Original Research Article

Do US counties benefit from wilderness designation? Examining local government revenue and county expenditures

ABSTRACT

We examine the effect of wilderness designation on US counties' spending patterns as well the effect of designation on counties' overall and tax revenue. Using data on each of the 3,144 US counties from the US Census Bureau and the Bureau of Labor Statistics we apply ordinary least squares regression to determine the effect of wilderness designation. After controlling for relevant confounding variables we find that the presence of wilderness lands in a county does not have a statistically significant effect on overall tax revenue and property tax revenue collected by counties. We also find that wilderness designations change the ways counties spend taxes they do collect. Specifically, counties with wilderness designations tend to spend more on fire and protection, health, and less on public welfare programs. There were no statistically significant increases in spending on education, police, or government payroll. If counties are gaining more tax revenue but having to spend more to manage their county, and also having to borrow more than counties without wilderness lands, the land that might be thought to an amenity to the county could actually be a hindrance.

Keywords: Economic Outcomes; Local Government Revenue; Wilderness

1. INTRODUCTION

> *"If future generations are to remember us with gratitude rather than contempt, we must leave them something more than the miracles of technology. We must leave them a glimpse of the world as it was in the beginning, not just after we got through with it."*
> *— President Lyndon B. Johnson, on the signing of the Wilderness Act of 1964*

The Wilderness Act of 1964 has created a lengthy and at times acrimonious discussion regarding the best course of action for public lands. There are some that would like public lands to receive wilderness designations because of the natural beauty, ecological services, and recreational opportunities the designation provides. Others question the effect the designation and its ban on extractive industries has on local economies. Those on both sides of the argument have attempted to provide conclusions regarding the effect of these Lands, with varying results.

Since the passage of the Wilderness Act of 1964, 109 million acres have been designated as wilderness. The intention of the federal wilderness lands program is to ensure, regardless of the growth of urban sprawl and population, there would be some land that remained "untouched." Wilderness in the United States is land designated as such by the Wilderness Act of 1964, and defined as follows:

> “An area of wilderness is further defined to mean in this Act 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.” [1]

Each of the 3,143 counties in the United States is unique, with varying physical characteristics. Among them, 287 have areas designated as wilderness within their boundaries. Designation occurs within already existing federal lands. So an area of Forest Service lands, for example, can gain an additional designation as wilderness through the 1964 act [2]. Arguments about the costs and benefits of having these designated lands within a county have been consistent and often discordant. Explorations of the impacts of wilderness protection on local economies, quality of life, and the tourism industry have been made in the scholarly literature. Despite these efforts to date little research has been completed in regards to the effects of wilderness lands on local government tax revenue or spending patterns which are core contentions in the academic and policy literatures.

In what follows we attempt to address this question using county level tax receipt data as well as spending data from county governments.

1.1 Framing the Debate: Protecting Wilderness Lands For Amenity Value

As pressures from urbanization, industrialization, and population growth continue to rise in the United States, a common refrain from environmentalists is the desire to ensure that public lands are protected from exploitation. For most environmentalists the goal of the wilderness designation is to keep the land in a formally protected ‘natural’ state. The Wilderness Act of 1964 provides the federal government power to secure environmentally ‘unique’ lands in the United States. Those who argue for this formal protection assert that by placing these lands under federal control, citizens can “gain spiritual fulfillment and... preserve the intergenerational opportunities in safeguarding ecological integrity." They further note that use of these lands for recreation and tourism is a byproduct of formal wilderness protection [3].

Among the self-proclaimed environmentalists an emphasis on the importance of preserving the natural characteristic of public lands land and reliance data on the decline of the extraction industry dominates the narrative. Despite these claims even regions with large protected wilderness areas continue to rely heavily on resource extraction as a major economic driver. In fact a growing number of communities and local governmental officials fight wilderness proposals to ensure they continue to have access to these resources [4].

Many local communities have responded to pushes for wilderness designations by citing a surplus of literature that finds that wilderness designation limits the economies of the communities in which they are located. Environmentalists in response argue that most wilderness areas have remained unutilized “precisely because they are relatively isolated and unattractive to extractive industries. As a result, the value of the natural resources they contain may be less than the cost of extracting them,”[5].

