven recoverable reserve is estimated at 15 billion barrels. Oil recovery in the Bakken however, is much more difficult and expensive than in a conventional oil field. The commercial viability of the Bakken is only possible because of high oil prices, prices above $60 a barrel. A well in the Bakken costs between $5 and $10 million to complete.

To capture crude from the tight shale oil formations, companies may need to drill down nearly two miles then angle the well sideways for about another two to three miles. Following extensive drilling, a pressurized mix of water, chemicals and grit is injected to break open oil-bearing rock, which allows the oil to flow to the well. Despite the cost of horizontal drilling and hydraulic fracturing, the commercial viability of the Bakken is unquestioned. The Bakken formation has produced over 1 billion barrels of oil, two-thirds of that production in the last three years. And as noted earlier, current daily production is over 1 million barrels a day, ten times the production rate of all of Utah's oilfields. The Bakken accounts for 10 percent of U.S. daily oil production and about 1 percent of the world's daily oil production.

B.2.2 Green River Formation

The world's largest deposit of oil shale is in the Green River Formation, which covers parts of Colorado, Utah, and Wyoming. Estimates of the oil resource "in place" in Utah's oil shale portion is nearly 1.3 trillion barrels, but of course only a fraction of the resource is recoverable. The development and the commercial viability of this resource are vastly different than the shale oil reserves in North Dakota.

Shale oil production, while more complicated and expensive than conventional oil production—horizontal drilling and hydraulic fracturing—is likely less expensive than oil shale development.

The cost of oil shale production is largely unknown, since there is very little production in the U.S. or the world. Estonia has the largest production levels. Worldwide production is less than 50 million barrels annually, about half a day of the world's daily oil production. It has been more than 20 years since oil was produced from oil shale in the U.S., and then it was in very small quantities.

Currently, there are two companies in Utah pursuing oil shale development; Red Leaf Resources and Enefit American Oil. The difficulty of getting oil from oil shale is best illustrated by Red Leaf Resources' Early Production System (EPS), which is the production process the company intends to use to achieve commercially viable production levels. The EPS is 5/8ths of a fully commercial system. The production process is known as EcoShale In-Capsule technology (Red Leaf Resources website). The first step of the EPS is to dig a pit 150 feet deep over an 8-acre parcel of land. That's roughly a city block excavated to a depth of 150 feet. The pit is then lined with a layer of clay and filled with surface-mined oil shale. The oil shale is then covered with layers of impermeable clay and soil, and heated to high temperatures by natural gas via steel pipes running horizontally through the oil shale. High temperature melts the kerogen rich shale to the point at which oil, condensate and natural gas are produced. The oil is then pumped to the surface for refining.

The EcoShale process uses very little water—primarily for dust remediation and saturating the bentonite-amended soil lining for the capsule—and reclaims the land with each capsule that is built. Reclamation begins as the capsule is heated. Red Leaf's EPS capsule is expected to produce about 350,000 barrels of oil over a 400-day process. Once Red Leaf's process is fully operational the company will have a number of capsules continuously in the production process. Red Leaf has leased 17,000 acres in Uintah County. When fully operational, in early 2020s, Red Leaf Resources expects to produce about 10,000 barrels per day, about 10 percent of Utah's current production.

Despite billions spent on research and failed operations over several decades, commercial levels of oil production from Utah's oil shale have eluded investors. Red Leaf's $200 million joint venture investment with Total SA, the fifth largest integrated oil and gas company in the world, is the most recent investment in oil shale. Total SA is funding 80 percent of the joint venture.

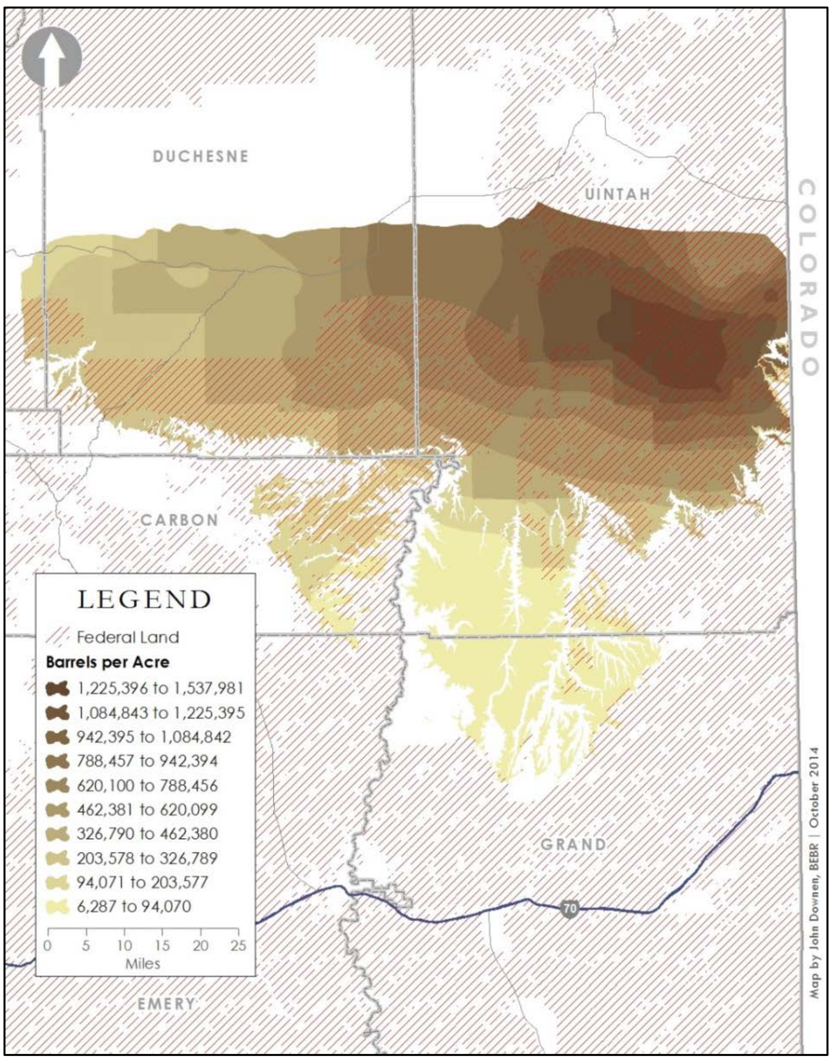
Enefit American Oil, an Estonian company with Estonian government backing, is also investing several millions of dollars in developing Utah's oil shale using a proprietary retorting process. Enefit's development timeline however, has been delayed by serious regulatory issues. Enefit appears to be farther away from commercial production than Red Leaf Resources.

B.3 CONCLUSION

In terms of resource characteristics and commercial viability, Utah's oil shale has little in common with North Dakota's shale oil. Some will point to land ownership as a critical factor in the pace of development of shale oil and oil shale. The Bakken formation is almost entirely under private land, whereas 54 percent (700 billion barrels) of Utah's oil shale resource, which includes some of the richest oil shale deposits, is under federal land (Figure B.1). But there is no evidence, even anecdotally, that federal land ownership has been a barrier to oil shale development. The federal government has leased land for oil shale demonstration and development projects and provided other support—most notably the Colony Oil Shale project in Colorado in 1980, which received $1.1 billion in federal loan guarantees. The project was abandoned by Exxon and Tosco in 1982. The oil shale industry has also received a number of federal subsidies dating back to 1944 and the Synthetic Liquid Fuels Act, which authorized funds from the Interior Department's Bureau of Mines to construct and operate demonstration plants to produce synthetic liquid fuel from oil shale.

The evidence from a hundred years of development attempts, both public and private, overwhelming points to the nature of the resource as the principal barrier to the production and commercial viability of oil shale.[107, 108] Without significant advances in production it is unlikely that oil shale will contribute in any meaningful way to Utah's oil production, severance tax revenues and funding for education in the near or medium term—2015 to 2025.

Figure B.1
Federal Land Ownership and Utah's Oil Shale Resource



Source: U.S. Geological Survey, Oil Shale Resources of the Uinta Basin, Utah and Colorado; State of Utah, SGID.

[107] *Oil Shale: A Century of Failure*, report by Checks and Balances Project, April 2012.
[108] *Oil Shale: History, Incentives, and Policy,* Congressional Research Service, April 2006.

APPENDIX C: STATE FOREST MANAGEMENT AND TIMBER PROGRAMS

Experts within Utah's Division of Forestry, Fire and State Lands (FFSL) envision a level of forest management that would improve stewardship of national forests in the state, while increasing utilization of forest products and decreasing the risk of wildfire. If the land transfer described in H.B. 148 takes place, Utah would take control of 7.4 million acres of forest land. However, FFSL is not currently equipped to estimate the expense that would be required for the state to manage these forests, nor does it currently own forest land or directly manage forested acres. In looking at state forest programs across the western United States, it becomes clear that managing forested lands for purposes of stewardship versus managing forests for revenue accrues differing costs. Revenue-generating timber programs on state forest land incur greater costs that detract from state revenue. The State of Idaho, for example, generated $50.8 million in revenue from timber sales to professional logging contractors in FY2012, but also incurred $19 million in expenses and managerial overhead. Nine designated recipients received 62.6 percent of the revenue in excess of expenses that year.

Many areas of national forests in Utah are in need of active forest management and extensive restoration to achieve significant increases over current harvests. An example of a large-scale collaborative effort of this variety is the Four-Forest Restoration Initiative in Northern Arizona. The Forest Service and its partners propose to restore a healthy, fire-adapted forest ecosystem by treating about 40 percent of a 2.4-million-acre region of degraded ponderosa pine forests.

This chapter describes forest management information, including state timber programs, for state-owned forests in five western states relative to Utah: Arizona, Colorado, Idaho, Montana, and eastern Washington. Each state is described in terms of management structure, state trust land information, budget and costs associated with state forestry, and challenges facing forest management (where available). Table C.1 compares federal and state forest acres in these five states and Utah. Table C.2 summarizes the forest management data collected for this chapter.

Table C.1
State Forest Management
Federal Forest Acres vs. State Forest Acres, 2012

Category	Arizona	Colorado	Idaho	Montana	Utah	Eastern Washington
Federal Forest Acres	11,264,611	13,900,888	20,417,019	17,115,843	8,153,642[1]	1,647,086[2]
State-Owned Forest Acres	1,583,702	563,265	1,212,713	780,000	860,000	897,898

1. Does not include the Desert Experiment Station, which is 55,630 acres.
2. Figure includes national forest land located only within the Northeast and Southeast regions of Washington State, as outlined by the Washington Department of Natural Resources.

Source: U.S. Forest Service, Forest Inventory & Analysis, 2012; U.S. Forest Service, Land Areas of the National Forest System Report, 2012.

Table C.2
State Forest Management Data Overview
(Excludes Wildfire Management Costs)

Category	Arizona	Colorado	Idaho	Montana	Utah	Eastern Washington
State Forestry Organization(s)	Arizona State Forestry Division	Colorado State Forest Service (CSFS), Colorado Department of Public Safety	Idaho Department of Lands, which includes Forest Management Bureau and Fire Management Bureau	Montana Department of Natural Resources and Conservation, Forestry and Trust Lands Management Divisions	School and Institutional Trust Lands Administration (SITLA)	Washington Department of Natural Resources, Public Lands, and Northeast and Southeast Regions
Total Agency Employment	63 FTE	110 (includes full-time and seasonal)	114 FTE	53 FTE	NA	38 FTE, plus an additional 20 foresters in NE and SE Regions
State-Owned Forest Acres	1,583,702	563,265	1,212,713	780,000	860,000	897,898
State-Owned Timberland Acres	5,987	273,165	1,086,864		186,862	834,788
Private Forest Acres	7,313,061	5,597,905	3,049,183	6,956,843	2,824,188	4,118,840
Private Timberland Acres	749,771	2,262,815	2,821,823	5,834,921	608,984	3,995,550
Forest Land Revenue (2012)	$0	$184,000	$72,500,000[1]	$10,504,738[2]	$156,616	$8,100,000
Revenue per State-Owned Forest Acre	$0	$0.33	$59.78	$13.47	$0.18	$9.02
Agency Budget (FY2013)	$7,118,600	$10,500,000	$17,153,106	$5,662,690	$184,237	$11,628,600
Cost per State-Owned Acre	$4.50	$18.64	$14.14	$7.26	$0.21	$18,82
State-Owned Acres per FTE	25,138.13	5,120.60	10,637.83	14,716.98	12,647.06	15,481

1. Idaho's revenue is current through FY2014.
2. Montana's revenue is current through FY2013.
3. Utah's budget figures are current through FY2014.

Source: Arizona State Land Department; Colorado State Forest Service, personal conversation; Idaho Department of Lands, personal conversation; Montana Department of Natural Resources and Conservation, Forest Management Bureau, personal conversation; Utah State Legislature, Compendium of Budget Information; Washington Department of Natural Resources, personal conversations; U.S. Forest Service, Forest Inventory & Analysis; Utah State Institutional and Trust Lands Administration; State of Arizona, General Fund Operating Budget Spending; U.S. Forest Service, Forest Inventory & Analysis.

C.1 ARIZONA

C.1.1 Overview

Arizona manages all state forest land through the Arizona State Forestry Division. While both the forestry division and the Arizona State Land Department were once a single government agency, they have since been separated. Sixty-three full-time staffers are employed with the forestry division. Today, principal responsibilities of the State Forestry Division include:

> Fire Suppression and Prevention: The Arizona State Forestry Division provides for the prevention and suppression of wildland fire on 22 million acres of State Trust Land and private property outside of incorporated communities. This includes supporting aviation

resources, firefighter training, dispatching of personnel and equipment, and business management information. In addition, prevention efforts include helping communities learn about and prepare for wildfire, and providing homeowner and community risk assessments. Funds are also granted to communities to reduce hazardous fuels in and around forested communities as well as on State Trust Lands.

Urban and Community Forestry: The division offers assistance to communities and homeowners in care and management of their trees and planting projects. Moreover, forward stewardship programs include forest landowner assistance with management and implementation of forest health policies.

Forest Health: The Forest Health Program offers technical assistance to communities and landowners on the many insects and diseases that threaten native tree species.

Utilization and Marketing: State forestry offers communities, contractors, and companies assistance in starting, improving, or expanding their operations to provide markets for hazardous fuel reduction and forest restoration efforts across the state.

C.1.2 State Trust Lands

All state trust land in Arizona is managed through the State Land Department. State trust land in Arizona no longer includes forested acres, though trust land does include 20,000 to 25,000 acres of commercial ponderosa pine timber stands just southwest of Flagstaff. In the 1970s, 1980s and early 1990s, ongoing timber sales were made from state lands. Prices varied, peaking in 1996. The last viable timber sale was in 1998 or 1999, at 2,800 hundred cubic feet (CCF).[109] Annual revenues varied from zero up to an average of $250,000, covering salaries and overhead for two foresters and five seasonal employees (markers, cruisers) at that time. The remainder was contributed to the trust fund. Some of Arizona's state lands contain marketable timber that as recently as the 1990s generated approximately $1 million from one timber sale—revenue for Arizona's trust. Similar opportunities are not viable currently due to a lack of sawmills related to a decline in demand for fuel wood and timber (low prices), competing wildlife and recreation priorities on public lands, and the slowing of timber sales from national forests. However, the state is no longer selling timber on a commercial basis. Today, trust land management receives the majority of its revenue from development and residential real estate sales instead of natural resources.

The state was operating a timber program on its 25,000-acre forest, which it divided into 20 areas. The plan was to sell one or two areas each year, but the program was not so regular. In several years nothing was sold, and in one year as many as eight or nine sections (5,000 acres) were harvested in a plan to bring the forest into regulation. At the time, the pulpwood reload facility was 15 miles away. Pulp was then shipped up to 150 miles by rail to the mill. It would be possible to design a viable small-scale sale on 640-acre sections, but they are a little small to institute proper rotation plans.

The most common marketable tree harvested from state-owned forests is ponderosa pine. There are markets for firewood, pallets, dimensional lumber, cants and specialty wood. People do not

[109] Using the conversion factor of 6.25 board feet per cubic foot from the BLM's *Public Land Statistics*, 2,800 CCF would be 1.75 million board feet (MMBF). Total Forest Service sales were 77.4 MMBF in FY2012.

burn firewood as much as before, making it harder to sell. Wood was sold for fuel to a biomass power plant. The plant's price is now too low to cover harvesting and transportation costs, although the plant may be a more viable option for forests located closer to it, mainly national forests. Since mills and higher-end buyers are lacking, the full value of quality timber is not realized. For example, 30-inch ponderosa pines are used to make pallets. Logs for homes and other small-volume uses are common but do not amount to much in terms of volume or percent of timber sold.

C.1.3 Budget/Cost

Total funding for the Arizona State Forestry Division in FY2013 totaled $7,118,600, appropriated from the state general fund. In addition, the division received roughly $4 million in fire suppression funds in FY2013 for a 22-million-acre area of state trust and private land. State-owned forest land is reported to total 1,583,702 acres, which includes 5,987 acres of timberland. Trust land funding and budgetary costs totaled $28,834,100 in FY2013, appropriated from both the state's general fund and other sources of funding, including revenue generated from the state trust lands.

C.1.4 Challenges

Vast areas of the nearly 20 million acres of Arizona's total forest lands (federal, state and private) are unhealthy and vulnerable to unnatural fire due to accumulated fuels, overcrowding, and drought. In 2002, for example, the Rodeo-Chediski Fire burned 470,000 acres and destroyed more than 400 homes. The containment and suppression costs exceeded $50 million as well as other immeasurable costs of rebuilding the communities and restoring the ecosystems destroyed by the fire (Arizona Forest Resource Assessment 2010). Shrinking state and municipal budgets have compounded these challenges.

Drought has visited Arizona in recent decades but without the major concerns over beetle infestation of the type that has arisen in states north of Arizona. Many parts of the state have experienced protracted droughts. Even during some of the worst years lately and back in 2001 and 2002, beetle population spikes were primarily localized in areas with some combination of dry south-facing slopes, rocky soil, overcrowded stands, and aging trees already senescing. Arizona foresters are monitoring the beetle situation but so far have not seen and don't expect to see beetle epidemics like those in Utah, Idaho and other states. Nature has kept beetle populations in balance, for example with cold and moisture.

C.2 COLORADO

C.2.1 Overview

All state-owned forest acres in Colorado are managed by the Colorado State Forest Service (CSFS). CSFS is operated from offices housed at Colorado State University. This is facilitated by lease and cooperative agreements with the Colorado State Land Board, which oversees all state trust land. CSFS also has separate agreements with Colorado Parks and Wildlife to manage variable acreage amounts in state parks and state wildlife areas each year. In addition, CSFS prepares reports regarding forest health and resources, prepares timber sales, conducts audits, and provides support and information to forest operators and forest communities. Overall, the state is reported to have 563,265 acres of state-owned forest, which includes 273,165 acres of timberland.

In the absence of a Forest Practices Act, the CSFS encourages timber operators on state and private lands to follow Best Management Practices for forest regeneration and fire risk reduction, among other considerations. In addition, recommended streamside management zone procedures were developed to protect water quality as roads are built, streams crossed and vegetation removed. Participation and compliance are voluntary, with CSFS as a resource.

CSFS timber sales are funded independently by revenue they generate, including timber sales and service fees. Total forestry revenue in 2012 was $184,000, which is normal for a good year lately. But given the low prices for timber caused by the recession the past several years, annual sales since 2008 have been as low as $80,000. Multiple sawmills have shut down due to the decline in harvest volume, which makes it more difficult for the state to find buyers. In particular, it is difficult to sell timber from trees killed by beetle infestation, since the Forest Service offers large amounts of salvage timber, sometimes at no charge or even with payments to operators for removal (Ochis 2014).

Of total revenue, 60 percent is retained by CSFS—20 percent for administration costs and 40 percent for forest management, of which a remainder is devoted to improvement projects based on forest needs around the state. The Colorado State Land Board (SLB) statutorily receives 40 percent of CSFS forestry revenue. CSFS's 60 percent is enough to cover basic costs of running the timber program and contribute to the improvement fund, but since fiscal year 2009 SLB has returned all of its 40 percent to CSFS to help it address unusual expenses associated with beetle infestation and disease.[110]

C.2.2 State Trust Lands

The Colorado State Land Board is managed strictly from income generated from state trust lands, through programs such as timber sales. Revenue generated from forest product sales on state trust lands for the last fiscal year was $316,987. The land board statutorily receives 40 percent of CSFS forestry revenue. CSFS does not manage forests for the purpose of producing forest products; rather timber sales are a means to accomplish broader objectives such as forest health and diversity, wildlife habitat and fire risk.

C.2.3 Budget/Costs

CSFS operating costs for FY2013 were approximately $10.5 million, which includes wages, supplies, services and indirect costs. Approximately 110 full-time and seasonal workers are employees with CSFS, with 16 districts and three field offices across the state. In 2012, all fire suppression responsibilities were transferred to the Colorado Department of Public Safety, Division of Fire Prevention and Control, which received $10,078,372 of funding in FY2013.

[110] Colorado State Land Board revenue from timber sales was $72,110, which implies $180,275 in total timber sales for FY2009, adding another 60 percent retained by the Colorado State Forest Service. Real timber sales for FY2009 were $191,115 in FY2012 dollars, adjusted for inflation by the Bureau of Labor Statistics' CPI. Fiscal year 2009 in Colorado began July 1, 2008 and ended June 30, 2009 (Duda 2014, Colorado State Board of Land Commissioners 2013).

C.2.4 Challenges

Options for timber development in Colorado are limited as two-thirds of the state is federally managed. Moreover, several sawmills have shut down due to a decline in harvest volume, which makes it difficult for the state to find buyers for timber products. In addition to the challenge of inhibited future timber development, Colorado is also confronted with a recent increase in emerald ash borer infestations across state forest lands.

C.3 IDAHO

C.3.1 Overview

The Division of Forestry & Fire within the Idaho Department of Lands (IDL) oversees four bureaus related to forestry in the State of Idaho:

> Forest Management Bureau—FMB oversees the forest management on approximately 1 million acres of forest endowment trust lands. These forests are managed with the purpose of maximizing revenue to the trust beneficiaries in the state, the largest being K–12 public schools. All revenue is generated by the sale of timber. Other FMB management responsibilities include, but are not limited to, timber harvesting, planting, pre-commercial thinning, site preparation, and road building and maintenance.
>
> Forestry Assistance Bureau—FAB provides assistance to private forest landowners and oversees the Forest Practices Act that is designed to protect water quality and ensure proper management and conservation of state forest lands.
>
> Fire Management Bureau—Wildland fire protection on 6.3 million acres of private and state forest land is coordinated through FMB. Some federal lands are also protected through an offset agreement whereby the state protects some federal forest lands within the state's protection boundaries, while the federal agencies (the Forest Service and Bureau of Land Management) protect some state land that falls within their protection boundaries.
>
> Technical Services Bureau—TSB provides technical assistance to bureau and field staff in the areas of hydrology, geotechnical engineering, fisheries, wildlife management, water rights, threatened and endangered species, remote sensing, and GIS analysis and support.

Idaho has had a Forest Practices Act since 1974. Notification is required for timber harvesting, road construction, reforestation, chemical use, and slash management. Violations without correction prompt enforcement action, such as not accepting new notifications or possibly taking civil action (Idaho Forest Products Commission, nd). The regulatory program maintains a close relationship with industry, and there is a culture of compliance.[111] Throughout the year, IDL's

[111] Many lumber companies are third-party certified to meet environmental and quality standards. These companies receive annual audits, and state audits are reviewed by the certification organization. This verification of a high standard of compliance can result in higher market prices. On another topic, one element of the collaborative relationship with industry is that influential timber industry lobbyists influence law-making and rule-making activities in the state, which establish the parameters for the regulatory program.

regulatory program has 8 to 14 foresters on the ground doing inspections, apparently somewhat unannounced, at least every four years (Andrea 2013b).[112] During 2012, IDL conducted 1,310 forest practices inspections for private forests, plus 43 in-depth audits with particular emphasis on water quality (Andrea 2013a).

C.3.2 State Trust Lands

Overall, the Idaho Department of Lands manages approximately 1 million acres of forested state trust lands. The agency assists other state entities such as Fish & Game, Parks and Recreation, and the Department of Transportation in managing additional state forest land. In total, the reported state-owned forest land is 1,212,713 acres, which includes 1,086, 864 acres of timberland. There are a total of 114 full-time employees funded by the FMB, which includes bureau staff, field staff, and support services. In FY2014, a total of 346 MMBF was harvested from forested endowment trust lands, which generated $72.5 million in gross revenue. Sustained yields are calculated every five years using current inventory information, program costs and revenues, market conditions, and other inputs and constraints. The current sustained timber yield in Idaho is 247 MMBF each year.

Besides conducting timber sales, in 2012 the Idaho Department of Lands planted 1.5 million seedlings[113], conducted pre-commercial thinning on 4,500 acres, sampled timber on 64,000 acres for inventory purposes, and managed weeds on 700 miles of road (Idaho Department of Lands 2013). IDL prepared a Forest Action Plan to address leading threats to the state's forests, including uncharacteristic wildfire, forest health issues (beetle, moth, disease, noxious weeds, climate change), development and recreation (Idaho Department of Lands 2012).

C.3.3 Budget/Costs

Total management costs for forested endowment trust lands were just under $19 million in FY2013. This figure includes a $.60 per acre fire assessment fee that all forest landowners must pay in the state. This money is transferred to the Fire Management Program to help fund fire preparedness. Fire suppression is funded through deficiency warrants out of the state's general fund.

C.4 MONTANA

C.4.1 Overview

Two divisions within the Montana Department of Natural Resources and Conservation (DNRC) are responsible for state forestry programs in Montana: The State Trust Land Management Division, and the Division of Forestry, which provides forestry assistance and is responsible for fire management. Montana's fire suppression fund is supported by appropriations from the Montana

[112] There are eight full-time foresters and six seasonal ones. Two additional full-time foresters will be hired by 2015.

[113] Bob Helmer (Oct 17, 2013 email) notes IDL has had a challenge obtaining enough seeds for reforestation. Reforestation takes more effort in dry southern Idaho than in northern parts of the state. IDL has its own seed orchards and purchases seed from another organization. In contrast, most stands of timber naturally regenerate without planting in eastern Washington, according to Tom Heller, Timber Sales Program, Washington Department of Natural Resources (Oct 8, 2013 phone conversation).

State Legislature. DNRC has fire protection responsibilities for roughly 50 million acres statewide; 5.2 million lie within the direct protection program. The remaining 45 million acres are protected by a network of 400 fire departments statewide through the County Cooperative Fire Protection Program. DNRC provides training, prevention materials, and equipment and assists on fires that escape the capabilities of the county. Fire preparedness efforts in Montana are focused in four areas: the Fire Prevention Program, which seeks to educate Montanans about fire risk, the wildland-urban interface, and reducing human-caused fires; the Fire Training Program, which provides statewide training opportunities for DNRC and local government personnel; the Equipment Development Center, which builds and maintains wildland fire equipment and communications; and Fire Support Programs, such as GIS and fire assessment fees (Montana Fire & Aviation Bureau, nd).

Montana DNRC administers several laws as they pertain to forest practices, including the Forest Practice Notification Law. Commonly known as the Forestry Best Management Practices (BMP), it requires operators or landowners to notify the department when forest practices are going to take place on private lands and sets some standards for those practices. These practices are considered voluntary or non-regulatory. The state monitors or "audits" the "application and effectiveness" of these practices and produces a biannual report to the Montana Environmental Quality Council prior to the biannual legislative session. BMPs include guidance in addressing streamside management, road planning, timber harvesting and site preparation, stream crossings, winter logging, and the handling of hazardous substances.

Montana fields a limited and nonintrusive regulatory program compared with those in Washington, Oregon and Idaho. Private forest operators may voluntarily implement BMP. The state has adopted a basic Streamside Management Zone[114] law for water quality protection and requires a bonded Hazard Reduction Agreement[115] for slash reduction. In 2012, the Forestry Assistance Bureau audited 42 private forest operators that had opted to be included in a pool for inspections. The timber industry has high compliance rates, partially because it is not costly, and the Bureau maintains a close relationship with forest operators.[116] For timber extraction on state land, the Forestry Assistance Bureau shares BMPs and cooperates with the state's Trust Lands Management Division, which has jurisdiction there. The U.S. Forest Service (USFS) and Bureau of Land Management (BLM) exceed Montana's BMP expectations, and the Bureau does not check on them.[117]

[114] Streamside Management Zone rules are concerned with water quality, road construction near streams and wetlands, stream shade, riparian habitats, sediment filtering and erosion, integrity of stream channels and banks, and floodplain stability. SMZ law prohibits off-road vehicle operation, clear-cutting, and the disposal of slash near bodies of water. An illustrated 37-page pamphlet explains additional guidelines and prohibitions: "Montana Guide to Streamside Management Zone Law and Rules 2006," Montana Department of Natural Resources, available at dnrc.mt.gov/forestry/Assistance/Practices/Documents/SMZ.pdf, accessed October 2013.

[115] The Hazard Reduction Agreement relates fire hazard reduction by removing or spreading of slash left after marketable lumber is hauled away. The bond costs about $6 per thousand board feet (MBF) harvested. Within two years, the logging business returns a signed affidavit that they complied reasonably with HRA expectations, whereupon their bond money is returned (Ziesak 2013) and (Montana Department of Natural Resources and Conservation Forestry Division nd).

[116] Forestry associations with which the Forestry Assistance Bureau maintains relationships are the Montana Wood Products Association and the Montana Loggers Association (Ziesak 2013). The compliance rate was 98 percent in 2012.

[117] Stricter federal standards apply to logging on USFS and BLM land compared with state or private land in Montana (Ziesak 2013).

C.4.2 State Trust Lands

The Montana State Trust Land Management Division reports managing roughly 780,000 acres of forested state trust land. This is lower than the estimate of the U.S. Forest Service Forest Inventory figure of 956,861 acres. There are 53 full-time employee positions managing these lands. The division is funded with trust fund revenue, timber sales, and forest resource fees. The remaining funding is from recreational use and resource development of state lands. Because funding for state lands is taken directly from revenues, any expenditure for administration of state lands is a direct reduction in trust income. The general fund provides general support to the Forestry Division as well as the fixed costs of the Fire and Aviation Management program. A transfer from the general fund is made to the proprietary fund, from which it is spent. State special revenue support comes from forest improvement fees and forest protection fees. In FY2013, 70.3 MMBF was harvested from state trust lands in Montana, generating $10,504,738 in total revenue. The current annual sustainable yield is 57.6 MMBF, which is the annual sales target for the state. While the volume sold is fairly steady, volume harvested is more variable due to exactly when purchasers are contractually obligated to harvest timber.

DNRC collected $1.6 million in improvement fees, which were used in the Forest Improvement Program for purposes such as "disposal of logging slash, reforestation, acquiring access, maintaining roads necessary for timber harvest, other treatments necessary to improve the condition and income potential of state forests, and compliance with other legal requirements associated with timber harvest" (Montana Department of Natural Resources and Conservation, 2013). In real dollars, state revenue from timber sales and associated fees in Montana reached as high as $19.7 million in FY2005. The five-year average for FY2009–2013 is $9.4 million.

C.4.3 Budget/Costs

Forest improvement fees consist of $25 for each slash hazard reduction agreement and 60 cents per thousand board feet sold, plus any forfeited fire hazard reduction bonds. Fees are established when timber sales are approved based upon the state's projected costs of slash disposal, road maintenance, and reforestation. The department is also required to collect up to one-third of the state's fire protection appropriation from private landowners through a forest protection fee. The other two-thirds are funded from the general fund. The department is required to levy the tax so that collections equal the amount appropriated by the legislature. In the 2015 biennium, fire costs that are the responsibility of the state totaled $48.4 million. In FY2013, forest management costs for state trust lands were $5,662,690.

C.5 Eastern Washington

C.5.1 Overview

The Washington State Department of Natural Resources oversees all state forest land. Washington State DNR is responsible for enforcing the Forest Practices Act within the state. The goal of the act is to "require a balance between protecting public resources and the continued economic viability of forestry in Washington" (Washington State Legislature nd). Forest practices emphasize education and pre-application reviews to communicate the state's expectations for timber extraction and minimize the need for enforcement actions. A thorough stakeholder process happens over a period of time, involving various interested parties, such as ecologists, counties, environmental groups, tribes, etc. Inspections are not mandated on a particular schedule, so regional offices are free to focus on operations in more sensitive areas and companies with past lapses. Timber operations on state lands are guided by the Division of State Lands and are usually lower maintenance than private forestry operations from the perspective of the Forest Practices Division. The State Environmental Protection Act (analogous to NEPA) applies to forestry on state lands but not on private land, although there are other laws and guidelines requiring environmental responsibility, such as avoiding habitat disruption (Mahan 2013).

The division is oriented toward resource conservation and is funded by the legislature, not from independent sources. For example, permit fees go to the state's general fund.[118] Laws specify riparian management zones to protect water quality. Washington State grants greater autonomy to regional offices in dealing with implementation of forest practices.

C.5.2 State Trust Lands

The Office of the Commissioner of Public Lands, director of state trust lands, is housed within DNR. The state is divided into six regions: Northeast, Northwest, Olympic, Pacific Cascade, South Puget Sound, and Southeast. The Northeast and Southeast regions make up what is referred to here as eastern Washington, with forest land that appears similar to other western states outside of the Pacific Northwest. Of the timberland in the eastern portion of the state, the state owns 10 percent, while the federal government manages 41 percent. The remaining forested land is private. Thirty-eight employees are assigned to forest management, with roughly 20 foresters in the eastern regions of the state. In 2012, 81.8 MMBF of Eastern Washington's timber harvest came from state lands. That represents 20.8% of the total Eastern Washington harvest volume, including private and federal lands, and 18.5% of the harvest from state lands throughout Washington, including the premium coastal regions (Washington DNR 2012a).

C.5.3 Budget/Costs

In FY2013, the total budgeting costs for the two eastern regions totaled $16,897,400. This included funding for fire control and regulation, which totaled just over $5 million that year.

C.5.4 Challenges

Current concerns in forest management include overstocked stands of marketable timber in the eastern regions of state forest land. This is due, in part, to the fact that sustainable harvest yields have not been recalculated in over ten years (McKellar 2014). As a result, a primary challenge will be not to over-harvest on state forest land without first determining a long-term sustainable yield. In addition to timber harvesting, primary concerns include securing long-term funding to replace supplemental program funding, root disease, and several species of beetles infesting densely packed timber stands and other state forest lands. One-third of the forests have elevated mortality due to deteriorating forest health. Insect infestation is a growing threat to forest health (U.S. Forest Service 2010, Washington DNR 2012b). In response, the state has established a Forest Health Program to monitor forest health, provide technical assistance, and remove more of the 13 percent per year of annual forest growth that is lost to disease. Removal of affected

[118] The assistant manager of the Forest Practices Division would prefer to be able to generate some funds from permitting or other fees. Currently, the division is wholly reliant on the legislature every two years for its budget.

timber is done by contract and generates revenue for the department (Washington DNR 2012b, Washington DNR 2012c, Washington DNR 2012d).[119]

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[119] In 2012, perhaps a third of the timber harvest from state lands in Eastern Washington was made possible through this program. This is a rough estimate with some merit but not without caveats. The one-third share is conservative considering the 37.5% difference (30.7 MMBF) between the total *harvest* volume on state lands in Eastern Washington in *calendar* year 2012 (81.8 MMBF) and the volume of timber *sold* there by the state outside of the forest health program in *fiscal* year 2012 (51.2 MMBF). Regarding the calendar year and fiscal year mismatch, as well as the lag from sale to harvest, the volume of timber sold outside of the forest health program was similar for FY2012 and FY2013, 51.2 and 53.5 MMBF, respectively, with data for FY2011 and previous years not readily available, and the harvest volume for calendar year 2012 is close to the five-year average, 82.3 MMBF.

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Appendix D: BLM Oil & Gas Leasing: Wilderness, Master Lease Planning and Sage-Grouse

The Bureau of Land Management (BLM) operates under a multiple use mandate that allows for a range of uses of federal public lands. Striking the appropriate balance between resource development and resource protection is both difficult and controversial. This section explores three public land management approaches which affect access to BLM lands in Utah. In an increasingly litigious context and in the interest of primitive recreation, environmental protection and habitat preservation, BLM has required master mineral lease planning in designated areas, protected certain lands found to have wilderness qualities, and deferred development on habitat for two sage-grouse species. These policies appear to have delayed or precluded oil and gas development in certain areas of the state.

First, the Master Leasing Plan (MLP) process calls for additional fact-finding and preparation before BLM offers leases for oil, gas or potash development in portions of Grand and San Juan counties. Planning for this MLP area is well underway. Pending MLP completion, BLM routinely defers oil and gas parcel nominations there, as well as in four other sizeable MLP regions in Uintah, Grand and San Juan counties, where planning has not begun. Prior to the advent of master lease planning in 2010, Resource Management Plans (RMPs) were the official statement on which BLM lands were available for development, subject to individual review of parcel nominations and Applications for Permit to Drill (APDs).

Second, in addition to designated Wilderness Areas and Wilderness Study Areas (WSAs) authorized by Congress, BLM has identified "non-WSA lands with wilderness characteristics" (LWCs) through inventories, based on criteria set forth in the Wilderness Act. Natural Areas are a small subset of LWCs where the BLM has determined that management to maintain wilderness character is appropriate. Development is not permitted in Natural Areas. While not formally protected, LWCs often receive additional scrutiny in advance of development activity, and oil and gas activity is approved in LWCs less often than in undesignated BLM lands. This study finds a similar pattern of protection for Red Rock Wilderness areas identified and proposed by the Utah Wilderness Coalition (UWC).

Third, the greater sage-grouse and Gunnison sage-grouse are receiving serious consideration by the U.S. Fish and Wildlife Service (FWS) for listings under the Endangered Species Act. In the interim, BLM is exercising abundant caution to avoid exacerbating declines and fueling calls for listing. This stance may limit opportunities within sage-grouse habitat.

This section utilizes recent data for oil and gas lease offerings and parcel deferrals to address the broader issue of access on federal lands in Utah. BLM offers five years of detailed geographic and tabular data statewide for oil and gas deferrals and offerings. Such extensive information is not available for other important uses of public lands in the state or for oil and gas before 2010. If BLM determines certain places are off-limits to oil and gas development, then a variety of other activities on BLM lands may be prohibited there as well, such as timber harvesting, mining, and motorized access for wildlife management, non-dispersed camping and other recreation. In proposing parcels for lease, oil and gas operators prompt BLM to review the availability of public lands around the state.

BLM follows a defined process for determining where to allow oil and gas development. The agency invites the public to nominate parcels of BLM and Forest Service lands by submitting "expressions of interest." Leases for approved parcels are offered for sale at public auction. Alternatively, BLM may defer lease offerings for nominated parcels for a variety of reasons. Deferral decisions are ambiguous in the data, since insurmountable denials are often indistinguishable from preliminary responses indicating further review will proceed as soon as agency resources allow. Operators who win oil and gas leases may submit an Application for Permit to Drill (APD) for each well to be drilled on leased parcels. APD approval is a prerequisite to any surface disturbance. BLM reviews during these various stages are guided by the National Environmental Policy Act (NEPA), Resource Management Plans (RMPs) governing resource use in the area, and, in some cases, Master Leasing Plans (MLPs).

During the five year period from 2010 to 2014, BLM deferred 1,927 parcels totaling 3.2 million acres and approved for sale 461 parcels covering 0.6 million acres. Less than one-third of the sale offerings (31.7 percent) and most of the deferrals (at least 62.6 percent) were associated with wilderness characteristics, MLPs or sage-grouse habitat. The approval rate for nominated parcels on BLM lands statewide was 19.3 percent, whereas the shares of nominated parcels resulting in lease offerings within these three protective categories were much lower, ranging from 1.2 percent (MLP areas) to 10.8 percent (LWCs).

D.1 OVERVIEW OF PROTECTED BLM LANDS IN UTAH

BLM lands in Utah are classified in various ways to emphasize certain values and uses. The designations shown in Table D.1 overlap in many cases, offering layers of protection and multiple emphases. Several of these will be analyzed in separate sections of this document: Master Leasing Plan (MLP) areas, sage-grouse habitat, and wilderness. The wilderness section addresses "non-WSA lands with wilderness characteristics" (LWCs), Natural Areas, and proposed Red Rock Wilderness. Below are comments regarding several of the other designations.

No development is permitted within 3.7 million acres of designated Wilderness Areas or Wilderness Study Areas (WSAs). Disturbances to the natural environment are prohibited with few exceptions.

For BLM lands with any of the other three congressionally-conferred protected statuses noted in Table D.1—Wild and Scenic Rivers, National Conservation Areas (NCA), and National Recreation Areas (NRA)—permissible activities are largely outside BLM's purview. These 19 miles of Wild and Scenic Rivers and 190,646 acres of NCAs and NRAs are available primarily for recreation or conservation.[1] Protections for WSR river segments depend on whether an area has been

[1] "National and Scenic Rivers System," *U.S. Fish and Wildlife Service*, accessed September 15, 2014, www.rivers.gov/info/contact.cfm; "Wild and Scenic Rivers," *Bureau of Land Management*, accessed September 15, 2014, www.blm.gov/wo/st/en/prog/blm_special_areas/NLCS/Rivers.html.

classified as wild, scenic or recreational. River segments defined as "wild" are typically closed to new leasing, and "recreational" river segments receive the least protection of the three (Stevens 2014). Policies for mineral leasing in NCAs and NRAs are largely determined by the particular enabling legislation that created them.