A second argument raised by wilderness opponents is focused on democratic principles. Namely that citizens living closest to the lands, who are most affected both positively and negatively, by the lands should have the greatest say in their use and management. One commentator notes;

> “They bear the biggest burden of any environmental harms and dangers such as wildfire, the sight of massive clearcuts, or sediment-filled creeks. And they reap the most immediate benefits, whether from clean water, developed campsites or harvest or recreation use,” [6].

Environmentalists implicitly and often explicitly respond that local residents will stop the conservation of the natural ecosystems and simply extract without thought for the ecosystem value of the area.

To allay the fears of residents environmentalists cite studies that have found proximity to a wilderness area helps the economies of the neighboring communities. Several reasons are cited for this effect. One study examined the population growth of these communities and attributed the growth to the aesthetic value of the area and the ability for many to work from any location. Others find that designating lands as wilderness help local economies through employment growth from expanding recreation and tourism opportunities that accompany wilderness designation. Some studies in this same vein

suggest the role of extractive industries is changing dramatically as the number of people employed in such activities has declined, and is expected to continue to decline [7, 8, 9] Rather than employing loggers, farmers, fisherman, and miners "these landscapes often may generate more new jobs and income by providing the natural resource amenities, water, and air quality, recreational opportunities, scenic beauty and the fish and wildlife that make the . . . [area] an attractive place to live, work, and do business,"[9].

Still other research has indicated that wilderness designation plays a substantial role in attracting new migrants to a place or region. One study examined 113 rural counties in the American West, 43 percent of which contained designated wilderness areas. The study shows that between 1970 and 2000 there was a significant positive correlation between the percent of land in designated wilderness and population, income, and employment growth [10].

One researcher active in this area, Paul Lorah, has done extensive research on the effects of wilderness lands on employment growth and the local economies. Lorah used a geographic information system to calculate the proportion of protected lands occurring within 50 miles of the center of each Western county. Lorah's calculation, in combination with detailed county-level data, "indicates that environmental protection is correlated with relatively rapid income and employment growth," [5]. Lorah also took employment growth and disaggregated it into individual sectors, finding, "the biggest differences between growth rates in wilderness and non-wilderness counties appear in those sectors benefiting from a shift to an amenity economy." According to the study, employment in wilderness counties grew faster in construction, services, finance, insurance, real estate, and trade than it did in non-wilderness counties [11].

Others claim that there are non-economic opportunities that draw people to live near wilderness that have a positive effect on the economy through tourism and outdoor recreation. This theory, however, is difficult to prove due to the complexity of discerning exact revenue effects of these activities. One piece of evidence cited by Rudzitis and Johnson is that after the passage of the Endangered Species Act critics expected a significant downturn in the raw materials industry. In reality, the opposite occurred and most of the West saw economic growth [12].

The literature focuses primarily on the tourism the wilderness lands bring to the local economies. Many authors agree that tourism not only provides a better way for local economies to gain revenue than does extracting natural resources from the land, but also that tourism is more beneficial for the land itself. Hal K. Rothman, a professor of history at the University of Nevada, Las Vegas, explained that tourism offers the lure of economic prosperity without the environmental costs associated with extractive and manufacturing processes [13]. Rothman also argues that tourism can also promote conservation. There are two types of tourism: heritage tourism and ecotourism. "Heritage tourism increases the profitability of conserving historical resources while ecotourism promotes the preservation of natural resources by turning them into marketable commodities whose value is based on their preservation rather than their consumption"[13].

In contrast to tourism focused studies, a number of studies have found no statistically significant relationship between wilderness lands and local economics, and seem to indicate that macroeconomic factors are responsible for shifts in the rural west. The first study was done on the cost and benefits of these lands, examining eight states in the Intermountain West. In this region an average of 47 percent of all land is federally owned [14]. The study focused on the estimated population and employment growth of 250 non-urban counties from 1980 to 1990. In the end, the study was unable to reject the null hypothesis that "Wilderness has had no effect on both population and total employment growth in these counties during the 1980s,"[14]. However, the author claims that, "certain counties with economies that are very heavily weighted toward resource-extraction industries may still be adversely affected" by wilderness designation [14]. These findings are echoed in "The Role of Amenities and Quality of Life in Rural Economic Growth" in which no joint relationship was found between wilderness designation and employment or income [15].