As for BLM Utah's national monument, while limited oil and gas activity has not entirely ended since the monument's creation, new development is not permitted within Grand Staircase-Escalante National Monument (GSENM) (Matranga 2014).[2]

Special Recreation Management Area (SRMA) is a BLM planning designation for lands it deems "require explicit recreation management to achieve recreation objectives and provide specific recreation opportunities" (BLM 2008b). Most SRMA acreage in Utah coincides with GSENM, but there are other SRMAs throughout the state. For example, the Moab Field Office has ten SRMAs, generally managed to favor primitive recreation. In the Fillmore Field Office, OHV and boating opportunities are emphasized in two SRMAs, both operated in conjunction with the State of Utah's Department of Parks and Recreation.[3] Management appropriate to individual SRMAs in Utah varies, but generally development is restricted in favor of recreation opportunities, scenic values and artifact preservation (BLM 2008b, BLM 2008e).

The Federal Land Policy and Management Act (FLPMA) called for BLM to create Areas of Critical Environmental Concern (ACECs).[4] Some of BLM's 59 ACECs in Utah are not available for development, particularly the ACECs created to preserve cultural resources (Jarnecke 2014). Others are open to oil and gas activity with stipulations, such as "no surface occupancy" (NSO), depending mostly on the reason for ACEC creation. ACECs are created to preserve a variety of values, including scenery, cultural resources, geologic features, archeological sites, paleontological resources, relict vegetation, endangered species, other wildlife, riparian health, and soil stability, among others.[5]

BLM Utah manages the mineral estate for lands documented in Table D.1, as well as for U.S. Forest Service lands in Utah that are open to oil and gas activity. The Forest Service owns 8,179,722 acres in Utah, 15.1 percent of the Utah's land area (AGRC 2014). Forest Service lands are not specifically analyzed in this section, although results in most tables and maps throughout are for BLM and Forest Service lands together. Maps not included in this report suggest the amount of such activity on Forest Service lands is very small compared to the amount of oil and gas activity on BLM lands.

[2] Declining production persists in the Little Valley oil field inside GSENM based on existing rights that pre-date the monument's creation. Utah's other national monuments are not administered by BLM.
[3] "Special Recreation Management Areas," *Bureau of Land Management*, Fillmore Field Office, accessed September 10, 2014, www.blm.gov/ut/st/en/fo/fillmore/recreation/special_recreation.html.
[4] 43 U.S.C. § 1712(c)(3)
[5] "Utah ACECs," *Bureau of Land Management*, accessed August 27, 2014, www.blm.gov/ut/st/en/prog/more/acecs/utah_acecs.html.

Table D.1
BLM Lands in Utah with Restrictions on Multiple Use

Designation[1]	Authority	Acres	Share
Non-WSA Lands with Wilderness Characteristics (LWCs)*[2]	BLM	3,885,700	17.0%
Natural Area*[3]	BLM	446,499	2.0%
Master Leasing Plan (MLP) Area*	BLM	2,717,692	11.9%
Sage-Grouse Habitat*[4]	BLM/DWR	7,562,407	33.2%
Red Rock Wilderness, Proposed*[5]	UWC	10,310,960	45.2%
Special Recreation Management Area (SRMA)[6]	BLM	1,881,761	8.3%
Area of Critical Environmental Concern (ACEC)	BLM	757,814	3.3%
National Monument	President	1,867,858	8.2%
Designated Wilderness Area	Congress	257,886	1.1%
Wilderness Study Area (WSA)[7]	Congress	3,434,012	15.1%
Wild and Scenic Rivers (WSR)	Congress	113,654	0.5%
National Conservation Area (NCA)	Congress	133,229	0.6%
National Recreation Area (NRA)	Congress	57,417	0.3%
BLM Lands in Utah		22,809,046	100%

* Land management policies for these five designations are analyzed in this document.
1. Areas overlap. Lands may have more than one designation. For example, proposed Red Rock wilderness includes all WSAs.
2. A BLM wilderness inventory completed in the early 1980s addressed all 22.8 million acres in Utah. Since then, BLM conducted a re-inventory with regards to wilderness characteristics to assess 8.4 million acres, 36.8 percent of its lands in Utah. A milestone in this effort was the 1999 revision, which has since been updated. As of 2014, 46.3 percent of re-inventoried lands and 17.0 percent of all BLM lands are found to possess wilderness characteristics.
3. Natural Areas are a subset of "non-WSA lands with wilderness characteristics" that have been selected during the RMP process for protection of wilderness character.
4. Sage-grouse habitat acreage includes breeding, nesting, brood-rearing and winter habitats for the Greater and Gunnison species from the Utah Division of Wildlife Resources (DWR).
5. The Utah Wilderness Coalition (UWC) provided input for "America's Red Rock Wilderness Act," introduced in Congress in 2013, but not passed. The bill proposed new designated wilderness in Utah. BLM has not adopted UWC's determinations of wilderness, but it constitutes one of many sources of public input.
6. Grand Staircase-Escalante National Monument is the only national monument BLM manages in Utah. It also comprises a Special Recreation Management Area (SRMA).
7. BLM participated in creating WSAs under Congressional authority.

Sources: BEBR analysis of geographic data from the Bureau of Land Management, Utah's Division of Wildlife Resources, Southern Utah Wilderness Alliance and Utah's State Geographic Database System (SGID).

D.2 OIL & GAS LEASE OFFERINGS AND PARCEL DEFERRALS

Based on five-years of BLM records, the agency limited oil and gas development in wilderness, sage-grouse habitat and MLP areas. BLM lease offerings there were relatively low compared to nominations in those areas, the share of BLM lands occupied, and lease offerings in other parts of the state. Such an outcome appears to be in keeping with laws and policies BLM followed, some recently adopted, to respond to competing public interests in the lands it governs.

D.2.1 Summary of Results

Of 2,388 parcels nominated for leasing during the period 2010 to 2014, BLM offered at auction 461 new leases for oil and gas development, amounting to 625,067 acres on BLM and Forest Service lands for which BLM administers the mineral estate (Table D.2). A total of 146 unique oil and gas leases were offered on four types of lands: "non-WSA lands with wilderness characteristics" (LWCs, 79), proposed Red Rock Wilderness (97), sage-grouse habitat (44) and MLP areas (8).[6] Most of the offerings, 63.8 percent, were outside these four designations, while only 32.0 percent of the nominated parcels were outside the area.

Table D.2
BLM Oil and Gas Lease Offerings and Deferrals
by Location in Utah, 2010–2014

Location[1]	Offerings Number	Offerings Share	Deferrals Number	Deferrals Share	Total Nominated Number	Total Nominated Share
Lands with Wilderness Characteristics (LWCs)[2]	79	10.8%	651	89.2%	730	100%
Red Rock Wilderness, proposed[3]	97	10.6%	821	89.4%	921	100%
Sage-grouse habitat[4]	44	9.4%	426	90.6%	470	100%
Master Leasing Plan (MLP) areas[5]	8	1.2%	686	98.8%	694	100%
One or more of the above[6]	146	9.0%	1,478	91.0%	1,624	100%
Anywhere in Utah	461	19.3%	1,927	80.7%	2,388	100%

1. The location of an offering or deferral is defined as whether any part of the parcel is within a specified area.
2. "Non-WSA lands with wilderness characteristics" (LWCs) are outside of designated Wilderness Areas and Wilderness Study Areas (WSAs).
3. Lands the Utah Wilderness Coalition identified as wilderness in America's Red Rock Wilderness Act
4. Habitat is for greater sage-grouse and Gunnison sage-grouse.
5. MLP areas include Book Cliffs, Glen Canyon, Moab, San Rafael River and Vernal (see Table D.4).
6. "One or more..." shows the number of unique offerings and deferrals in any of the first four locations. These land designations overlap. For example, most LWCs are also considered Red Rock Wilderness.

Sources: Bureau of Land Management Oil & Gas Lease Offerings (BLM 2014e), Moab Field Office, Deferred Lands List (BLM 2014d) and National Landscape Conservation System GIS data (BLM 2014a); Utah Division of Wildlife Resources (DWR 2014); Southern Utah Wilderness Alliance; State of Utah, SGID.

The vast majority of oil and gas leases offered at auction are originally nominated by industry (Stevens 2014). Alternatively, BLM occasionally nominates parcels within leasing units or adjacent to state or private lands under development (Wilcken 2014).[7] BLM's state office receives nominations and, after an initial screening, often requests BLM field office review of parcels for a variety of criteria (Kenczka 2014). There is no fee for nominations.[8] BLM merely requires an "expression of interest," which is a letter identifying one or more parcels being nominated (Wilcken 2014). An individual or company may nominate a host of parcels with rather little effort.[9] A parcel may be approved outright, approved with specified requirements to mitigate environmental harm, or deferred. Deferral is often a final outcome, but in other cases it is a determination to delay a decision until sufficient fact-finding can occur.

During the five year period from 2010 to 2014, BLM deferred 1,927 parcels totaling 3.2 million acres (Table D.3). Of the 80.7 percent deferred, 62.6 percent were accompanied by a note referring to wilderness characteristics, habitat of the greater sage-grouse or Gunnison sage-grouse, or areas where master lease planning is underway or intended. Underscoring the importance of

[6] Up to 82 offerings given by land type were counted in more than one overlapping area.
[7] BLM's intent in these cases is usually to timely generate some royalties on its own property where state or private wells are draining a common reservoir that spans federal and non-federal lands (Ruple 2014).
[8] In contrast, the BLM submission fee for an APD is $6,500 per well. *Source:* "News Release: BLM Will Collect…," *Bureau of Land Management,* accessed September 8, 2014, www.blm.gov/wo/st/en/info/newsroom/2009/november/NR_11_04_2009.html.
[9] Insufficient effort is devoted to the preparation of some expressions of interest. Nominators often do not manage to determine whether a given parcel is within an MLP area or sage-grouse habitat, and they may fail to review and follow nomination instructions and relevant BLM policies that are available online. For example, many parcels nominated are already found on the publicly available cumulative deferred lands list from previous nominations. A preliminary review suggests that as many as 16.4 percent of nominations made during 2010-2014 overlap in whole or in part (see Table D.3).

these deferral reasons, spatial analysis indicates 76.7 percent of deferred parcels are within four land designations associated with these reasons (see Table D.2).[10]

Table D.3
BLM Oil and Gas Deferrals in Utah by Reason, 2010 to 2014[1]

	Parcels[2]		Acres[3]	
Reason for Deferral	**Number**	**Share**	**Number**	**Share**
Wilderness characteristics	275	14.3%	377,217	11.9%
Sage-grouse	362	18.8%	457,338	14.4%
Master Leasing Plans	705	36.6%	1,272,174	40.0%
One or more of the above reasons	1,206	62.6%	2,047,871	64.4%
Other reasons besides those above	721	37.4%	1,130,327	35.6%
Total deferred for any reason	1,927	100.0%	3,178,199	100.0%

1. November 2014 data with 216 deferrals is preliminary: more parcels may yet be deferred in 2014.
2. Rows sum to more than 1,206 and 1,927 since multiple reasons were given for many deferred parcels.
3. As many as 689 of 4,200 sections with deferred oil and gas nominations during this time period were not unique. Over time and from different companies, nominations for lands may partially or fully overlap. Total acres do not match because the same lands may be deferred for more than one reason.
Source: Bureau of Land Management (BLM 2014d).

During 2010 to 2014, BLM offered mineral leases to the public on 9.0 percent of 1,624 nominated parcels located within any of the four land designations evaluated in Table D.2. A 9.0 percent approval rate can be compared to a 19.3 percent offering or approval rate for all 2,388 parcels nominated statewide. The approval rate varies widely among these four land designations: "non-WSA lands with wilderness characteristics" (LWCs), 10.8 percent; proposed Red Rock Wilderness, 10.6 percent; sage-grouse habitat, 9.4 percent; and MLP areas, 1.2 percent. Development is approved in many cases within these areas, with the exception of Natural Areas, which constitute 11.5 percent of LWCs by acreage.

As noted, the overall approval rate for proposed Red Rock Wilderness was very similar to that of LWCs, just above 10 percent. This correspondence is largely attributable to the fact that the majority of nominations, 73 offerings and 599 deferrals, are located in areas that are both LWCs and proposed Red Rock Wilderness.[11] However, even for the 246 nominated parcels that were in proposed Red Rock Wilderness *outside* of LWCs, only 9.8 percent were approved, somewhat lower than the approval rate on LWCs of 10.8 percent.

Of 222 Red Rock deferrals outside of LWCs, the reason given for deferral was sage-grouse or master lease planning in 50.5 percent of deferrals and wilderness-related in 38.7 percent of deferrals.[12] Compared to deferrals in propose Red Rock Wilderness areas outside of LWCs, deferrals within LWCs were somewhat more likely to be prompted by pending MLPs (48.2 percent v. 44.6 percent) and similarly unlikely to be for protection of sage-grouse habitat (6.2 percent v. 5.9 percent). Yet deferrals within LWCs were considerably less likely to be for reason of wilderness (5.3 percent v. 38.7 percent) compared to deferrals for Red Rock Wilderness outside of LWCs. In summary, deferrals for reason of wilderness were more common in proposed Red Rock Wil-

[10] Of 1,927 deferred parcels during the five-year period, 1,478 are located in one or more of the following designations: LWCs, proposed Red Rock Wilderness, sage-grouse habitat, and MLP areas.
[11] Only 6 lease offerings and 52 deferrals for oil and gas occurred on LWCs outside of Red Rock Wilderness.
[12] Total deferrals by reason of wilderness, sage-grouse or MLP were 87.4 percent, 194 of 222, where 4 of the deferrals were for multiple reasons, wilderness and either sage-grouse or MLP.

derness areas than in BLM-designated LWCs, and approvals within Red Rock areas were slightly less likely than approvals within LWCs.

A confluence of factors affects BLM approval rates for fluid mineral development. These may include legal mandates for protection, communication gaps between BLM and nominators, limited resources at BLM, nominator carelessness when naming parcels, BLM professionals' conservation priorities, and the prospect of litigation (Ruple 2014, Wilcken 2014).[13]

D.2.2 Data Limitations

The present analysis provides insight by showing the variation in approval rates by location, land categories and reason for deferral. Other comparisons not available to us would be helpful, for example, approval rates in Utah during the decades before 2010 and in other state for any time period.

Admittedly, BLM data from 2010 to 2014 for lease offerings and deferrals do not precisely identify all areas where there has been the most recent interest in development. Individuals and companies may choose not to nominate promising areas where, from earlier attempts or for other reasons, they expect the request would be denied. In addition, lease offerings that result from the nomination and filtering process may not be the most valuable available on lands for which BLM administers mineral leasing. Many leases offered do not sell.[14]

BLM data on offerings and deferrals may also overstate public demand for oil and gas development. Parties may nominate parcels rather freely without serious intent to purchase a lease if offered the chance. Furthermore, the share of purchased lease sites that are eventually developed and produced is quite low.

Data available here do not clearly indicate geologic potential, resource depletion or existing production, nor do they reflect prior nominations, deferrals, leases or production. Still, offerings and deferrals are a window into public demand and BLM policy on the ground.

The decision to use data from the years 2010 to 2014 was made for a few reasons. In general, we prefer a view of current, rather than historic, policy for an agency that is evolving. In terms of practicality, geographic data for parcel deferrals and lease offerings is consistently available only since 2010. At the time of BLM's oil and gas leasing reform, mid-2010, the deferred lands list was cleared, such that companies needed to re-nominate any oil and gas requests that had been denied if they wanted to receive continued consideration, and records for deferrals before 2010 are not readily available (Wilcken 2014).[15] In addition, BLM Utah lease offerings are given at least since 2002, but data needed for GIS analysis by parcel is not provided for the years 2009 and 2002 to 2007 (BLM 2014d). Fortunately, BLM data for five years through 2014 is quite thorough for lease offerings and deferrals, providing a window into public land access throughout the state.

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[13] "2013 Dashboard: Production," *Western Energy Alliance*, accessed September 15, 2014, www.westernenergyalliance.org/2012dashboard.

[14] Development on these leases may not be good financial propositions for operators given regulatory requirements and opportunities on private and other public lands.

[15] The deferred lands list is generally cumulative, and requests are not ruled out if they are not initially approved. Some reasons for denial are fairly permanent, such as habitat conflicts that are unlikely to change, while others, for example, simply reference the need for more time to research and plan.

D.3 MASTER LEASE PLANNING

Since 2010, Master Leasing Plans (MLPs) have constituted an additional layer of analysis, screening and planning to inform BLM land management. BLM has turned to master lease planning in certain environmentally sensitive areas with significant public demand for conflicting uses including mineral development. The finished products resulting from MLP processes are revised Resource Management Plans (RMPs) for the corresponding field offices, with improved content related to mineral leasing in discrete MLP areas.

Master lease planning can be seen as a systematic, efficient, conscientious approach to making valuable public land resources available to industry in balance with other considerations—recreation and tourism, competing resource uses, scenic values, wildlife habitat, riparian systems, soil preservation, etc. Besides being amenable to non-development interests, the MLP process may reduce uncertainty for potential lessees and BLM by identifying constraints to development early. In this way, lease offerings in MLP areas may become more defensible, with reduced exposure to lease sale challenges and post-lease litigation.

In contrast, some voices from industry, local government and elsewhere express the view that master lease planning results in unwarranted delays during the time-consuming MLP preparation period. This improvised, costly BLM adaptation of the RMP process Congress instituted under FLPMA involves some redundancy and unnecessary work (Muhn and Stuart 1988, p. 175). Furthermore, once completed, MLPs remove additional lands from unconstrained multiple use (Stevens 2014).

D.3.1 BLM MLP Policy

Master lease planning came about as part of the Department of Interior's (DOI) reforms to BLM's onshore oil and gas leasing program after public controversy arose regarding 77 leases offered at a December 2008 BLM auction in Utah.[16] The intent was to front-load the planning process to preempt and prepare for legal challenges. Master Leasing Plans (MLPs) were introduced as a means to promote an orderly and open process for considering appropriate protections for wildlife, land, water, and other resources.

Compared to Resource Management Plans (RMPs), MLPs evaluate environmental issues and needed lease stipulations on a more granular level in the context of impending resource development (Stevens 2014). Infrastructure planning and resource conflicts are addressed. Public input is sought, and formal environmental reviews are undertaken at this juncture, where the focus and timeline are narrower than they were during the RMP process.

A May 2010 Instruction Memorandum from BLM's Washington office introduced the concept of master lease planning (BLM 2010b). It also authorized deferrals of lease nominations pending MLP completion. Thus, if an individual or company requested an oil or gas lease within an area where an MLP has been proposed, BLM should defer the request until the MLP is completed. The memorandum carried an expiration date of September 30, 2011, but in the absence of new

[16] "Interior Finalizes Onshore Oil and Gas Leasing Reforms," News Release, *Bureau of Land Management*, May 17, 2010, www.blm.gov/wo/st/en/info/newsroom/2010/may/NR_05_17_2010.html; "Interior Review Shines Light on Controversial Utah Oil and Gas Leases," News Release, Bureau of Land Management, June 10, 2009, www.blm.gov/wo/st/en/info/newsroom/2009/june/NR_0611_2009.html.

instructions, expired guidance is likely to still influence practices in the field. For example, in September 2013, the May 2010 memorandum was given as the reason for ongoing deferrals in MLP areas where master lease planning had not commenced (Palma 2013).

D.3.2 Master Lease Planning in Utah

In September of 2010, BLM's Utah office released a plan to implement oil and gas reform and identify areas in the state where master lease planning would be most beneficial (BLM 2010c). The process included consideration of MLPs in 17 areas identified by the public, as well as those recommended by BLM staff. In November of that year, BLM released brief MLP assessments for five Utah areas located along the eastern portion of the state: Book Cliffs, Moab, Glen Canyon, San Rafael, and Vernal (see Figure D.1).[17] As of Fall 2014, the Moab MLP process was well underway, while delays persisted for the other four MLPs.[18]

As subsequently revised, the five MLP areas would cover 2.7 million acres, nearly one million from the Moab MLP area alone (Table D.4). They ultimately comprised about one-fourth of the combined BLM planning area for the five field offices where they are located, 27.4 percent of 9.9 million acres. Utah MLP areas covered 11.9 percent of all BLM lands in the state.