Another study examined the strategy of using recreation to encourage economic development. The study looked specifically at monthly data on nonagricultural employment for the period 1973 through 1992 for 24 rural counties in Utah [16]. The study found the economies of the tourism-dependent counties are "subject to annual variances which are relatively large and appear to be increasing in absolute value." Despite this, they also found that "counties whose economic bases are less dependent on the tourism industry appear to have less short-run variation, even though long-run variability may exist," [16].

Some analysts have found a negative effect associated with wilderness lands and the economies of local communities. A study looking at the effects of wilderness on the economies of the counties used a quasi-experimental time series design to evaluate the economic impact of the designation of wilderness. This study found that claims of designated wilderness areas having a positive influence on the local economies is overstated at best, and patently incorrect at worst. In fact, this study found that the presence of wilderness lands has negative impact on the economies of the counties [17].

Despite these contrasting results about that the impact of wilderness lands the dominant theory throughout the academic literature is one of positive economic impacts through amenity tourism. As illustrated in the extensive literature, the theory rests on the assumption that the wilderness lands are an amenity that can be used by counties to improve the economic environment of the local community through increased tourism and population growth.

The theory asserts that because amenities bring economic activity to the county through recreation, tourism, and population growth. Population growth creates a higher demand for property, which leads to increased property values and higher property tax revenue. Further, tourism brings businesses to the local economy to support the visitors, which can increase local government revenue through sales taxes. If this prevailing theoretic construct is correct, wilderness lands should provide an increase in economic activity with a corresponding increase in sales and property taxes within the county.

2. HYPOTHESES, DATA, AND METHODS:

Two sets of hypotheses arise from the competing claims about wilderness. Our first set of hypotheses address how county revenues are affected by the presence of wilderness lands. These hypotheses are listed below.

Null Hypothesis: Federal wilderness within a county has no effect on that county's overall and tax revenue.

Hypothesis: Federal wilderness within a county increases that county's overall and tax revenue.

Alternate Hypothesis: Federal wilderness within a county decreases the local government's overall and tax revenue.

A second set of hypotheses emerges from the first and the implicit disagreement among the literature. These hypotheses address if the presence of wilderness changes policy priorities in the counties where it is located. We expect that consistent increased expenditures in wilderness counties across all policy categories which should be indistinguishable from their non-wilderness counterparts, if our hypothesis is confirmed, as they have more funds available for use. These hypotheses are:

Null Hypothesis: Federal wilderness within a county has no effect on that county's expenditures.

Hypothesis: Federal wilderness within a county increases that county's expenditures uniformly.

To test these hypotheses we use data from the, Yonk et al 2013 dataset and the Yonk et al 2016 dataset, which is composed of data from the U.S. Census Bureau and the Bureau of Labor Statistics. All of the data is from 2005 and includes the sales and property tax revenue from all 3,144 counties in the United States. The dataset also includes data on the presence of wilderness area within each county. Using this data we apply ordinary least squares regression (OLS) to complete two tests on the effects of wilderness designation on local tax revenues.

In the first test, our variable of interest is the presence of wilderness lands, measured dichotomously. Our dependent variable is property and sales tax revenue in dollars. We include several control variables, which can be broken down into four general categories: demographics, extraction, recreation, and land type.

The first category, demographics, includes: population, race, net migration, number of households within the county, and household income in each county. Controlling for these demographic variables gives the counties, although demographically diverse, an equal starting point to aid in comparison.

The second category of control variables are those related to resource extraction. Due to the presence of extraction arguments within the literature, we found it prudent to control for extraction related variables that would affect counties with wilderness lands. These variables include: earnings in mining (which includes oil and gas extraction), wood product manufacturing, and variables measuring employment in forestry, fishing, hunting, and agricultural support services.

Third, we include control variables related to recreation. The importance of this category is based off the argument that tourism and recreation increases in counties with wilderness lands. The control variables include: arts, recreation and entertainment, and recreation services.

Further, to demonstrate the impact of wilderness lands independently, we include other federal land holdings that might have confounding or collinear effects when excluded from the analysis. Since we are interested in the effects of the presence of wilderness land, we use a dummy variable for wilderness lands indicating whether or not wilderness is

present in the federal lands that already exist in a county. This binary designator for the presence of wilderness lands isolates the unique land management strategy that can exist among the ownership regimes of federal public lands. The other land variables are the percentage of land managed by each of the agencies in a county.

The additional land types were incorporated in both tests to control for the presence of other federally owned lands that might affect revenue. The land agencies which most commonly manage land including; Bureau of Reclamation, Department of Defense, Forest Service, Fish and Wildlife, National Park Service, other Federal lands, Tribal lands, and Tennessee Valley Authority are included in the analysis. Lastly, the area of the county was included to control for variations in overall size as it is likely that larger counties would face greater costs. These are included in the regression to allow the dummy variable (Wilderness Lands) to be exclusively analyzed.

As we conduct the analysis if we find evidence that that the presence of wilderness land within the county increases tax revenue, we can reject the null hypothesis of no effect and the alternate hypothesis of a negative effect.

The second set of models looks at expenditures within each county to understand how local funds are spent on county-provided services. These expenditure variables included total expenditure within county, expenditures in education, public welfare, hospitals, health, highways, police, fire and protection, local government payroll, and also the total debt within a county; the same control variables from the first set of tests are included for continuity and for the same theoretic reasons. If the data shows that the presence of wilderness land within the county increases or decreases expenditures on particular categories to the exclusion of other categories we can reject the null hypothesis of no effect. Further because we would expect consistency of effect if the tourism hypothesis of increased economic activity is correct we should find no difference among wilderness counties and their non-wilderness counterparts if the hypothesis is correct.

3. RESULTS

Table One: County General Revenue
Observations 3144
Pseudo R Sqr .1062

Variable	Coefficient	Standard Error	P Value
Wilderness Lands (Dummy)	92758.47	105582.5	.380
Bureau of Reclamation	30164.92	52667.5	.567
Dept of Defense	11333.51	6595.773	.086
Forest Service	-124.4473	1776.606	.944
Fish and Wildlife	-12643.76	4217.3	.003***
National Park Service	13401.72	8542.848	.117
Other Fed Lands	-17109.69	11724.24	.145
Tribal Lands	-5247.555	1725.899	.002***
Tenn Valley Authority	540.6521	3982.999	.892
County Area	1.127	3.402	.740
Population	.464	.222	.037**
Race	-13004.8	2339.669	.000***
Household Income	31.99	4.077	.000***
Earnings in Mining	.659	.164	.000***
Earning in Wood	.217	.229	.342
Earning Construction	.019	.015	.202
Arts, Rec, Entertain	.157	.106	.138
Net Migration	-53.454	63.75	.402
Forestry, Fish, Hunt	.155	.143	.281
Constant	215089.2	180442.3	.233

**P<.05 ***P<.01

As Table 1 shows, the presence of wilderness lands does not have a statistically significant impact on general revenue, and we fail to reject the null hypothesis that the presence of wilderness lands has no impact the general revenue within a county. We find no difference in wilderness counties overall revenue than their non-wilderness counterparts.

The second part of our first test used total tax revenue, sales and property taxes, within a county as the dependent variable; the results are listed in Table 2.