Table D.4
Proposed BLM MLPs in Utah

Master Leasing Plan	Counties	Acres
Book Cliffs	Grand	321,750
Glen Canyon	San Juan	364,149
Moab	Grand and San Juan	946,466
San Rafael River	Emery and Wayne	524,854
Vernal	Uintah	560,463
All MLPs	Five counties	2,717,682

Source: Bureau of Land Management, Moab Field Office.

In September of 2013, BLM's Utah office determined that proceeding with the four MLPs after Moab would not be feasible in the near future (Palma 2013). Priorities and circumstances had changed since those plans were made, and funding to manage oil and gas had been reduced. Furthermore, the Moab MLP, one of the first in the country, showed that MLPs require extensive personnel time and expensive outside contracts. As a result, Utah BLM Director, Juan Palma announced, "it is now apparent that the four remaining MLPs will not be completed in the foreseeable future" (Palma 2013).

At that time, the Glen Canyon MLP area was reduced in size from about 650,000 acres to the present acreage of 364,149 shown in Table D.4 and Figure D.1, partially to avoid unnecessary deferrals given the uncertain timeline for additional MLPs (Palma 2013).

As of August 2014, the delay persists with no timeline for resumption, and deferrals continued in the defined MLP areas (BLM 2014d, Jarnecke 2014). With regards to the Vernal MLP process, discussions are active regarding how to proceed (Kenczka 2014). Meetings on the matter were scheduled for September 2014 with participation from Vernal Field Office staff and BLM personnel visiting from neighboring states. Meanwhile, the Moab MLP is nearing completion.

The area covered by the Moab Master Leasing Plan (MLP) is 0.95 million acres (Wight 2014). Four ownership categories are present: BLM, 82.8 percent; Utah School and Institutional Trust

[17] Minutes for Resource Advisory Council (RAC) meeting, Salt Lake City, May 10, 2011, www.blm.gov/pgdata/etc/medialib/blm/ut/external_affairs/rac.Par.20402.File.dat/May10RACMtgMin.pdf.
[18] "Moab Master Leasing Plan," *Bureau of Land Management,* accessed September 10, 2014, www.blm.gov/ut/st/en/fo/moab/MLP.html.

Lands Administration (SITLA), 13.3 percent; private owners, 3.4 percent; and State Parks, 0.05 percent.[19]

Industry has expressed interest in oil and gas development on over 120,000 acres in the Moab MLP area, in addition to potash development on 350,000 acres (BLM 2013a). Besides extractive resources, the area contains six Areas of Critical Environmental Concern (ACECs), six Special Recreation Management Areas (SRMAs), two Wild and Scenic Rivers (WSRs), and one historic trail. The Moab MLP area is near two National Parks.

The Moab MLP process will consider development scenarios for oil, gas and potash resources in the context of resource conflicts and environmental concerns (BLM 2013a). The outcome may include development constraints, leasing stipulations and mitigation strategies, as well as a large batch or stream of new leases.

This extensive planning effort will amend Resource Management Plans (RMPs) for the Moab and Monticello field offices and create an Environmental Impact Statement (EIS) (BLM 2013a). Drafts should be released Fall 2014, and the Final EIS and Proposed MLP should be ready Fall 2015. The Moab MLP is the first standalone plan with its own EIS, whereas BLM's first MLP in Wyoming was accomplished solely through RMP revision (Stevens 2014).

D.3.3 Oil & Gas Lease Offerings and Parcel Deferrals for MLP Areas

Over a five-year period since 2010, BLM offered for sale only 8 oil and gas leases and deferred 686 parcel nominations within areas where it had proposed Master Leasing Plans (MLPs) in Utah (see Table D.2 and Table D.5).

As noted, MLP areas hold valuable mineral resources and constitute 11.9 percent of BLM acreage in the state, yet they only contributed 1.7 percent of BLM's 461 oil and gas offerings statewide during 2010-2014. A more striking point of contrast is the MLP areas' sizeable share of all BLM parcel nominations during this period, 29.1 percent.

The offering of only eight parcels in five years can be seen as a *temporarily* suppressed level of lease offerings in MLP areas, particularly for the portions of MLP areas that are made newly available for mineral leasing once master lease planning is complete. It is possible that when renewed leasing in MLP areas does occur, sales there will command higher premiums since MLP analysis provides lessees with a stronger defense against legal challenge to lease adequacy. On the other hand, low approval rates for nominations in MLP areas during 2010-2014 are partially a reflection of a new status quo, referring to those lands that will be made unavailable to leasing on a fairly permanent basis in connection with decisions made during the MLP process (Stevens 2014).

Lost economic opportunities are attached to multi-year approval delays and the closure of lands to mineral leasing. The costs of temporary deferrals are likely to be highest within the four MLP areas where time-consuming master lease planning was announced November 2010 but not expected to commence in the foreseeable future due to BLM resource constraints, with nominations deferred since the announcement (Palma 2013). The acreage and mineral potential made

[19] Acreages by ownership are as follows: BLM, 783,381 acres; SITLA, 126,281 acres; private, 32,430 acres; and State Parks, 4,377 acres.

unavailable over the medium or long term by RMP revisions stemming from master lease planning will not be knowable until those MLPs are completed.

BLM gave the deferral reason of "Master Leasing Plan" for over one-third of the nominated parcels that the agency denied (36.6 percent of 1,927 parcels) with reference to oil and gas auctions held between 2010 and 2014 (Table D.5). The number of parcels deferred in each of the five MLP areas during this period is associated with their geographic size (also see Table D.4): the San Rafael River and Moab MLP areas have the largest land areas and the most deferrals, while deferrals were the least common for the smallest MLP areas in the Book Cliffs and Vernal; the Glen Canyon MLP area was in between the two pairs on both metrics.

Table D.5
BLM Oil and Gas Deferrals by Reason of MLP, 2010–2014

	Parcels[1]		Acres[2]	
Reason, MLP Area	**Number**	**Share**	**Number**	**Share**
Book Cliffs	57	8.1%	67,964	5.3%
Glen Canyon	161	22.8%	291,212	22.9%
Moab	191	27.1%	355,872	28.0%
San Rafael River	212	30.1%	415,829	32.7%
Vernal	84	11.9%	141,296	11.1%
Any MLP Area	705	100.0%	1,272,174	100.0%

Note: Master Leasing Plans (MLPs) were a common reason BLM gave when deferring parcels nominated for oil and gas development in areas where an MLP was pending. November 2014 data with 110 deferrals is preliminary: more parcels may yet be deferred in 2014.
1. Rows sum to more than 705 and 1,927 since multiple reasons were given for many deferred parcels.
2. As many as 689 of 4,200 sections with deferred oil and gas nominations during this time period were not unique. Over time and from different companies, nominations for lands may partially or fully overlap.
Source: Bureau of Land Management (BLM 2014e).

Of the 705 deferrals where the reason given was "Master Leasing Plan," 72.9 percent or 514 were for MLPs other than the Moab MLP. While the four MLPs besides Moab were indefinitely postponed in September 2013, deferrals continued through 2014 for parcels nominated in those areas (Palma 2013).

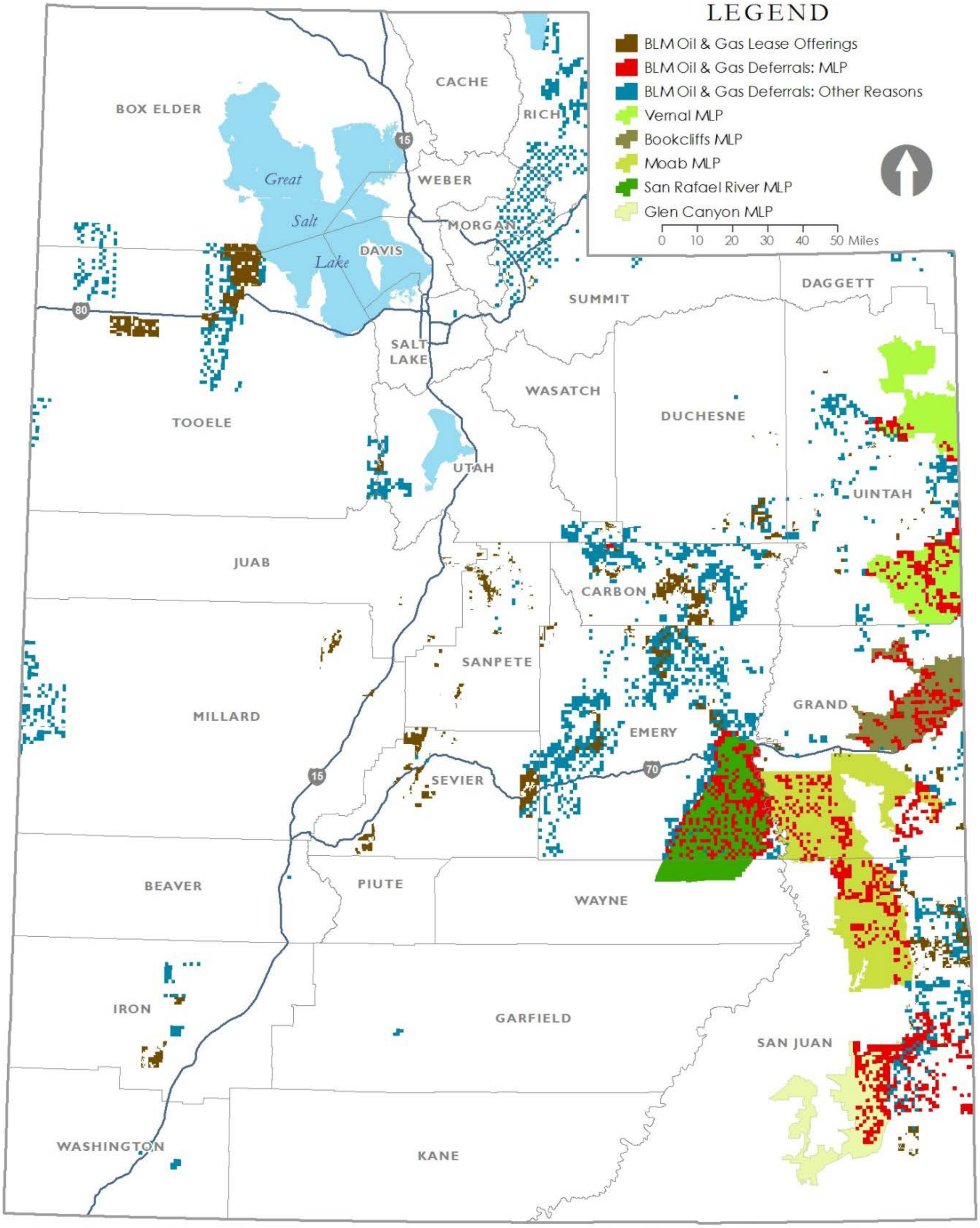
A review of deferrals by location supports our observation that deferrals are common in the proposed MLPs in Moab and the four other areas (Table D.6). Of 686 deferrals for any reason within the five MLP areas, 72.4 percent were outside of the Moab MLP area. At the time they submit their nominations to BLM, most individuals and companies have not determined whether their parcels of interest are within MLP areas, leading to deferrals that could have been anticipated (Wilcken 2014).

Table D.6
Master Leasing Plan (MLP) Areas and
BLM Oil and Gas Deferrals in Utah, 2010–2014

Location[1]	MLP Reason	Any Reason[2]
MLP areas	630	686
Moab MLP area	182	189
MLP areas besides Moab[3]	448	497
Anywhere in Utah	705	1,927

1. The location of an offering or deferral is based on whether any part of the parcel is within the area indicated.
2. For each parcel deferred, BLM staff note a reason for deferral. This column gives the total deferred for any reason, including those with reasons that referred to MLPs.
3. This row addresses four MLPs that, as of August 2014, remained postponed since the previous September: Book Cliffs, Glen Canyon, San Rafael River and Vernal.
Sources: Bureau of Land Management (BLM 2014d),BLM Moab Field Office, Utah Division of Wildlife Resources (DWR 2014), and State of Utah, SGID.

Figure D.1
Master Lease Planning and BLM Oil & Gas Lease Offerings and Deferrals in Utah, 2010–2014



Map by John Downen, BEBR | August 2014

Source: Bureau of Land Management and State of Utah, SGID.

Figure D.1 shows that BLM curiously deferred many parcels in eastern San Juan County outside of the Glen Canyon MLP area as it is currently defined. At about 650,000 acres, extending to the Colorado border, the original Glen Canyon MLP area drawn in 2010 was 1.8 times larger than its current size and included the area where these deferred parcels are located (Palma 2013). BLM revised the MLP area's boundaries in September 2013, and MLP deferrals in that portion of San Juan County have not been necessary since that time (Quigley 2014). This change in boundaries explains most of the 85 parcels BLM deferred for reason of MLP that were outside an MLP area, but there are also several parcels near but outside the Moab MLP and a few other isolated cases.

Exceptions aside, unless an MLP is anticipated in a particular area, BLM's policy is to move nominated parcels through its traditional process of approval or deferral based on the corresponding RMP and individual consideration of nominations, leases, and Applications for Permit to Drill (APDs) (Stevens 2014). The non-MLP process continues unabated in most parts of the state.

The reader may also notice an anomalous absence of deferred oil and gas parcels south of the Emery-Wayne county line in the vicinity of the San Rafael River MLP. A field office boundary follows that border, with the Price Field Office covering Emery County and the Richfield Field Office managing Wayne County. There is no obvious difference in geology, land ownership or road access that would explain why industry would not nominate parcels for development in northeastern Wayne County as industry commonly did in the adjacent southern portion of Emery County. BLM has offered a small number of oil and gas leases in the Wayne County portions of the Richfield Field Office based on industry nominations granted before 2010. For whatever reason, during the 2010-2014 period shown in Figure D.1, the Richfield Field Office did not receive oil or gas parcel nominations for Wayne County (Andersen 2014).

D.4 Wilderness Inventories and Management

Certain public lands in Utah have been categorized as wilderness by various groups and with varying degrees of protection. These include, for example, designated Wilderness Areas created by Congress, Natural Areas identified for protection by BLM, and Red Rock Wilderness proposed by the Utah Wilderness Coalition.

A range of views exist regarding BLM's approach to wilderness conservation and resource development on public lands in Utah. On the one hand, many emphasize that unrestricted public access or permissive resource extraction causes irreparable harm to the environment for the sake of industry profits. Others observe that public lands outside of congressionally designated areas—such as Wilderness Areas, WSAs, and National Parks—should be open for a range of activities under multiple use doctrine. This section reviews BLM policy with regards to wilderness in Utah and examines the availability of wilderness-type lands for development during a recent five-year period.

D.4.1 Non-WSA Lands with Wilderness Characteristics (LWCs) and Natural Areas

Natural Areas and non-WSA Lands with Wilderness Characteristics (LWCs) are areas BLM regards as having wilderness qualities, apart from lands specifically protected by law as wilderness. In accordance with the Wilderness Act of 1964, Congress designates Wilderness Areas. These are subject to strong protective management requirements. Wilderness Study Areas (WSAs) are areas inventoried as possessing the characteristics of wilderness, which have been nominated to Congress by the Secretary of the Interior or the Secretary of Agriculture for inclusion in the National Wilderness Preservation System (NWPS), and whose petitions have yet to be acted upon by Congress.[20] In many cases, these nominations have not been acted upon for a decade or more. Until acted upon, WSAs remain subject to a non-impairment mandate that requires wilderness like protections. This process for creating BLM-administered WSAs is no longer available.

In keeping with the Federal Land Policy and Management Act (FLPMA) of 1976, BLM has conducted multiple inventories of wilderness characteristics.[21] FLPMA prompted a wilderness inventory of all BLM lands in Utah, completed in the early 1980s (Muhn and Stuart 1988, p. 174). An extensive re-inventory was released in 1999, identifying additional lands with wilderness qualities. Subsequently many areas were reviewed or newly inventoried during a land use planning effort completed in 2008 for 6 of the 11 Utah field offices (Martinez 2014, Sterin 2014).

Of 8.4 million acres reviewed in 1999 or since with respect to whether they possess wilderness characteristics, 3.9 million acres (46.3 percent) were identified as non-WSA Lands with Wilderness Characteristics (LWCs). LWCs comprise 17.0 percent of all 22.8 million BLM acres in the state (see Table D.1). Such a determination includes an unavoidable level of subjectivity, but criteria are defined along the lines of the Wilderness Act of 1964 (Stevens 2014). In that sense, wilderness is an undeveloped area of at least 5,000 acres offering solitude and perhaps remarkable features.

> A wilderness…[is] an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain…[,] an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value.[22]

As shown in Table D.1, BLM has found that 3.9 million acres outside of designated Wilderness Areas and WSAs, 17 percent of its Utah lands, have wilderness characteristics. Resource Management Plans (RMPs) for 6 of the 11 field offices in the state have protected and limited access to 446,499 acres of "non-WSA lands with wilderness characteristics" (LWCs) as Natural Areas (also see Figure D.2 map).

[20] WSAs administered by BLM would generally be nominated by the Secretary of the Interior, since BLM is part of the Department of the Interior. The U.S. Forest Service is part of the Department of Agriculture. In Utah, there happen to be no WSAs administered by the Forest Service, although it does administer roadless areas. Both BLM and the Forest Service administer designated Wilderness Areas in Utah.

[21] 43 U.S.C. § 1702(c)

[22] 16 U.S.C. § 1131(c)

Table D.7
BLM Utah Lands with Wilderness Characteristics, Acres

Field Office[1]	Natural Areas[2]	Wilderness Characteristics[3]	All BLM
Cedar City	0	189,120	2,103,944
Fillmore	0	78,233	4,451,720
Grand Staircase[4]	0	458,722	1,866,180
Kanab	27,731	90,673	554,100
Moab	47,590	276,307	1,846,016
Monticello	89,153	595,902	1,785,506
Price	97,222	1,017,670	2,479,527
Richfield	78,591	636,495	2,126,037
Salt Lake	0	139,543	3,265,292
St. George	0	89,692	628,789
Vernal	106,213	313,344	1,690,144
Totals[5]	446,499	3,885,700	22,809,046

1. See Figure D.2 for the locations of field offices in Utah.
2. Natural Areas are a subset of "non-WSA lands with wilderness characteristics" (LWCs) that have been selected for management to protect wilderness character, as established in a field office Resource Management Plan (RMP).
3. Lands found to possess wilderness characteristics during inventory (LWCs) are outside of BLM's designated Wilderness Areas (257,886 acres) and Wilderness Study Areas (WSAs, 3,434,012 acres).
4. Grand Staircase-Escalante National Monument (GSENM)
5. Estimated Field Office acres for all BLM lands add to 99.95 percent of the more precise total given here.

Source: Bureau of Land Management National Landscape Conservation System (BLM 2014a) and geographic data received from six field offices July 2014; State of Utah, SGID.

BLM policy in Utah is that most LWCs remain available for a variety of uses under multiple use guidelines subject to NEPA reviews (Sterin 2014). LWCs' remote and undisturbed character is just one value they may possess. Other values may include scenery, wildlife, bodies of water, forests and minerals. As BLM decisions seek to balance conflicting uses and values, activities that may impair wilderness character are more often denied than approved (see Table D.2 and Table D.3).

Figure D.2
BLM Field Offices in Utah

Source: BLM; Utah SGID.

A relatively small share of LWCs are protected as Natural Areas, 11.5 percent in Utah (see Table D.7). A Natural Area is a discretionary management category different from formal designations such as Wilderness Areas (BLM 2008a). The manner of specifying that certain LWCs will be protected as Natural Areas is during the land use planning process, documented by a Resource Management Plan (RMP). Since an RMP can be expected to guide BLM land uses in a given area for 15-20 years, subject to revision only by a formal process, specifying a Natural Area is a fairly long-term decision (BLM 2014c).

D.4.2 BLM Wilderness Policy from 2010 to 2014

The process for identifying and managing LWCs received considerable attention at BLM since 2010. Before that time, the process was centered around RMPs with local discretion about what constituted a Natural Area. At the time of RMP revision, BLM state and field office planners could create Natural Areas from LWCs at their discretion, and the overwhelming majority of LWCs were not so classified.

Some of this controversy relates to DOI Secretarial Order 3310 that Ken Salazar issued during December of 2010 to clarify the process used to identify and protect "Wild Lands" (Salazar 2010). Wild Lands were defined in a way that corresponded to the official definition for wilderness. The Order established a rebuttable presumption favoring protection of LWCs as Wild Lands in RMPs, to the exclusion of other land uses (Keiter et al. 2012). However, not all LWCs must become Wild Lands if a justifiable reason for impairment of those characteristics were established.