Table Two: County tax revenue OLS results
Observations 3144
Pseudo R Sqr .1592

Variable	Coefficient	Standard Error	P Value
Wilderness Lands (Dummy)	58837.84	34891.15	.092
Bureau of Reclamation	13685.49	22000.97	.534
Dept of Defense	2654.801	2093.105	.205
Forest Service	-437.8501	516.802	.397
Fish and Wildlife	-4642.12	1597.24	.004***
National Park Service	3742.477	2746.921	.173
Other Fed Lands	-7442.907	5324.125	.162
Tribal Lands	-1999.136	651.4231	.002***
Tenn Valley Authority	1074.622	1411.622	.447
County Area	-.305	.920	.740
Population	.193	.092	.036**
Race	-5105.795	878.865	.000***
Household Income	14.791	1.690	.000***
Earnings in Mining	.360	.084	.000***
Earning in Wood	.111	.098	.258
Earning Construction	.009	.006	.167
Arts, Rec, Entertain	.071	.046	.126
Net Migration	-29.612	26.007	.255
Forestry, Fish, Hunt	.0613	.058	.295
Constant	877.964	71884.8	.990

**P<.05 ***P<.01

Again as Table 2 shows, the presence of wilderness Lands does not have a statistically significant impact on total tax revenue, and thus we again fail to reject the null hypothesis that the presence of wilderness lands has no impact the general revenue within a county.

The last test in this set looked just at property tax revenue within a county, as some in the literature have claimed property values should increase in wilderness counties. To test this proposition, we regressed property tax revenue against the presence of wilderness lands. The results are found in Table 3:

Table 3. County property tax revenue OLS results

Observations 3144
Pseudo R Sqr .2231

Variable	Coefficient	Standard Error	P Value
Wilderness Lands (Dummy)	38895.38	21903.24	.076
Bureau of Reclamation	7018.712	14000.72	.616
Dept of Defense	1172.342	1359.097	.388
Forest Service	-395.276	318.247	.214
Fish and Wildlife	-3089.789	980.565	.002***
National Park Service	1937.594	1749.286	.268
Other Fed Lands	-5532.91	4083.815	.176
Tribal Lands	-1148.829	370.198	.002***

Tenn Valley Authority	583.051	892.257	.514
County Area	-.185	.578	.748
Population	.128	.058	.028**
Race	-3202.547	412.8525	.000***
Household Income	11.330	1.241	.000***
Earnings in Mining	.286	.066	.000***
Earning in Wood	.064	.060	.281
Earning Construction	.006	.004	.153
Arts, Rec, Entertain	.044	.028	.122
Net Migration	-14.902	15.597	.339
Forestry, Fish, Hunt	.039	.041	.333
Constant	-63151.58	41112.52	.125

**P<.05 ***P<.01

Table 3 shows that like general revenue and total tax revenue, the presence of wilderness lands does not have a statistically significant impact on property tax revenue, and thus we fail to reject the null hypothesis that the presence of wilderness lands has no impact on the property tax revenue within a county.

The results from each of these three tests looking at general revenue, total tax revenue, and property tax revenue within a county found no significant relationship between wilderness lands and revenue in US counties.

Wilderness designation and county expenditures regression

Our second set of hypothesis tests addresses how county expenditures are affected by the presence of wilderness lands. To test these hypotheses, we regress our dummy variable of wilderness presence on multiple measures of county expenditures. These measures include total expenditures, expenditures in education, public welfare, hospitals and health, highways, police services, fire and protection, the county's total debt, and the local government payroll expenditures. Abbreviated results are in Table 4 with full results for each model available in the appendix.

Table 4. Abbreviated county expenditures OLS results

Observations 3144

Variable	**Total Expenditures**	**Education**	**Public Welfare**	**Highways**	**Police**	**Fire and Protection**	**Total Debt**	**Gov't Payroll**	**Health and Hospitals**
Pseudo R Sqr	0.9976	0.9516	0.8382	0.8670	0.9823	0.96449	0.9346	0.9963	0.8745
General Revenue	.952***	.320***	.0817***	.032***	.0648***	.026***	1.158***	.036***	.089***
Wilderness Lands (Dummy)	9640.17	939.59	-16155.52***	2480.50	1474.77	1295.27**	89013.73**	147.08	-6627.28**
Bureau of Reclamation	-95.28	-5465.61	-2479.15	1206.45	469.84	369.32	60185.24	-.875	520.47
Dept of Defense	300.51	816.73	-245.63	-79.48	-11.34	-14.95	-2198.10	30.05	111.73
Forest Service	-185.14**	-168.58**	137.44***	-13.73	-13.23	-7.34	-1205.33**	-5.83**	58.65
Fish and Wildlife	-341.89	-1118.32***	334.40	30.50	51.18	19.88	1323.48	-16.57	111.45
National Park Service	-51.11	-871.51***	-93.82	-166.22	108.28	-3.62	-2722.69	-24.50	526.03
Other Fed Lands	-1795.54	-1352.51	225.70	-320.95	-106.80	-22.68	33012.42	9.49	-103.96
Tribal Lands	-78.20	-45.92	133.77	46.59	14.90	-16.87**	-890.99	.648	-43.80
Tenn Valley Authority	125.86	-637.30	-347.29	-34.09	33.82**	16.41	2375.09	2.95	-826.60

County Area	-.145	.113	.117	.015	-.022	-.029	-1.304	-.009	-.031
Population	.021	.022	-0197**	.004	.001	.001	.080	.000	-.006
Race	-280.45	-525.51***	386.75***	13.30	8.84	-40.01***	-239.82	-1.079	48.29
Household Income	1.479***	3.66***	-1.33***	.434***	-.215***	.076**	-3.30	.032**	-.87***
Earnings in Mining	.096***	.103***	-.055***	.014***	-.006***	-.001	.622***	.002***	.004
Earning in Wood	.010	.006	-.014	.001	-.001	.001	.150*	.000	-.003
Earning Construction	.001	.001	-.001	.000	-.0003	.000	.017*	.000	-.000
Arts, Rec, Entertain	.001	.000	-.003	-.0008	-.0003	-.000	.026	-.0003	.001
Net Migration	-3.66	7.19*	.023	-.663	-.365	-.181	-2.534	-.215	-.1.245
Forestry, Fish, Hunt	.006	.000	-.014	.003	.0005	.000	.64	.000	-.004
Constant	-20010.62**	-56156.82***	5782.64	-13650.78***	4001.95*	588.34	75970.51	-821.00	25018.08***

**P<.05 ***P<.01

The results of these tests provided mixed results amongst the different expenditure variables. The expenditure categories where wilderness had a statistically significant effect are: public welfare, highways, fire and protection, total debt, and health and hospitals. These mixed results are at odds with the consistency expected if wilderness designations were not impacting local communities at all. To explore this inconsistent set of results we explore the models with statistically significant impacts of wilderness presence in more detail.

In the public welfare expenditure model our regression found a statistically significant negative effect of $16,155.00. This result suggests the presence of wilderness lands is related to counties spending about $16,155 less on public welfare programs than counties without wilderness lands.

In the fire and protection expenditure model we found a statistically significant positive result with a coefficient of $12,95.27, indicating counties with wilderness lands are spending more on fire and protection than those without.

The health and hospital expenditure model we also found a statistically significant negative impact with a coefficient of -$6,627.28. This result indicates that counties with wilderness lands are spending less on health and hospital related expenditures than counties without wilderness lands.

The last expenditure model that returned a statistically significant impact of wilderness was the total debt model, with a coefficient of $89,013.73. This result suggests counties with wilderness lands are more in debt than counties without wilderness lands.

4. CONCLUSIONS: WILDERNESS, A BOON OR HINDRANCE?

In the first set of models, which examined the effects of wilderness lands on a county's revenue, we were unable to reject the null hypothesis in all of our tests examining the revenue streams of counties. These results, which, indicate that the presence of wilderness lands in a county does not have a statistically significant effect on both overall tax revenue and property tax revenue collected by counties are consistent with other literature that finds no impact (Deller et al., 2001; Duffy-Deno, 1998; Yonk et al., 2016).

More interesting are the results from the second set of regressions that indicate a different spending pattern in counties with formally protected wilderness. What seems clear from the results of our tests is that the presence of wilderness land is related to a change in how counties spend taxes they collect. The presence of wilderness lands in a county seems to require the county to provide extra services, and bear extra costs than counties without wilderness lands. Evidence for this is exhibited in higher spending in county expenditures that relate to services the county has to provide due to the presence of wilderness lands. The core question is whether there are additional costs burdening the county in order to manage the county due to the presence of these lands or is the county simply able to spend more because of the increase in property values due to wilderness lands. Our results indicate that counties with wilderness lands are spending more on, fire and protection, and health, and less on public welfare programs.