> BLM offices shall protect… inventoried wilderness characteristics [on Lands with Wilderness Characteristics (LWCs)] when undertaking land use planning and when making project-level decisions by avoiding impairment of such wilderness characteristics unless the BLM determines that impairment of wilderness characteristics is appropriate and consistent with applicable requirements of law and other resource management considerations… Where the BLM concludes that protection of wilderness characteristics is appropriate, the BLM shall designate these lands as "Wild Lands" through land use planning (Salazar 2010).

An important feature of Order 3310 is that it pertained not just to land use planning through RMP revisions, with subsequent application for project-specific reviews governed by those RMPs. Order 3310 also called for the direct application of the new Wild Lands policy when making project-level decisions, if the most recent RMP revision had not implemented Wild Lands policy. This would make Order 3310 effective through the publicly-vetted, long-term, RMP land use planning, as well as apart from the customary RMP process during the interim until corresponding RMP revisions were made.

About six months after its announcement, Secretary Salazar placed Order 3310's Wild Lands plan in abeyance with a June 2011 memorandum prompted by a congressional moratorium on funding for the Order's implementation (Salazar 2011). Public perception was that BLM had overstepped its authority with Order 3310, since only Congress has the prerogative to designate Wilderness Areas. It appears that, if Order 3310 had remained in force, Wild Lands would have comprised a greater share of LWCs than Natural Areas presently include.

DOI and BLM also pursued the official channel for wilderness designations. By October 15, 2011 Salazar released a list identifying areas nationwide for which DOI sought wilderness or other special conservation protection from Congress. These BLM lands are documented in the "crown jewels report" (BLM 2011c). The report proposes wilderness designations in three Utah locations corresponding to existing WSAs: Desolation Canyon WSA (Carbon and Emery counties), Westwater Canyon WSA (Grand County) and Mill Creek Canyon WSA (Grand County).

In 2012, to address wilderness policy, BLM Director Robert Abbey issued two new sections of the BLM Manual. These directed that wilderness characteristics be considered as part of the traditional land use planning process. Protective management for wilderness would not be triggered during the interim until new land use planning could be completed with respect to LWCs. This contrasts with the Order 3310 Wild Lands approach. Further, there would be no presumption in favor of protecting wilderness-related values to the exclusion of other land use opportunities. Manual 6310 outlines the wilderness characteristics inventory process.[23] Manual 6320 directs how resource management plans (RMPs) should treat LWCs in the context of BLM's multiple-use mandate.[24] While Order 3310 remains in abeyance, sections 6310 and 6320 of the BLM Manual are the current policy and definitive statement as of July 2014 on protecting LWCs.

In 2008, Resource Management Plans (RMPs) were created for BLM field offices in the eastern part of Utah.[25] Local determination through normal BLM planning with public input governed which LWCs will be protected as Natural Areas. Natural Areas as a share of LWCs varied by field office in Utah from 0.0 percent to 33.9 percent (see Table D.7). For the six field offices with RMPs recent enough to have any Natural Areas, the average share of LWCs thus managed to protect wilderness characteristics was 16.6 percent. LWCs and Natural Areas remain cornerstones of BLM's official wilderness inventory and protection regime, even as policies evolved through secretarial order, DOI memoranda, BLM manuals and other documents.

D.4.3 Natural Area Management by Field Office

In contrast to BLM policy for LWCs, protections nearly as complete as those for Wilderness Study Areas (WSAs) apply to the 446,499 acres of Natural Areas in Utah. The main objective is preservation of environmental, cultural, historic, scientific, scenic and other sensitive resources.

RMPs for all six field offices with Natural Areas include the statement: "BLM natural areas will be managed to protect, preserve, and maintain values of primitive recreation, the appearance of naturalness and solitude" (e.g. BLM 2008d, p. 36). Natural Areas allow primitive recreation. They are avoidance areas for rights of way, such that roads, electric lines, pipelines and other infrastructure would not be allowed.

The 45 Natural Areas in Utah have a "no surface occupancy" (NSO) stipulation with regards to oil and gas extraction, if extraction is allowed at all. Only 2 of the 45 Natural Areas in Utah are open to oil and gas leasing, one corresponding to the Monticello Field Office and one the Vernal Field Office (BLM 2008c, p. 37). The accompanying NSO stipulation does not preclude approved directional drilling from a point outside a Natural Area to reach a reservoir beneath the surface of a Natural Area (Jarnecke 2014). In contrast, a designated Wilderness Area is off-limits from the surface to the core of the earth. Strictly vertical drilling adjacent to either a designated Wilderness Area or a Natural Area may tap into a common reservoir that spans areas outside of the restricted area. Thus, access to fluid mineral resources is possible even with surface restrictions, especially in areas open to leasing.

[23] The new BLM Manual section 6310 superseded section 6301, which had been held in abeyance like Order 3310 (Abbey 2012a).

[24] The new BLM Manual section 6320 superseded sections 6302 and 6303, which had been held in abeyance like Order 3310 (Abbey 2012b).

[25] The Vernal, Price, Moab, Monticello, Richfield, and Kanab field offices have RMPs from 2008. Areas administered by the Salt Lake, Fillmore, Cedar City and St George field offices are governed by land use planning documents roughly ten to twenty years older than the RMPs, the most recent item posted for each of these field offices being from 1997, 1987, 1986 and 1999, respectively. Figure D.2 shows field office locations. *Source:* "BLM Utah Land Use Plans & Some Amendments: Existing Plans," *Bureau of Land Management*, accessed September 10, 2014, www.blm.gov/ut/st/en/prog/planning/existing_plans.html.

In the Monticello Field Office, a Natural Area overlaps a Special Recreation Management Area (SRMA), which allows low-impact recreation that is consistent with preserving wilderness character (BLM 2008c, p. 37).

D.4.4 Field Offices Without Natural Areas

While the Salt Lake, Fillmore, Cedar City and St. George field offices have identified some LWCs, no Natural Areas have been designated within these four field offices, presumably because their RMPs have not been updated to reflect recent wilderness inventories. RMP processes in these four areas may lead to new wilderness characteristics inventories covering additional BLM lands, the identification of new LWCs, and the creation of Natural Areas.

The lack of current RMPs in the four western field offices may imply fewer restrictions on development and other activities on BLM lands there. The absence of viable programmatic planning decisions may also create inefficiency, uncertainty, delays and legal challenges as management devolves to project-specific reviews (Ruple 2014).

Cedar City's RMP should be finalized in 2015.[26] There is currently no RMP process underway in the Salt Lake or Fillmore field offices (Johnson 2014).

St. George does not foresee the need to create Natural Areas. That field office has a unique wilderness landscape owing to the Omnibus Public Lands Management Act of 2009 (P.L. 111-11) (Kiel 2014). Congress recently designated Wilderness Areas from WSAs and other areas determined to need such protection. Now the St. George Field Office administers 129,000 wilderness acres, aside from wilderness on Forest Service land in Washington County. St. George's current land use plan is from 1999. A partial revision is underway, focusing on the two National Conservation Areas (NCAs).

A variety of robust protections apply to Grand Staircase-Escalante National Monument land, but there are no Natural Areas within the monument (Matranga 2014).

D.4.5 Proposed Red Rock Wilderness

In addressing BLM wilderness, we have focused primarily on that agency's policies and inventories. Next we expand our scope to evaluate access to public lands known as Red Rock Wilderness.

The Utah Wilderness Coalition (UWC) has found through its own inventory, as revised August 2014, that 10,310,960 acres in Utah have merit as wilderness areas, lands UWC calls Red Rock Wilderness (Keiter et al. 2012, p. 19; Murdock 2014). These lands are outside designated Wilderness Areas, but proposed Red Rock Wilderness includes all WSAs in the state. UWC's inventory is documented extensively with maps and photographs.[27] UWC executive members are Sierra

[26] The intention to prepare an Environmental Impact Statement (EIS) for a new RMP was announced September 2010. The draft EIS will be released September 2014, and the final document should be ready in 2015 (BLM 2014c, Dastrup 2014, Jacobsen 2014).
[27] "The Story of America's Red Rock Wilderness Act," Southern Utah Wilderness Alliance, accessed September 10, 2014, suwa.org/issues/arrwa/the-story-of-americas-red-rock-wilderness-act/.

Club, Southern Utah Wilderness Alliance (SUWA), Wasatch Mountain Club, and The Wilderness Society.[28]

Being named Red Rock Wilderness by UWC does not activate any official status for these lands. Unlike designated Wilderness Areas, WSAs, Natural Areas and LWCs, Red Rock Wilderness areas have not been formally identified, designated or protected by Congress, the President or BLM.

Based largely on UWC input, America's Red Rock Wilderness Act of 2013 proposes nine new wilderness areas comprising 9,144,240 acres (Hoover et al. 2014).[29] By comparison, a 1989 UWC inventory called for 5.7 million acres to be protected as wilderness in Utah (Keiter et al. 2012, p. 19). Between 2008 and 2014, proposed Red Rock Wilderness land area declined somewhat owing mainly to the 2009 conversion of WSAs in Washington County to designated Wilderness Areas.

Proposed Red Rock Wilderness areas may currently be protected as WSAs or by a variety of other designations, such as ACECs. However, Red Rock lands receive no formal protection because of the bill, which has not been enacted into law.

Advocates for UWC's Red Rock inventory may affect BLM land management quite apart from the attempt to secure official protection through Congress. BLM bases its land use decisions—including long-range planning and approvals for leasing and APDs—on BLM's own inventory of wilderness characteristics, together with consideration of an array of values and resources (Sterin 2014). Since BLM is required to consider public input in its land planning process, demands from the public to minimize impacts to lands contained in proposed Red Rock Wilderness areas may necessitate extra analysis before development can proceed there (Ruple 2014). The work that went into the 2013 bill's development can be used in UWC members' comments on proposals related to BLM-managed lands, often requiring a reasoned agency response, whether or not BLM proceeds with the proposed action or undertakes a modified plan of action incorporating the comments. The need for additional analysis is especially relevant where RMP consideration of wilderness quality lands is either dated or incomplete. Proponents of Red Rock Wilderness may also litigate, or signal their intent to litigate, BLM actions they view as impairing wilderness qualities on those 10.3 million acres.

In a fairly recent letter to Congressman Rob Bishop, UWC identified its two highest priorities for Bishop's public land conservation initiative: first, the sizeable Greater Canyonlands region and second, the San Rafael Swell (Buccino, Manuel, and Groene 2013). These lands in Emery, Garfield, Grand, San Juan and Wayne counties received many nominations for oil and gas development. BLM offered few, if any, leases there. Aside from UWC's influence, these deferrals can be attributed to the fact that UWC's priorities largely coincide with LWCs, Natural Areas, the Moab MLP area or the San Rafael River MLP area.

[28] "About the Utah Wilderness Coalition," *Utah Wilderness Coalition*, accessed September 10, 2014, www.protectwildutah.org/about/index.html.

[29] Clearly, more land area is included in the August 2014 inventory from UWC member SUWA, 10.3 million acres, than in America's Red Rock Wilderness Act of 2013, 9.1 million acres, 88.7 percent of the total (113th Congress, H.R. 1630 and S. 769; Murdock 2014). Perhaps UWC did not include all lands from its wilderness inventory in that particular bill, and certainly UWC members were not the only voices shaping the 2013 bill.

D.4.6 Oil & Gas Lease Offerings and Parcel Deferrals for Wilderness

During the five-year period, 2010 to 2014, BLM offered at auction 79 oil and gas leases located in lands inventoried as having wilderness characteristics (LWCs), none of which were within Natural Areas. The share of BLM lease offerings within LWCs corresponded closely to the share of BLM land area occupied by LWCs, both about 17 percent.[30] However, the share of nominations received for parcels on LWCs, 30.6 percent, signaling a high level of public interest disproportionate to LWCs' land area.[31] This represents a 10.8 percent approval rate, considerably lower than the statewide BLM approval rate of 19.3 percent (see Table D.2).

Besides the 79 leases within LWCs, another 24 leases were offered in proposed Red Rock Wilderness that did not coincide with LWCs. BLM made a total of 97 offerings in Red Rock Wilderness.[32] The approval rate of Red Rock parcels outside of LWCs was only 9.8 percent, while the approval rate corresponding to all 97 approved nominations was 10.6 percent.

Figure D.3 documents the long-standing prohibition on development or resource extraction in designated Wilderness Areas and WSAs. The map shows where parcels were deferred for wilderness considerations (red) and for other reasons (blue) within or without several types of wilderness.

During 2010-2014, BLM deferred 651 nominated parcels located on LWCs, according to BLM inventories (see Table D.8). In addition, BLM deferred 239 parcels outside of LWCs citing reasons related to wilderness. Many of the non-LWC parcels deferred for reason of wilderness are located near designated Wilderness Areas, WSAs or LWCs (see Figure D.3). Perhaps deferrals were prompted by this proximity and comparisons to nearby lands inventoried or protected as wilderness.

For 86 of the 239 non-LWC wilderness deferrals, deferred parcels are located within proposed Red Rock Wilderness (see Figure D.4). The remaining 153 parcels are outside of lands identified by BLM or UWC as having wilderness characteristics. This is noteworthy since proposed Red Rock Wilderness areas are generally considered to be fairly comprehensive of Utah lands possessing wilderness qualities. While the reasons are uncertain for the 239 non-LWC deferrals—particularly for the 153 non-LWC, non-Red Rock deferrals—it is possible that some of the lands involved were subject to calls from the public for protection of wilderness related values. If the land had not been reviewed recently by the BLM, the agency may have needed additional time to consider new information or changed conditions reflected in public comments.

The March 2014 version of National Landscape Conservation System (NLCS) geographic data for LWCs is cumulative of wilderness characteristics inventories performed on BLM land in Utah to comply with FLPMA and NEPA over the years, incorporating the original inventory

[30] LWCs occupy 17.0 percent of BLM's 22.8 million acres in Utah (see Table D.1), and a remarkably consistent 17.1 percent of BLM's 461 lease offerings for oil and gas during 2010-2014 were for parcels located on LWCs.
[31] Whereas LWCs occupy 17.0 percent of BLM lands in Utah, 30.6 percent of the state's 2,388 oil and gas nominations were for parcels located on LWCs.
[32] Of the 79 oil and gas leases offered in LWCs, 73 were in places identified as Red Rock Wilderness by UWC, all but 6. The 97 Red Rock leases include 73 in LWCs and 24 outside of LWCs.

completed in the early 1980s, the re-inventory revised in 1999, and the additions made during work on new RMPs released in 2008 (Martinez 2014, Stevens 2014, Sterin 2014).[33]

Table D.8
Lands with Wilderness Characteristics and
BLM Oil and Gas Deferrals in Utah, 2010–2014

Location[1]	**Wilderness Reason**	**Any Reason**[2]
Lands with Wilderness Characteristics (LWCs)[3]	36	651
Natural Areas[4]	3	30
Red Rock Wilderness, proposed[5]	122	821
Other	153	1,054
Anywhere in Utah	275	1,927

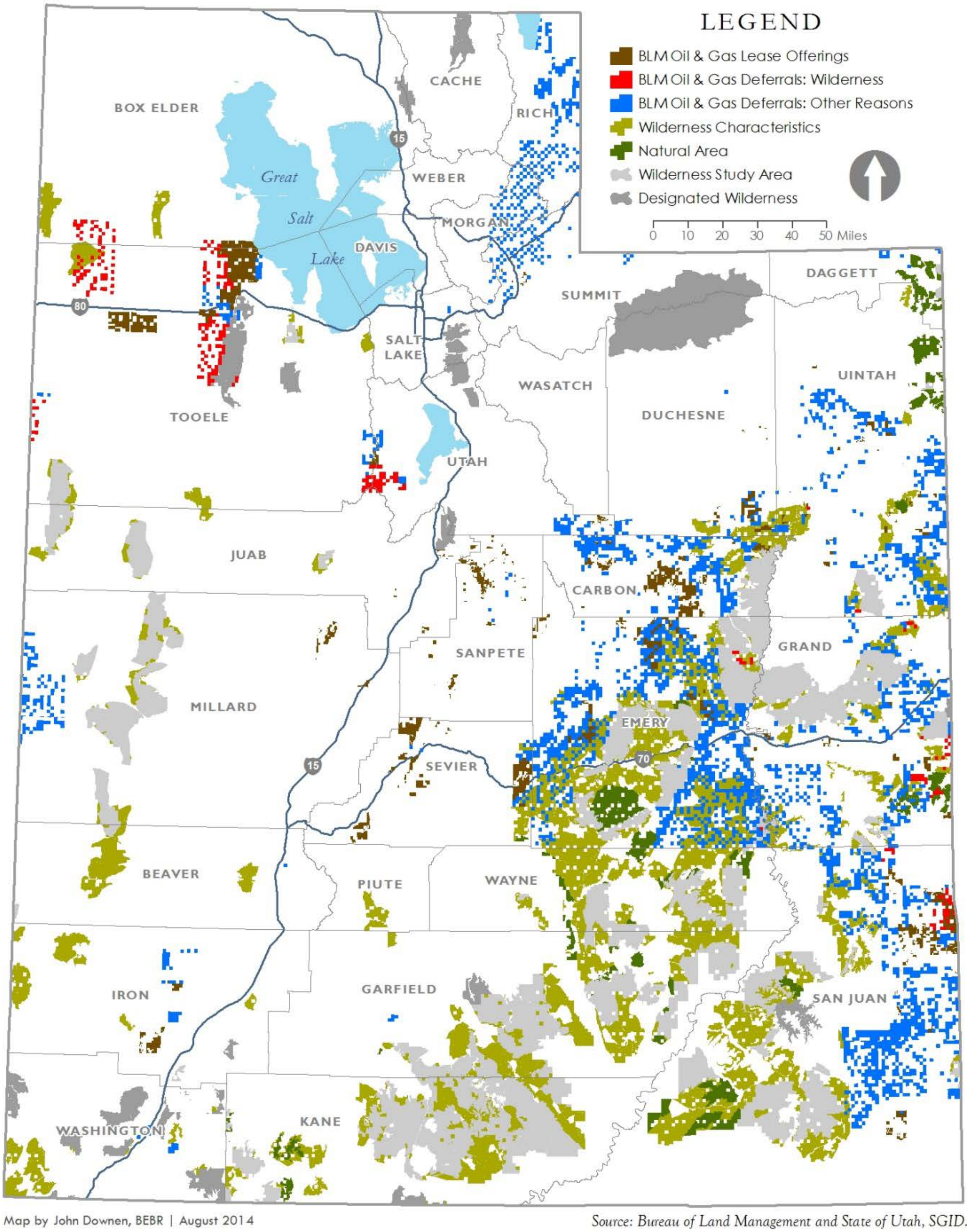
1. The location of an offering or deferral is based on whether any part of the parcel is within an area with the indicated designation. The areas in this table overlap.
2. For each parcel deferred, BLM staff note a reason for deferral. This column gives the total deferred for any reason, including those with reasons that referred to wilderness.
3. "Non-WSA lands with wilderness characteristics" (LWCs) are outside of designated Wilderness Areas and Wilderness Study Areas (WSAs).
4. Natural Areas are LWCs that have been selected for management restrictions to protect those characteristics. Deferrals in Natural Areas should not be added to obtain total deferrals for the State of Utah, since deferrals in LWCs include those in Natural Areas.
5. Red Rock Wilderness includes lands identified by the Utah Wilderness Coalition (UWC) and recommended for protection as designated Wilderness Areas. Of 122 parcels in Red Rock Wilderness deferred for reason of wilderness, 86 were outside of LWCs. Of 821 deferrals for any reason within Red Rock Wilderness, 222 were outside of LWCs. Also, 52 deferrals for a reason other than wilderness were within LWCs but outside of Red Rock Wilderness.

Sources: Bureau of Land Management Deferred Lands List (BLM 2014d), National Landscape Conservation System GIS data (BLM 2014a), data received from six field offices July 2014; Southern Utah Wilderness Alliance; State of Utah, SGID.

Figure D.3 is based on NLCS data is for LWCs, as well as maps directly from Utah field offices for Natural Areas. Figure D.4 shows proposed Red Rock Wilderness areas, as mapped by SUWA, a UWC member, with similar overlays as Figure D.3 for deferred parcels and offered leases.

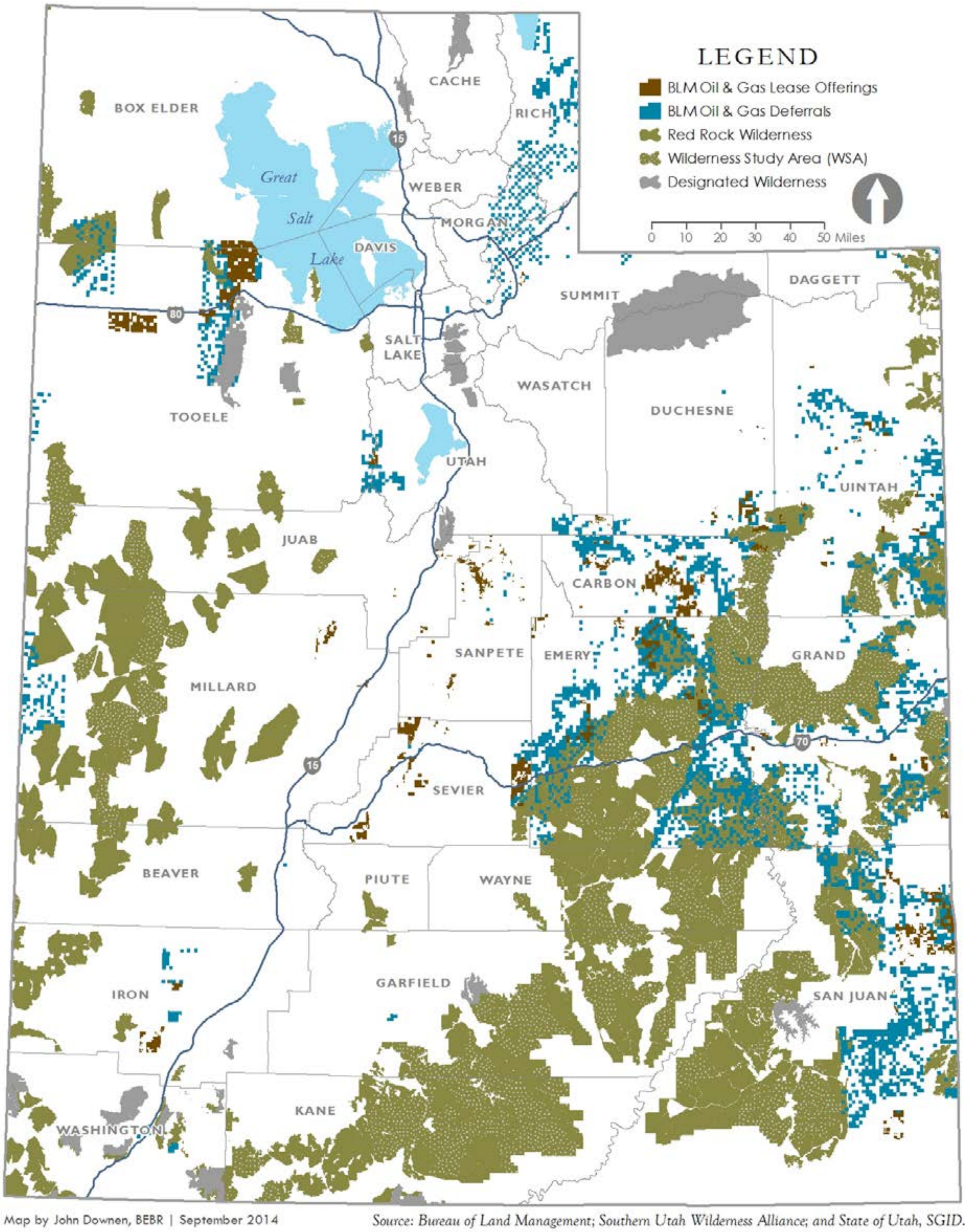
[33] There have been updates to BLM Utah's wilderness inventory since the 2008 RMPs that field offices and the state office may not have been fully compiled in the NLCS data released March 2014 (Anderson 2014).

Figure D.3
Wilderness and BLM Oil & Gas Lease Offerings and Deferrals in Utah, 2010–2014



Source: Bureau of Land Management and State of Utah, SGID.

Figure D.4
Proposed Red Rock Wilderness and BLM Oil & Gas Lease Offerings and Deferrals in Utah, 2010–2014



D.5 SAGE-GROUSE ESA LISTINGS

Figure D.5
Greater Sage-Grouse

Photo credit: U.S. Fish and Wildlife Service

The U.S. Fish and Wildlife Service (FWS) is seriously considering protective listings under the Endangered Species Act (ESA) for two sage-grouse species that live in Utah, the greater sage-grouse and the Gunnison sage-grouse.[34] BLM and other land owners are presented with the challenge of managing lands in the presence of species that may be listed under the ESA in the near future, but that currently are not listed.

On the one hand, extensive protection efforts in the interim and complete avoidance of conflicting activities throughout sage-grouse habitat may prompt FWS to consider a listing no longer warranted. This would allow the state more freedom in managing for sage-grouse going forward. Also, actions taken by land managers for the benefit of sage-grouse tend to have favorable side effects, such as preserving wilderness character and protecting coexistent plant and animal species.

Yet aggressive management for sage-grouse comes at a cost on lands with many resources and needs. Even without exclusive, rigid protections by land management agencies or FWS, sage-grouse populations may be supported sufficiently by avoiding the most sensitive habitat, particularly during critical seasons for mating, nesting and brood-rearing. In balance with other land values, multiple use may proceed with appropriate caution and adaptation. A flexible approach would conserve existing sage-grouse habitat and create new habitat primarily in places that have fewer conflicts in terms of land use alternatives.

D.5.1 Listing Status for Each Species

The greater sage-grouse is a candidate species, for which the U.S. Fish and Wildlife Service (FWS) has proposed a "threatened species" listing under the ESA.[35] Alternatively, the Secretary of the Interior, which oversees FWS, may choose to list the species as "endangered," a more protective status than "threatened" (Trollen 2014). FWS determined in 2010 that "listing the greater sage-grouse (range-wide) is warranted, but precluded by higher priority listing actions" (FWS 2010). A settlement agreement arising out of litigation requires a decision on this matter by September 2015 (DWR 2013, p. 2).

[34] 16 U.S.C. § 1533
[35] "Species Profile: Greater sage-grouse (Centrocercus urophasianus)," *U.S. Fish and Wildlife Service*, accessed September 9, 2014, ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B06W.

In addition, the Gunnison sage-grouse has been proposed for listing under the ESA. FWS is approaching a November 2014 court deadline for a listing decision.[36] Although an "endangered species" listing was originally proposed, as of May 2014 a "threatened species" listing was the primary consideration. Like the greater sage-grouse, the Gunnison sage-grouse could ultimately be listed as endangered, the highest level of ESA protection, or as threatened, perhaps with special rules and appropriate exemptions to enhance and tailor protection with minimal unecessary side effects (Trollen 2014). Other possible outcomes for either type of sage-grouse are deadline extensions or determinations that neither type of listing is warranted.

D.5.2 Habitat

Total greater and Gunnison sage-grouse habitat of 7,562,407 acres (see Figure D.6) includes space for breeding (leks), nesting, brood-rearing, and passing the winter, collectively covering 13.9 percent of Utah's land area (DWR 2014, p. 39-40). Utah contains 7,236,875 acres of greater sage-grouse habitat throughout most of the state, except the southeast corner, the urban Wasatch Front, and Millard and Washington counties (AGRC 2014). Gunnison sage-grouse habitat covers 325,532 acres in Grand and San Juan counties.

Both species require large expanses of relatively flat terrain with sagebrush (DWR 2014, p. 39; Gunnison Sage-Grouse Rangewide Steering Committee 2005, p. 26-28 and 143). Sagebrush provides food, shade and hiding. Sage-grouse often migrate seasonally among dispersed sites. Habitat spans private, state, tribal and federal lands (BLM 2013b). Current habitat for both species is defined primarily by information from Utah's DWR (Andersen 2014, Riddle 2014). FWS or BLM may provide an alternative map of habitat at some point (BLM 2010a).

D.5.3 State of Utah Greater Sage-Grouse Conservation Plan

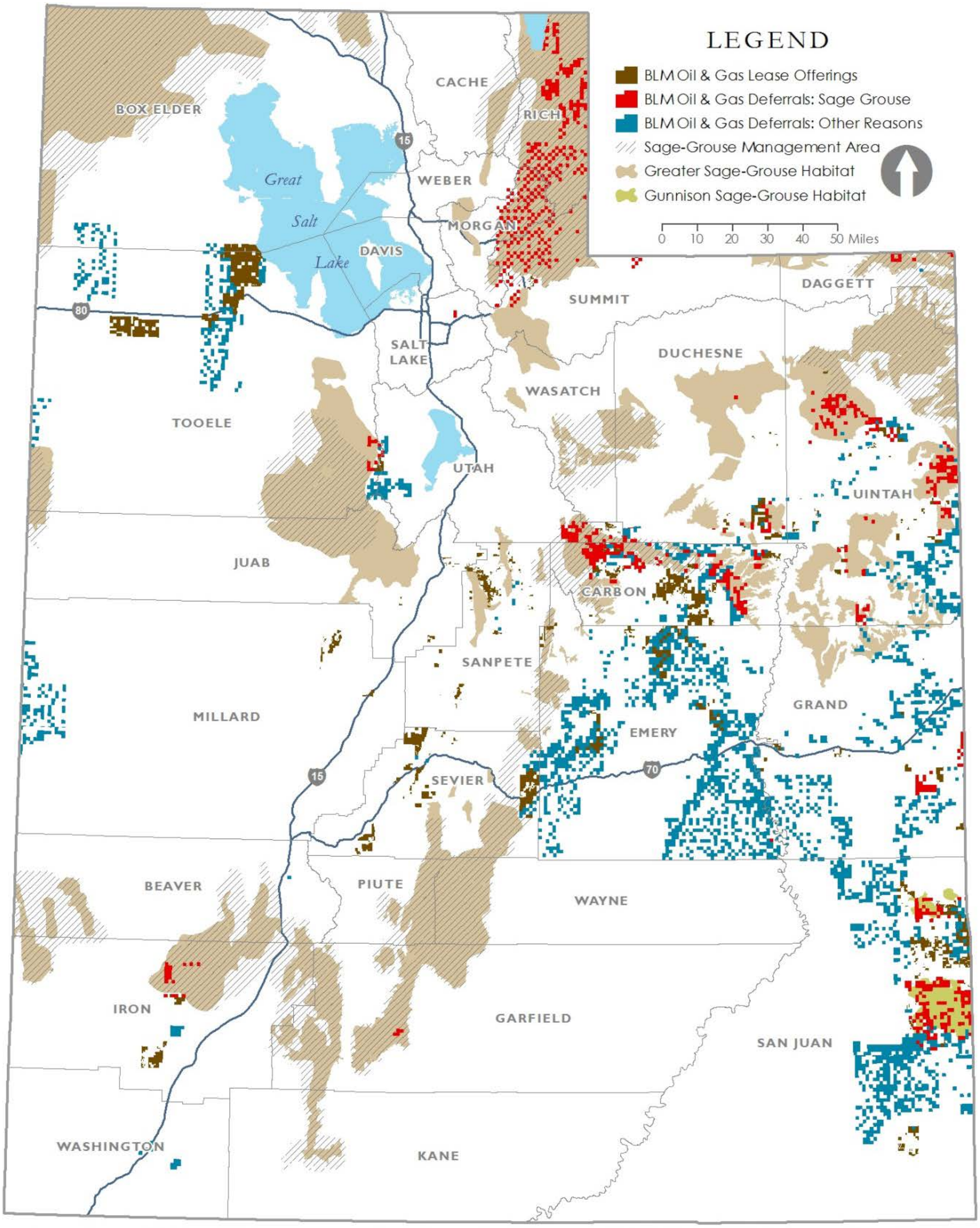
The State of Utah has actively supported conservation planning for sage-grouse, particularly for the greater sage-grouse, which has much more extensive habitat in Utah than the Gunnison sage-grouse. Participants contributing to the state's process include local governments, industry, Utah Division of Wildlife Resources (DWR), Utah Public Lands Policy Coordination Office (PLPCO), Utah School and Institutional Trust Lands (SITLA), Bureau of Land Management (BLM) and U.S. Fish and Wildlife Service (FWS) (Canning 2014, DWR 2013, p. 5). BLM and FWS are also pursuing their own planning processes apart from Utah's. Utah's goal in developing its plan is to demonstrate that federal listings are unnecessary since state management is sufficient to prevent further decline in sage-grouse populations. Many participants believe the state can more easily manage and protect the greater sage-grouse in balance with other wildlife and considerations if the bird is not listed.

The Utah plan establishes 7,488,450 acres of Sage-Grouse Management Areas (SGMAs, see Figure D.6) (DWR 2013, p. 48-51). Its conservation strategy is to support a growing greater sage-grouse population by protecting exiting habitat where at least 90 percent of the existing population lives. Additional lands have been treated and reserved to create new sage-grouse habitat. In keeping with the needs of sage-grouse, resource development within their habitat is yet possible a sufficient distance away from leks and brooding ranges—particularly during times of mating,

[36] "U.S. Fish and Wildlife Service Announces Short Extension of Final Decision on Listing the Gunnison Sage-Grouse," News Release, *U.S. Fish and Wildlife Service*, May 6, 2014, www.fws.gov/mountain-prairie/pressrel/2014/05062014_usfws_announces_short_extension_of_final_decision_on_listing_the_gunnison_sage_grouse.php.

nesting and brooding—as long as impacts are mitigated or offset by habitat improvements elsewhere.

Figure D.6
Sage-Grouse and BLM Oil & Gas Lease Offerings and Deferrals in Utah, 2010–2014



Map by John Downen, BEBR | August 2014

Source: Bureau of Land Management; Utah Division of Wildlife Resources; and State of Utah, SGID.

The State of Utah's conservation plan has informed BLM's planning process for the greater sage-grouse on its Utah lands (BLM 2013b). This major undertaking at BLM was nearing completion as of August 2014.[37] More than one alternative BLM is considering references state actions and strategies to protect this sensitive species. Thus, the state is advancing one of multiple in-depth responses to the possibility of an ESA listing and the needs of sage-grouse in Utah.

D.5.4 BLM Sage-Grouse Policy and Mineral Leasing

BLM planning and decisions grant special consideration to all species proposed for listing under the Endangered Species Act (ESA), as well as to those advanced to candidate status, officially listed as threatened or endangered, or delisted within the previous five years (BLM 2008f). The greater sage-grouse (ESA candidate and proposed for listing) and the Gunnison sage-grouse (proposed for listing) are both treated as sensitive species by BLM under this policy (BLM 2010a).

Instruction issued by BLM's Washington Office in 2010 and 2011 gave new direction to BLM field staff regarding oil and gas activity within sage-grouse habitat. During March of 2010, BLM emphasized the option to defer or withhold from sale any oil and gas parcels nominated in priority habitat for greater sage-grouse or Gunnison sage-grouse (BLM 2010a).[38] Confirming this direction, particularly for greater sage-grouse, a December 2011 memorandum advised that parcels within greater sage-grouse habitat may be deferred while a major BLM land use planning initiative for the benefit of the greater sage-grouse was ongoing (BLM 2011a). This effort was nearly three years from completion at the time the greater sage-grouse deferral policy memorandum was issued, with completion currently expected by Fall 2014.

BLM's Washington Office also required that any oil and gas leases offered within greater sage-grouse habitat be accompanied by information that justifies the decision to lease in a sensitive area (BLM 2011a). Oil and gas development that did not on the whole, considering all mitigation actions, maintain or enhance sage-grouse habitat must be reviewed by the BLM State Director and an FWS representative, with the possibility of further review at the national level.

Additional instruction from BLM headquarters required that when revising or amending Resources Management Plans (RMPs) all conservation measures that would benefit the greater sage-grouse must be considered in more than one alternative course of action, an elevated level of analysis compared to that received for most values and resources on BLM lands (BLM 2011b).

Other policy statements BLM released during 2010 and 2011 concerned appropriate adaptation for mineral leasing operations that were allowed to proceed within sage-grouse habitat. For any parcels offered within greater sage-grouse or Gunnison sage-grouse habitat, BLM field officials were authorized to impose stipulations and conditions for new oil and gas development more protective than those specified in the most recent RMP (BLM 2010a). Furthermore, BLM officials were to request that operators accept new stipulations for existing oil and gas leases within Gunnison sage-grouse habitat if the leases were originally approved without sufficient mitigation requirements (BLM 2014b). Finally, at least for the greater sage-grouse, offsite mitigation may

[37] In 2005, BLM completed an extensive conservation plan for the Gunnison sage-grouse in Colorado, New Mexico, Arizona and Utah (Gunnison… 2005).

[38] BLM describes "priority habitat" as "habitat of highest conservation value relative to maintaining sustainable sage-grouse populations range-wide" (BLM 2010).

also be required to sufficiently offset population effects and habitat degradation caused by development (BLM 2011a).

One of the six alternatives BLM presented in its draft sage-grouse plan for Utah called for stringent restrictions within four miles of occupied leks, while most greater sage-grouse habitat would be available for most land uses, albeit with protective stipulations (BLM 2013b, p. ES-10). Another of the alternatives would prohibit "discrete anthropogenic disturbances" on 97 percent of all sage-grouse habitat, with less allowance for these disturbances in the event of wildfire and minimal allowances for vegetation treatments. Under any alternative, proposed requirements to reduce sage-grouse impacts from mineral development in or near greater sage-grouse habitat in Utah include road design and location, vehicular traffic restrictions, dust abatement, noise limits, underground power lines, anti-perch devices targeting sage-grouse predators on above-ground structures, minimal new fences and tall structures, preference for directional and horizontal drilling over vertical drilling, and clustering of surface disturbances (BLM 2013b, p. J-1 to J-4). It remains to be seen which alternative and what requirements will become policy and whether deferrals will remain the standard response to nominated parcels in sage-grouse habitat after BLM planning for sage-grouse in Utah is complete.

D.5.5 Oil & Gas Lease Offerings and Parcel Deferrals for Sage-Grouse

As noted previously, 44 of the 461 oil and gas leases BLM offered at auction in Utah during 2010 to 2014 were within the habitats of either the greater sage-grouse or Gunnison sage-grouse (see Table D.2) (BLM 2014e). The share of lease offerings in sage-grouse habitat, 9.5 percent, is lower than the share of parcel nominations there, 19.7 percent, and much lower than the share of BLM land area in Utah occupied by sage-grouse habitat, 33.2 percent.[39]

Table D.9
Sage-Grouse Habitat and
BLM Oil and Gas Deferrals in Utah, 2010–2014

Location	Sage-Grouse Reason	Any Reason
Sage-grouse habitat	340	426
Anywhere in Utah	362	1,927

Note: For each parcel deferred, BLM staff note a reason for deferral. This table shows whether the reason given referred to greater sage-grouse or Gunnison sage-grouse. A deferred parcel is counted as having a location in sage-grouse habitat if any portion of the parcel is within the habitat.
Sources: Bureau of Land Management (BLM 2014d), Utah Division of Wildlife Resources (DWR 2014), and State of Utah, SGID.

Of the 1,927 nominated oil and gas parcels in Utah that BLM deferred from 2010 to 2014, the reason for deferral included sage-grouse in 362 instances, 18.8 percent of the total (Table D.9). Reasons besides sage-grouse were given for an additional 86 deferrals within sage-grouse habitats.

Of the 362 deferrals for reason of sage-grouse, 22 were for parcels located outside of sage-grouse habitat as defined by DWR. One explanation is that agencies have not always agreed on habitat boundaries. For example, BLM deferred parcels in Grand County that are located within Gunnison sage-grouse habitat DWR claims has been vacant for more than a decade (Riddle 2014).[40]

[39] That is, 44 of 461 offerings (9.5 percent), 470 of 2,388 nominations (19.7 percent), and 7,562,407 of 22,809,046 BLM acres (33.2 percent) were in habitats for the Gunnison sage-grouse or greater sage-grouse (see Table D.1 and Table D.2).
[40] BLM protects the vacant habitat in Grand County, not shown in Figure D.6, which only includes occupied sage-grouse habitat as defined by DWR in 2012.

BLM field offices have discretion to determine whether a deferral is appropriate in order to protect sage-grouse. In consultation with Utah's DWR, they have offered some parcels for lease in sage-grouse habitat, generally in opportunity habitat, for example in greater sage-grouse habitat in Sanpete County (Andersen 2014). Opportunity sage-grouse habitat is outside of, but adjacent to, presently occupied habitat and appears to offer suitable habitat or have the potential to become suitable habitat with treatment to improve the land (DWR 2013, p. 29).

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APPENDIX E: ECONOMIC IMPACT MODELING

Economic impacts are the changes in the size and structure of a region's economy that occur when goods and services are purchased from vendors within the region with money generated outside the region. In the strictest interpretation, economic impacts occur *only* when "new" money enters the regional economy and is then spent locally. Such an inflow has the potential to expand the size and strength of the region's economy. Money spent outside the region is considered "leakage" and does not generate economic growth within the region. Likewise, purchases of goods and services by local residents from local vendors do not increase the economic base of the region; they simply reshuffle existing resources.

Various models have been built to evaluate the economic impacts that occur with changes in regional exports. The key inputs to these models are the direct impacts, which are the spending injections into the community when goods produced locally are sold outside the region. One of the most commonly used models for regional impact analysis is the single region input-output (I-O) model.

E.1 INPUT-OUTPUT MODELS

I-O models capture business-to-business purchases within a region. If an export base industry purchases raw materials, equipment or other inputs from local producers, this effectively increases the size of the region's export base; these are the indirect effects. These inter-industry linkages are captured in an I-O model. I-O models also capture induced spending generated when households supported by these direct and indirect activities purchase goods and services within the region. One the most commonly used I-O models is RIMS II (Regional Input-Output Modeling System).

E.1.1 Estimating Economic Impacts and Effects Using RIMS II

The economic impact and effect estimates presented in this report were generated using RIMS II. RIMS II is the updated version of the Regional Input-Output Modeling System developed by the U.S. Department of Commerce, Bureau of Economic Analysis (BEA). RIMS II is based on an accounting framework called an input-output table, which shows the input and output structure of approximately 500 industries in the U.S. The BEA's regional economic accounts are used to adjust the national I-O table to show a region's industrial structure and trading patterns. RIMS II multipliers can be estimated for any region in the U.S. that is composed of one or more counties, and for any industry or group of industries in the national I-O table.

The RIMS II method for estimating regional I-O multipliers can be viewed as a three-step process. In the first step, the producer portion of the national I-O table is made region-specific by using six-digit NAICS location quotients (LQs). The LQs estimate the extent to which input requirements are supplied by firms within the region.

RIMS II uses LQs based on two types of data. BEA's personal income data (by place of residence) are used to calculate LQs in the service industries and BEA's wage and salary data (by place of work) are used to calculate LQs in the nonservice industries.

In the second step, the household row and the household column from the national I-O table are made region-specific. The household row coefficients are adjusted to reflect regional earnings leakages that result when individuals working in one region reside in another. The household column coefficients are adjusted to account for regional consumption leakages stemming from personal taxes and savings.

In the last step, the Leontief inversion approach is used to estimate the multipliers. This inversion produces output, earnings, employment and value-added (or gross state product) multipliers which can be used to trace the impacts of changes in final demand, by industry, within a specific region.[41]

RIMS II was used to estimate the economic impacts and contributions of current activities on federal lands including grazing, oil and gas production, coal production, wildlife recreation, geothermal production and other mineral production.

E.1.2 Estimating Economic Impacts Using REMI PI+

Another impact model is REMI PI+, developed by Regional Economic Models, Inc. In contrast to RIMS, which is a static-I-O model, The REMI model is a dynamic, multi-regional simulation model that forecasts economic, population, and labor market impacts for many years into the future. REMI provides year-by-year estimates of the regional effects of specific policy initiatives. Although REMI has many complex, interrelated submodels and features, the essential logic of the model derives from the cohort component, economic base, and input-output submodels. The REMI model connects these submodels through labor, capital, financial and product markets. It simulates the size and composition of the population and economy overtime. If there is an increase in the production of an export base industry to the region, the region employment and income increase as well. REMI produces estimates of these increases over multiple years.

REMI PI+ was used to estimate the economic impacts related to the oil and gas production forecasts and the impacts related to the coal scenarios.

E.1.3 Estimating Fiscal Impacts

The fiscal impacts presented in this analysis were estimated by quantifying the relationship between earnings and selected state and local tax collections in 2008-12 using data published by the U.S. Census Bureau. These relationships are expressed as ratios that represent the effective state and local tax rates. These ratios are applied to the total earnings impact estimates.

To estimate the impact on state tax revenue, BEBR quantified the relationship between earnings and the following taxes: individual income tax, state sales tax and other miscellaneous taxes. To estimate the impact on local tax revenues, BEBR quantified the relationship between earnings and local sales taxes and other miscellaneous taxes.

[41] *Regional Multipliers, A User Handbook for the Regional Input-Output Modeling System (RIMS-II).* U.S. Department of Commerce, Bureau of Economic Analysis, Economic and Statistics Division. March 1997.

The fiscal impact estimates generated in this report should be viewed as broad measures. This methodology assumes a linear relationship between state and local taxes and earnings. While this assumption may hold with respect to state income tax collections and to a lesser degree, sales tax collections, the relationship between earnings and corporate income tax and property tax (which was not included in the analysis) is less obvious.

E.1.4 Terms Used in This Report

*Terms are presented in groups within a logical rather than alphabetical order. The definitions presented here are consistent with measures developed by the Bureau of Economic Analysis***.**

Economic Impact Analysis estimates the impact of dollars generated outside the region (new dollars) on the region's economy.

Economic Contribution Analysis shows the economic contribution of purchases made within the region without regard to the source of the money used to make those purchases.

Direct Impacts are the changes in economic activity within the region during the first round of spending. Typically these include the direct employment and direct spending in the region by the business or industry under study.

Indirect Impacts are the changes in sales, labor income and employment within the region in backward-linked industries that supply goods and services to the business or industry under study.

Induced Impacts are the increased sales within the region from household spending of the income earned for both the business or industry under study *and* supporting businesses.

Total Impacts are the sum of direct, indirect and induced effects or impacts.

Multipliers capture the size of the secondary effects in a given region, generally as a ratio of the total change in economic activity in the region relative to the direct change. Multipliers express the degree of interdependency between sectors in a region's economy.

Measures of Economic Activity

Earnings are the sum of wage and salary disbursements, supplements to wages and salaries and proprietors' income. Earnings are an economic "flow," meaning they can be summed from year to year in order to estimate total impacts over time.

Jobs is a measure of the number of jobs required to produce a given volume of sales or production. Jobs include full-time and part-time workers as well as the self-employed. Jobs are a "stock," meaning they are a point-in-time estimate and cannot be added over time.

Value-Added/Gross State Product is the sum of total income and indirect business taxes and is equivalent to the gross state or regional product measure. Value-added is the most commonly used measure of the contribution of a region to the national economy as it avoids double counting of intermediate sales and captures only the "value added" by the region (or business) to final products. In this report, value-added is referred to as gross state product. Value-added is a flow.

Appendix F: Grazing Cattle Budgets

The economic impacts presented in Section 7.6 are based on the expenditures of livestock producers grazing on federal lands. These expenditures were estimated using Livestock Enterprise Budgets provided by Utah State University. The methodology used to develop these budgets is presented here.

F.1 Livestock Enterprise Budgets

To accommodate the wide variety of production practices across the state, Utah State University Extension personnel regularly generate and update "enterprise budgets" for various crop and livestock enterprises in Utah. Enterprise budgets include all costs and returns associated with the production of a given crop or livestock product(s) and provide useful information to both operators and researchers (Riggs, et al., 2005). Budgets allow one to estimate the outcome of production activities under various scenarios that may involve changing input costs, output prices, or production practices. Farms and ranches in a region vary with regard to the size of the operation, access to resources, and skill in management so that an enterprise budget may not fully reflect any one farm or ranch; rather the budget is to be used for planning purposes.[42]

Enterprise budgets may reflect production practices, costs, and returns that are *representative* of farms and ranches a region, or they may be *typical* of a region (Feuz and Skold, 1991). The distinction between the two is subtle: a budget based on a representative farm or ranch is an average, or mean, of all operations in the region, whereas a budget based on a typical farm or ranch is more akin to the mode of a distribution, that is, the value that occurs most often in a group of numbers. Feuz and Skold note the possible aggregation errors associated with "scaling" from a ranch-level enterprise budget to a regional estimate of costs and returns, noting that agricultural economists have settled on budgets based on a typical (modal) farming operation. Though actual production practices on any given farm are likely to differ from the enterprise budget, the budgets provide a useful base from which to gauge changes in economic activity associated with transfer of public lands from federal to state entities.

Following consultation with Agricultural Extension and Utah Department of Agriculture and Food personnel, three existing cow/calf budgets were updated to reflect current market conditions. The selected budgets, based on "typical" practices for ranchers using public lands, are Box Elder County for the Western district (Holmgren and Pace, 2013), Duchesne County for the Eastern district (Feuz, et al., 2007) and Beaver County for the Southern district (Godfrey and Bagley, 1999). Baseline budgets for producers using federal lands for grazing are provided following this discussion.

The budgets are broadly similar to one another but have key differences. For example, the Eastern district budget is based on a herd size of 200 cows using federal lands for 4.5 months of feed. Feed for the remainder of the year comes from private pasture (4 months) and purchased

[42] Interactive enterprise budgets are now constructed so as to allow producers to easily input data specific to their firm.

feed (3.5 months). Producers within the region obviously vary from this budget (using, perhaps more federal range in Grand and San Juan counties than in Uintah or Daggett), but the expenditure patterns shown for the Eastern district will be used as the basis for the economic activity analysis. The Southern district budget is based on a herd size of 650 cows and uses seven months of federal range to support livestock grazing. Relative to the Eastern district budget, ranchers in the Southern district cull cows at a faster rate (20% vs. 10%) and have more cows per bull (30 vs. 25). Finally, the Western cow/calf enterprise budget is based on a herd size of 200 head using federal lands for 6 months of grazing. Feed for the remaining six months of the year come from private pasture (4.5 months) and purchased feed (1.5 months). Ranchers in this region are assumed to experience a slightly higher death loss and a cull rate (12 percent) that is between that of the other two regions.

The baseline budget for a 200 cow herd grazing for six months in the Eastern district would require just over 950 AUMs from federal lands, including forage for the eight bulls that accompany the cows. We scale the budget to match the amount of cattle AUM consumption permitted in the region. That is, given an annual average of 279,498 cattle AUMs on federal lands in the Eastern district, the region could support production of a 58,595-cow herd and not exceed the total federal AUM limit. Similar scaling was calculated for the Southern (399,817 cattle AUMs supporting 54,620 cows) and Western (334,613 cattle AUMs supporting 53,624 cows) regions. Under the assumption of constant returns to scale, the costs and returns for each budget in can be scaled to approximate the aggregate expenditure patterns of producers in each region.

The budgets used for each of the regions are included on the following pages.

F.1.1 Baseline Cow/Calf Enterprise Budgets

Utah State University Extension Economics Costs and Returns per Cow and Total for Typical Western District Utah Cow-Calf Ranch, July 2013

Assumptions		
200 head		
Percentage of cows to wean a calf	90.0%	Change the values highlighted in the yellow cells
Percent death loss of cows	2%	to reflect your production levels and your costs.
Cost of replacement stock (heifers and bulls) @market value		
Cull Cow rate	12.0%	
Bull replacement rate	20%	
Feed costs at market value		
All calves sold. Some may be sold to another enterprise.		
Cows per Bull	25	
Number of months grazed		
Federal Land	6	
Private	4.5	
Number of months feed hay	0.75	Not all months are at full feed or strictly grazing
Number of months straw	0.75	
Animals sold in the fall		

Receipts	No. of Animals	Average Weight	Units	Sale Price per Unit	Value/ Cow	Total Value
Steers	90	550	lbs	$1.75	$433.13	$86,625
Heifers	90	510	lbs	$1.68	$385.56	$77,112
Cull Cows	24	1150	lbs	$0.65	$74.75	$14,950
Cull Bulls	2	1400	lbs	$0.65	$9.10	$1,820
Total Receipts					**$902.54**	**$180,507**

Expenses	Units/ Cow	Total Units	Units	Cost per Unit	Cost/ Cow	Total Costs
Variable Costs						
Feed Expense						
Grass Hay	0.75	150	tons	$140.00	$105.00	$21,000
Alfalfa Hay	0.7	140	tons	$65.00	$45.50	$9,100
Salt and Mineral	0.12	24.0	tons	$125.00	$15.00	$3,000
Federal Grazing permit[1]						
Grazing Fees	1.04	1248	AUMs	$1.35	$8.42	$1,685
Non fee costs	1.04	1248	AUMs	$13.00	$81.12	$16,224
Private Pasture Lease[1]	1.04	936	AUMs	$17.00	$79.56	$15,912
Other (aftermath)	0.00	0	AUMs	$5.00	$0.00	$0
Reproduction Costs						
AI project	1.00	200	heifer	$28.00	$28.00	$5,600
Breeding Bulls	1	8	bull	$5.60	$5.60	$1,120
Replacement heifers/cows[2]	0.14	28	heifer	$856.80	$119.95	$23,990
Animal Health						
Veterinarian service	1	200	cow	$5.60	$5.60	$1,120
Medication & supplies	1	200	cow	$12.00	$12.00	$2,400
Vaccinations-cow	1	200	cow	$7.50	$7.50	$1,500
Vaccinations-calf	0.900	180	calf	$10.00	$9.00	$1,800
Hired Labor						
Labor	1	1000	hrs	$13.10	$65.50	$13,100
Marketing and Transportation						
Transportation		200	cow	$10.00	$20.00	$4,000
Sale Commission	1.05	206	head	$7.00	$7.32	$1,463
Other						
Utilities/Miscellaneous		200	head	$34.44	$34.44	$6,888
Total Variable Costs					**$649.51**	**$129,902**

(continued)

	Total Units	Units	Cost per Unit	Cost/ Cow	Total Costs
General Overhead Cost					
Facility Maintenance	1	yr.	$300.00	$1.50	$300
Fuel & lube	1	yr.	$120.00	$0.60	$120
Machinery	1	yr.	$200.00	$1.00	$200
Vehicles & trailers	1	yr.	$200.00	$1.00	$200
Animal death insurance	200	head	$10.00	$10.00	$2,000
Depreciation-machinery & vehicles	1	yr.	$1,500.00	$7.50	$1,500
Property taxes	1	yr.	$1,000.00	$5.00	$1,000
Miscellaneous	1	yr.	$1,000.00	$5.00	$1,000
Total General Overhead Costs				**$31.60**	**$6,320**
Total Costs				**$681.11**	**$136,222**
NET INCOME				**$221.42**	**$44,285**

1. This figure includes bull grazing.
2. Heifers are replaced at cull cow rate plus death loss.

Source: Adapted from 2013 Box Elder county budget developed by Lyle Holmgren and Mike Pace.

Utah State University Extension Economics Costs and Returns per Cow and Total for Typical Eastern District Utah Cow-Calf Ranch, July 2013

Assumptions		
200 head		
Percentage of cows to wean a calf	90%	Change the values highlighted in the yellow cells to reflect your production levels and your costs.
Percent death loss of cows	1%	
Cost of replacement stock (heifers and bulls) @market value		
Cull Cow rate	10%	
Bull replacement rate	25%	
Feed costs at market value		
All calves sold. Some may be sold to another enterprise.		
Cows per Bull	25	
Number of months grazed		
BLM land	2.25	
Forest Service	2.25	
Private	4	
Number of months feed hay	3.5	
Animals sold in the fall		

Reciepts	No. of Animals	Average Weight	Units	Sale Price per Unit	Value/ Cow	Total Value
Steers	90	575	lbs	$1.67	$432.11	$86,423
Heifers	90	535	lbs	$1.67	$402.05	$80,411
Cull Cows	20	1100	lbs	$0.82	$90.20	$18,040
Cull Bulls	2	1850	lbs	$1.00	$18.50	$3,700
Total Receipts					**$942.87**	**$188,573**

Expenses	Units/ Cow	Total Units	Units	Cost per Unit	Cost/ Cow	Total Costs
Variable Costs						
Feed Expense						
Grass Hay	0.7	140	tons	$180.00	$126.00	$25,200
Alfalfa Hay	0.7	140	tons	$225.00	$157.50	$31,500
Salt and Mineral	0.01	2	tons	$125.00	$1.25	$250
Federal Grazing permit[1]						
Grazing Fees	1.06	954	AUMs	$1.35	$6.44	$1,288
Non fee costs	1.06	954	AUMs	$13.75	$65.59	$13,118
Private Pasture Lease[1]	1.06	848	AUMs	$22.00	$93.28	$18,656
Reproduction Costs						
AI project	0.11	22	heifer	$25.00	$2.75	$550
Breeding Bulls	0.01	2	bull	$3,000.00	$30.00	$6,000
Replacement heifers/cows[2]	0.11	22	heifer	$1,100.00	$121.00	$24,200
Animal Health						
Veterinarian service	1	200	cow	$3.00	$3.00	$600
Medication & supplies	1	200	cow	$2.00	$2.00	$400
Vaccinations-cow	1	200	cow	$7.00	$7.00	$1,400
Vaccinations-calf	0.9	180	calf	$5.00	$4.50	$900
Bull testing &vaccine	0.04	8	bull	$50.00	$2.00	$400
Hired Labor						
Calving season	2.4	480	hrs	$10.00	$24.00	$4,800
General Feeding	2.1	420	hrs	$10.00	$21.00	$4,200
Cattle handling & care	0.6	120	hrs	$10.00	$6.00	$1,200
Marketing and Transportation						
Transportation		200	cow	$5.00	$5.00	$1,000
Sale Commission	1.01	202	head	$7.00	$7.07	$1,414
Total Variable Costs					**$685.38**	**$137,075**

(continued)

	Total Units	Units	Cost per Unit	Cost/ Cow	Total Costs
General Overhead Cost					
Facility Maintenance	1	yr.	$975.00	$4.88	$975
Fuel & lube	1	yr.	$390.00	$1.95	$390
Machinery	1	yr.	$650.00	$3.25	$650
Vehicles & trailers	1	yr.	$650.00	$3.25	$650
Animal death insurance	200	head	$10.00	$10.00	$2,000
Depreciation-machinery & vehicles	1	yr.	$4,875.00	$24.38	$4,875
Property taxes	1	yr.	$3,250.00	$16.25	$3,250
Miscellaneous	1	yr.	$3,250.00	$16.25	$3,250
Total General Overhead Costs				**$80.20**	**$16,040**
Total Costs				**$765.58**	**$153,115**
NET INCOME				**$177.29**	**$35,458**

1. This figure includes bull grazing.
2. Heifers are replaced at cull cow rate plus death loss.

Source: Based on a budget originally prepared by: Dillon M. Feuz, E. Bruce Godfrey, Matt Hirschi and Troy Cooper.

Utah State University Extension Economics Costs and Returns per Cow and Total for Typical Southern District Utah Cow-Calf Ranch, July 2013

Assumptions		
650 head		
Percentage of cows to wean a calf	91.0%	Change the values highlighted in the yellow cells to reflect your production levels and your costs.
Percent death loss of cows	1%	
Cost of replacement stock (heifers and bulls) @market value		
Cull Cow rate	20.0%	
Bull replacement rate	25%	
Feed costs at market value		
All calves sold. Some may be sold to another enterprise.		
Cows per Bull	30	
Number of months grazed		
BLM land	4	
Forest Service	3	
Private	3	
Number of months feed hay	1	Not all months are at full feed or strictly grazing;
Number of months aftermath	1	feed 1/2 month grass-1/2 month alfalfa
Animals sold in the fall		

Receipts	No. of Animals	Average Weight	Units	Sale Price per Unit	Value/ Cow	Total Value
Steers	296	563	lbs	$1.67	$427.80	$278,067
Heifers	296	523	lbs	$1.67	$397.40	$258,311
Cull Cows	130	1100	lbs	$0.82	$90.20	$58,630
Cull Bulls	6	1850	lbs	$1.00	$18.50	$12,025
Total Receipts					$933.90	**$607,033**

Expenses	Units/ Cow	Total Units	Units	Cost per Unit	Cost/ Cow	Total Costs
Variable Costs						
Feed Expense						
Grass Hay	0.18	117	tons	$180.00	$32.40	$21,060
Alfalfa Hay	0.18	117	tons	$225.00	$40.50	$26,325
Salt and Mineral	0.031	20.2	tons	$125.00	$3.88	$2,519
Federal Grazing permit[1]						
Grazing Fees	1.05	4760	AUMs	$1.35	$9.89	$6,426
Non fee costs	1.05	4760	AUMs	$13.75	$100.69	$65,450
Private Pasture Lease[1]	1.05	2040	AUMs	$22.00	$69.05	$44,880
Other (aftermath)	1.05	682.5	AUMs	$5.00	$5.25	$3,413
Reproduction Costs						
AI project	0.21	136.5	heifer	$25.00	$5.25	$3,413
Breeding Bulls	0.01	6	bull	$3,000.00	$30.00	$19,500
Replacement heifers/cows[2]	0.21	136.5	heifer	$1,100.00	$231.00	$150,150
Animal Health						
Veterinarian service	1	650	cow	$3.00	$3.00	$1,950
Medication & supplies	1	650	cow	$2.00	$2.00	$1,300
Vaccinations-cow	1	650	cow	$7.00	$7.00	$4,550
Vaccinations-calf	0.910	591.5	calf	$5.00	$4.55	$2,958
Bull testing &vaccine	0.034	22	bull	$50.00	$1.69	$1,100
Hired Labor						
Calving season	2.4	1560	hrs	$10.00	$24.00	$15,600
General Feeding	0.6	390	hrs	$10.00	$6.00	$3,900
Cattle handling & care	0.6	390	hrs	$10.00	$6.00	$3,900
Marketing and Transportation						
Transportation		650	cow	$5.00	$5.00	$3,250
Sale Commission	1.12	728	head	$7.00	$7.83	$5,093
Total Variable Costs					$594.98	**$386,735**

(continued)

	Total Units	Units	Cost per Unit	Cost/ Cow	Total Costs
General Overhead Cost					
Facility Maintenance	1	yr.	$975.00	$1.50	$975
Fuel & lube	1	yr.	$390.00	$0.60	$390
Machinery	1	yr.	$650.00	$1.00	$650
Vehicles & trailers	1	yr.	$650.00	$1.00	$650
Animal death insurance	650	head	$10.00	$10.00	$6,500
Depreciation-machinery & vehicles	1	yr.	$4,875.00	$7.50	$4,875
Property taxes	1	yr.	$3,250.00	$5.00	$3,250
Miscellaneous	1	yr.	$3,250.00	$5.00	$3,250
General Overhead Costs				$31.60	**$20,540**
Total Costs				$626.58	**$407,275**
NET INCOME				$307.32	**$199,758**

1. This figure includes bull grazing.
2. Heifers are replaced at cull cow rate plus death loss.

Source: Based on a budget originally prepared by E. Bruce Godfrey and Verl Bagley.

APPENDIX G: TEXT OF H.B. 148

TRANSFER OF PUBLIC LANDS ACT AND RELATED STUDY

2012 GENERAL SESSION

STATE OF UTAH

Chief Sponsor: Ken Ivory

Senate Sponsor: Wayne L. Niederhauser

Cosponsors:

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Dean Sanpei
V. Lowry Snow
Kenneth W. Sumsion
Evan J. Vickers
Christine F. Watkins
R. Curt Webb
Ryan D. Wilcox
Brad R. Wilson
Bill Wright

LONG TITLE

General Description:

This bill addresses issues related to public lands, including the transfer of title to public lands to the state and requiring the Constitutional Defense Council to study or draft proposed legislation on certain issues related to public lands.

Highlighted Provisions:

This bill:

< enacts the Transfer of Public Lands Act;

< defines terms;

< requires the United States to extinguish title to public lands and transfer title to those public lands to the state on or before December 31, 2014;

< provides that if the state transfers title to public lands with respect to which the state receives title to the public lands under the Transfer of Public Lands Act, the state shall retain 5% of the net proceeds the state receives, and pay 95% of the net proceeds the state receives to the United States;

< provides that the 5% of the net proceeds of those sales of public lands shall be deposited into the permanent State School Fund;

< provides a severability clause;

< requires the Constitutional Defense Council to study or draft legislation on certain issues related to the transfer, management, and taxation of public lands, including:

C drafting proposed legislation creating a public lands commission; and

C establishing actions that shall be taken to secure, preserve, and protect the state's rights and benefits related to the United States' duty to have extinguished title to public lands and transferred title to those public lands to the state; and

< makes technical and conforming changes.

Money Appropriated in this Bill:

None

Other Special Clauses:

This bill provides an immediate effective date.

Utah Code Sections Affected:

ENACTS:

63L-6-101, Utah Code Annotated 1953

63L-6-102, Utah Code Annotated 1953

63L-6-103, Utah Code Annotated 1953

63L-6-104, Utah Code Annotated 1953

Uncodified Material Affected:

ENACTS UNCODIFIED MATERIAL

Be it enacted by the Legislature of the state of Utah:

Section 1. Section **63L-6-101** is enacted to read:

CHAPTER 6. TRANSFER OF PUBLIC LANDS ACT

63L-6-101. Title.

This chapter is known as the "Transfer of Public Lands Act."

Section 2. Section **63L-6-102** is enacted to read:

63L-6-102. Definitions.

As used in this chapter:

(1) "Governmental entity" is as defined in Section 59-2-511.

(2) "Net proceeds" means the proceeds from the sale of public lands, after subtracting expenses incident to the sale of the public lands.

(3) "Public lands" means lands within the exterior boundaries of this state except:

(a) lands to which title is held by a person who is not a governmental entity;

(b) lands owned or held in trust by this state, a political subdivision of this state, or an independent entity;

(c) lands reserved for use by the state system of public education as described in Utah Constitution Article X, Section 2, or a state institution of higher education listed in Section 53B-1-102;

(d) school and institutional trust lands as defined in Section 53C-1-103;

(e) lands within the exterior boundaries as of January 1, 2012, of the following that are designated as national parks:

(i) Arches National Park;

(ii) Bryce Canyon National Park;

(iii) Canyonlands National Park;

(iv) Capitol Reef National Park; and

(v) Zion National Park;

(f) lands within the exterior boundaries as of January 1, 2012, of the following national monuments managed by the National Park Service as of January 1, 2012:

(i) Cedar Breaks National Monument;

(ii) Dinosaur National Monument;

(iii) Hovenweep National Monument;

(iv) Natural Bridges National Monument;

(v) Rainbow Bridge National Monument; and

(vi) Timpanogos Cave National Monument;

(g) lands within the exterior boundaries as of January 1, 2012, of the Golden Spike National Historic Site;

(h) lands within the exterior boundaries as of January 1, 2012, of the following wilderness areas located in the state that, as of January 1, 2012, are designated as part of the National Wilderness Preservation System under the Wilderness Act of 1964, 16 U.S.C. 1131 et seq.:

(i) Ashdown Gorge Wilderness;

(ii) Beartrap Canyon Wilderness;

(iii) Beaver Dam Mountains Wilderness;

(iv) Black Ridge Canyons Wilderness;

(v) Blackridge Wilderness;

(vi) Box-Death Hollow Wilderness;

(vii) Canaan Mountain Wilderness;

(viii) Cedar Mountain Wilderness;

(ix) Cottonwood Canyon Wilderness;

(x) Cottonwood Forest Wilderness;

(xi) Cougar Canyon Wilderness;

(xii) Dark Canyon Wilderness;

(xiii) Deep Creek Wilderness;

(xiv) Deep Creek North Wilderness;

(xv) Deseret Peak Wilderness;

(xvi) Doc's Pass Wilderness;

(xvii) Goose Creek Wilderness;

(xviii) High Uintas Wilderness;

(xix) LaVerkin Creek Wilderness;

(xx) Lone Peak Wilderness;

(xxi) Mount Naomi Wilderness;

(xxii) Mount Nebo Wilderness;

(xxiii) Mount Olympus Wilderness;

(xxiv) Mount Timpanogos Wilderness;

(xxv) Paria Canyon-Vermilion Cliffs Wilderness;

(xxvi) Pine Valley Mountain Wilderness;

(xxvii) Red Butte Wilderness;

(xxviii) Red Mountain Wilderness;

(xxix) Slaughter Creek Wilderness;

(xxx) Taylor Creek Wilderness;

(xxxi) Twin Peaks Wilderness;

(xxxii) Wellsville Mountain Wilderness; and

(xxxiii) Zion Wilderness;

(i) lands with respect to which the jurisdiction is ceded to the United States as provided in Section 63L-1-201 or 63L-1-203;

(j) real property or tangible personal property owned by the United States if the property is within the boundaries of a municipality; or

(k) lands, including water rights, belonging to an Indian or Indian tribe, band, or community that is held in trust by the United States or is subject to a restriction against alienation imposed by the United States.

Section 3. Section **63L-6-103** is enacted to read:

63L-6-103. Transfer of public lands.

(1) On or before December 31, 2014, the United States shall:

(a) extinguish title to public lands; and

(b) transfer title to public lands to the state.

(2) If the state transfers title to any public lands with respect to which the state receives title under Subsection (1)(b), the state shall:

(a) retain 5% of the net proceeds the state receives from the transfer of title; and

(b) pay 95% of the net proceeds the state receives from the transfer of title to the United States.

(3) In accordance with Utah Constitution Article X, Section 5, the amounts the state retains in accordance with Subsection (2)(a) shall be deposited into the permanent State School Fund.

Section 4. Section **63L-6-104** is enacted to read:

63L-6-104. Severability clause.

If any provision of this chapter or the application of any provision to any person or circumstance is held invalid by a final decision of a court of competent jurisdiction, the remainder of this chapter shall be given effect without the invalid provision or application. The provisions of this chapter are severable.

Section 5. **Constitutional Defense Council study.**

(1) During the 2012 interim, the Constitutional Defense Council created in Section 63C-4-101 shall prepare proposed legislation:

(a) creating a public lands commission to:

(i) administer the transfer of title of public lands to the state; and

(ii) address the management of public lands and the management of multiple uses of public lands, including addressing managing open space, access to public lands, local planning, and the sustainable yield of natural resources on public lands;

(b) to establish actions that shall be taken to secure, preserve, and protect the state's rights and benefits related to the United States' duty to have extinguished title to public lands, in the event that the United States does not meet the requirements of Title 63L, Chapter 6, Transfer of Public Lands Act;

(c) making any necessary modifications to the definition of "public lands" in Section 63L-6-102, including any necessary modifications to a list provided in Subsections 63L-6-102(3)(e) through (h);

(d) making a determination of or a process for determining interests, rights, or uses related to:

(i) easements;

(ii) geothermal resources;

(iii) grazing;

(iv) mining;

(v) natural gas;

(vi) oil;

(vii) recreation;

(viii) rights of entry;

(ix) special uses;

(x) timber;

(xi) water; or

(xii) other natural resources or other resources; and

(e) determining what constitutes "expenses incident to the sale of public lands" described in Subsection 63L-6-102(2).

(2) During the 2012 interim, the Constitutional Defense Council created in Section

63C-4-101 shall study and determine whether to prepare proposed legislation:

(a) to administer the process for:

(i) the United States to extinguish title to public lands;

(ii) the state to receive title to public lands from the United States; or

(iii) the state to transfer title to any public lands the state receives in accordance with Title 63L, Chapter 6, Transfer of Public Lands Act;

(b) establishing a prioritized list of management actions for the state and the political subdivisions of the state to perform on public lands:

(i) before and after the United States extinguishes title to public lands; and

(ii) to preserve and promote the state's interest in:

(A) protecting public health and safety;

(B) preventing catastrophic wild fire and forest insect infestation;

(C) preserving watersheds;

(D) preserving and enhancing energy and the production of minerals;

(E) preserving and improving range conditions; and

(F) increasing plant diversity and reducing invasive weeds on range and woodland portions of the public lands;

(c) establishing procedures and requirements for subjecting public lands to property taxation;

(d) establishing other requirements related to national forests, national recreation areas, or other public lands administered by the United States; and

(e) addressing the indemnification of a political subdivision of the state for actions taken in furtherance of Title 63L, Chapter 6, Transfer of Public Lands Act.

(3) The Constitutional Defense Council may study any other issue related to public lands as determined by the Constitutional Defense Council.

(4) The Constitutional Defense Council shall:

(a) make a preliminary report on its study and preparation of proposed legislation to the Natural Resources, Agriculture, and Environment Interim Committee and the Education

Interim Committee:

(i) on or before the June 2012 interim meeting; and

(ii) on or before the September 2012 interim meeting; and

(b) report on its findings, recommendations, and proposed legislation to the Natural Resources, Agriculture, and Environment Interim Committee and the Education Interim Committee on or before the November 2012 interim meeting.

Section 6. **Effective date.**

If approved by two-thirds of all the members elected to each house, this bill takes effect upon approval by the governor, or the day following the constitutional time limit of Utah Constitution Article VII, Section 8, without the governor's signature, or in the case of a veto, the date of veto override.

APPENDIX H: TEXT OF H.B. 142

PUBLIC LANDS POLICY COORDINATING OFFICE AMENDMENTS

2013 GENERAL SESSION

STATE OF UTAH

Chief Sponsor: Roger E. Barrus

Senate Sponsor: Ralph Okerlund

LONG TITLE

General Description:

This bill requires the Public Lands Policy Coordinating Office to conduct a study and economic analysis of the transfer of certain federal lands to state ownership.

Highlighted Provisions:

This bill:

- requires the Public Lands Policy Coordinating Office to conduct a study and economic analysis of the transfer of certain federal lands to state ownership; and
- establishes reporting requirements.

Money Appropriated in this Bill:

None

Other Special Clauses:

This bill provides an immediate effective date.

Utah Code Sections Affected:

AMENDS:

63J-4-603, as last amended by Laws of Utah 2011, Chapter 252

ENACTS:

63J-4-606, Utah Code Annotated 1953

Be it enacted by the Legislature of the state of Utah:

Section 1. Section **63J-4-603** is amended to read:

63J-4-603. Powers and duties of coordinator and office.

(1) The coordinator and the office shall:

(a) make a report to the Constitutional Defense Council created under Section 63C-4-101 concerning R.S. 2477 rights and other public lands issues under Title 63C, Chapter 4, Constitutional Defense Council;

(b) provide staff assistance to the Constitutional Defense Council created under Section 63C-4-101 for meetings of the council and Federalism Subcommittee;

(c) (i) prepare and submit a constitutional defense plan under Section 63C-4-104; and

(ii) execute any action assigned in a constitutional defense plan;

(d) under the direction of the state planning coordinator, assist in fulfilling the state planning coordinator's duties outlined in Section 63J-4-401 as those duties relate to the development of public lands policies by:

(i) developing cooperative contracts and agreements between the state, political subdivisions, and agencies of the federal government for involvement in the development of public lands policies;

(ii) producing research, documents, maps, studies, analysis, or other information that supports the state's participation in the development of public lands policy;

(iii) preparing comments to ensure that the positions of the state and political subdivisions are considered in the development of public lands policy;

(iv) partnering with state agencies and political subdivisions in an effort to:

(A) prepare coordinated public lands policies;

(B) develop consistency reviews and responses to public lands policies;

(C) develop management plans that relate to public lands policies; and

(D) develop and maintain a statewide land use plan that is based on cooperation and in conjunction with political subdivisions; and

(v) providing other information or services related to public lands policies as requested by the state planning coordinator;

(e) facilitate and coordinate the exchange of information, comments, and recommendations on public lands policies between and among:

(i) state agencies;

(ii) political subdivisions;

(iii) the Office of Rural Development created under Section 63M-1-1602;

(iv) the Resource Development Coordinating Committee created under Section 63J-4-501;

(v) School and Institutional Trust Lands Administration created under Section 53C-1-201;

(vi) the committee created under Section 63F-1-508 to award grants to counties to inventory and map R.S. 2477 rights-of-way, associated structures, and other features; and

(vii) the Constitutional Defense Council created under Section 63C-4-101;

(f) perform the duties established in Title 9, Chapter 8, Part 3, Antiquities, and Title 9, Chapter 8, Part 4, Historic Sites;

(g) consistent with other statutory duties, encourage agencies to responsibly preserve archaeological resources;

(h) maintain information concerning grants made under Subsection (1)(j), if available;

(i) report annually, or more often if necessary or requested, concerning the office's activities and expenditures to:

(i) the Constitutional Defense Council; and

(ii) the Legislature's Natural Resources, Agriculture, and Environment Interim Committee jointly with the Constitutional Defense Council;

(j) make grants of up to 16% of the office's total annual appropriations from the Constitutional Defense Restricted Account to a county or statewide association of counties to be used by the county or association of counties for public lands matters if the coordinator, with the advice of the Constitutional Defense Council, determines that the action provides a state benefit;

(k) provide staff services to the Snake Valley Aquifer Advisory Council created in Section 63C-12-103; [~~and~~]

(l) coordinate and direct the Snake Valley Aquifer Research Team created in Section

63C-12-107[.]; and

(m) conduct the public lands transfer study and economic analysis required by Section 63J-4-606.

(2) The coordinator and office shall comply with Subsection 63C-4-102(8) before submitting a comment to a federal agency, if the governor would be subject to Subsection 63C-4-102(8) if the governor were submitting the material.

(3) The office may enter into a contract or other agreement with another state agency to provide information and services related to:

(a) the duties authorized by Title 72, Chapter 3, Highway Jurisdiction and Classification Act;

(b) legal actions concerning Title 72, Chapter 3, Highway Jurisdiction and Classification Act, or R.S. 2477 matters; or

(c) any other matter within the office's responsibility.

Section 2. Section **63J-4-606** is enacted to read:

63J-4-606. Public lands transfer study and economic analysis -- Report.

(1) As used in this section:

(a) "Public lands" is as defined in Section 63L-6-102.

(b) "Transfer of public lands" means the transfer of public lands from federal ownership to state ownership.

(2) (a) The coordinator and the office shall:

(i) conduct a study and economic analysis of the ramifications and economic impacts of the transfer of public lands; and

(ii) during the study and economic analysis, consult with county representatives on an ongoing basis regarding how to consider and incorporate county land use plans and planning processes into the analysis.

(b) The study and economic analysis shall:

(i) inventory public lands;

(ii) examine public lands':

(A) ownership;

(B) management;

(C) jurisdiction;

(D) resource characteristics;

(E) federal management requirements related to national forests, national recreation areas, or other public lands administered by the United States; and

(F) current and potential future uses and ways that socioeconomic conditions are influenced by those uses;

(iii) determine:

(A) public lands' ongoing and deferred maintenance costs, revenue production, and funding sources;

(B) whether historical federal funding levels have been sufficient to manage, maintain, preserve, and restore public lands and whether that funding level is likely to continue;

(C) the amount of public lands revenue paid to state, county, and local governments and other recipients designated by law from payments in lieu of taxes, timber receipts, secure rural school receipts, severance taxes, and mineral lease royalties;

(D) historical trends of the revenue sources listed in Subsection (2)(b)(iii)(C);

(E) ways that the payments listed in Subsection (2)(b)(iii)(C) can be maintained or replaced following the transfer of public lands; and

(F) ways that, following the transfer of public lands, revenue from public lands can be increased while mitigating environmental impact;

(iv) identify:

(A) existing oil and gas, mining, grazing, hunting, fishing, recreation, and other rights and interests on public lands;

(B) the economic impact of those rights and interests on state, county, and local economies;

(C) actions necessary to secure, preserve, and protect those rights and interests; and

(D) how those rights and interests may be affected in the event the federal government does not complete the transfer of public lands;

(v) evaluate the impact of federal land ownership on:

(A) the Utah School and Institutional Trust Lands Administration's ability to administer trust lands for the benefit of Utah schoolchildren;

(B) the state's ability to fund education; and

(C) state and local government tax bases;

(vi) identify a process for the state to:

(A) transfer and receive title to public lands from the United States;

(B) utilize state agencies with jurisdiction over land, natural resources, environmental quality, and water to facilitate the transfer of public lands;

(C) create a permanent state framework to oversee the transfer of public lands;

(D) transition to state ownership and management of public lands using existing state and local government resources; and

(E) indemnify political subdivisions of the state for actions taken in connection with the transfer of public lands;

(vii) examine ways that multiple use of public lands through tourism and outdoor recreation contributes to:

(A) the economic growth of state and local economies; and

(B) the quality of life of Utah citizens;

(viii) using theoretical modeling of various levels of land transfer, usage, and development, evaluate the potential economic impact of the transfer of public lands on state, county, and local governments; and

(ix) recommend the optimal use of public lands following the transfer of public lands.

(3) The coordinator and office shall:

(a) on an ongoing basis, discuss issues related to the transfer of public lands with:

(i) the School and Institutional Trust Lands Administration;

(ii) local governments;

(iii) water managers;

(iv) environmental advocates;

(v) outdoor recreation advocates;

(vi) nonconventional and renewable energy producers;

(vii) tourism representatives;

(viii) wilderness advocates;

(ix) ranchers and agriculture advocates;

(x) oil, gas, and mining producers;

(xi) fishing, hunting, and other wildlife interests;

(xii) timber producers; and

(xiii) other interested parties; and

(b) develop ways to obtain input from Utah citizens regarding the transfer of public lands and the future care and use of public lands.

(4) The coordinator may contract with another state agency or private entity to assist the coordinator and office with the study and economic analysis required by Subsection (2)(a).

(5) The coordinator shall submit a final report on the study and economic analysis described in Subsection (2)(a), including proposed legislation and recommendations, to the governor and the Natural Resources, Agriculture, and Environment Interim Committee before November 30, 2014.

Section 3. **Effective date.**

If approved by two-thirds of all the members elected to each house, this bill takes effect upon approval by the governor, or the day following the constitutional time limit of Utah Constitution Article VII, Section 8, without the governor's signature, or in the case of a veto, the date of veto override.