The expenditures in, fire and protection, hospitals and health are costs that can be reasonably related to wilderness lands. For example, a county with wilderness lands is likely to face higher fire and protection costs due to droughts, campfire accidents, and other visitor mishaps within the lands could increase fire danger in wilderness lands. Counties are obviously responsible for fire prevention within their boundaries and as a result, counties spend more money on fire and protection because they are at a greater risk to fire damage than counties without wilderness lands.

Further, counties with wilderness lands are also spending more on the health care system of their county. In general expenditures for hospital and health are defined as expenditures related to health-care services regardless of the primary purpose of the agency. The hospital portion of this expenditure includes costs counties bear to pay for hospitals. The hospital expenditures include infrastructure, research funding, facilities and charity care. Generally, when populations are bordering a wilderness land, they are more likely to enjoy the outdoors and the amenity the land provides through recreation. It is our assumption that communities that are generally more likely to explore the outdoors are also more likely to be injured or need health related services, which, could result in higher costs to maintain the county health and hospital resources.

More evidence of the costs a county faces with wilderness lands is the lack of spending in other areas. For example, our test showed no significant increase in the spending on education, police, and government payroll. The public welfare model showed a significant but lower spending.

Additionally, our test showed that counties with wilderness lands carry more debt than counties without wilderness lands. Even though there is no way to identify from the data if there are large scale transfers to the county, or other revenue sources, this result is especially disconcerting. Public policy analysts, county planners, and other policymakers should bear in mind that if counties are not gaining more tax revenue, but both spending and borrowing more to manage their county than counties without wilderness lands, the land that might be thought to be an amenity to the county could actually be a hindrance.

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APPENDIX A

Table A-1: Total county expenditures OLS results
Total Expenditures
Observations 3144
Pseudo R Sqr .9976

Variable	Coefficient	Standard Error	P Value
General Revenue	.952	.013	.000***
Wilderness Lands (Dummy)	9640.172	5387.791	.074*
Bureau of Reclamation	-95.282	2794.681	.973
Dept of Defense	300.515	239.704	.210
Forest Service	-185.147	79.109	.019**
Fish and Wildlife	-341.897	202.205	.091*
National Park Service	-51.113	199.749	.798
Other Fed Lands	-1795.547	1248.382	.150
Tribal Lands	-78.207	84.872	.357
Tenn Valley Authority	125.869	235.162	.593
County Area	-.145	.146	.321
Population	.021	.012	.074*
Race	-280.454	163.185	.086*
Household Income	1.479	.415	.000***
Earnings in Mining	.096	.288	.001***
Earning in Wood	.010	.088	.219
Earning Construction	.001	.001	.144
Arts, Rec, Entertain	.001	.003	.718
Net Migration	-3.660	3.347	.274
Forestry, Fish, Hunt	.006	.009	.517
Constant	-20010.62	9504.266	.035**

*P<.10 **P<.05 ***P<.01

Table A-2: County expenditures in education OLS results
Observations 3144
Pseudo R Sqr .9516

Variable	Coefficient	Standard Error	P Value
General Revenue	.320	.0268	.000***
Wilderness Lands (Dummy)	939.59	6080.569	.877

Bureau of Reclamation	-5465.61	2441.222	.025**
Dept of Defense	816.733	604.604	.177
Forest Service	-168.585	79.776	.035**
Fish and Wildlife	-1118.329	345.990	.001***
National Park Service	-871.511	428.648	.042**
Other Fed Lands	-1352.519	1629.857	.407
Tribal Lands	-45.928	129.546	.723
Tenn Valley Authority	-637.303	415.711	.125
County Area	.113	.251	.651
Population	.022	.0124	.076*
Race	-525.518	259.016	.043**
Household Income	3.66	.839	.000***
Earnings in Mining	.103	.029	.000***
Earning in Wood	.006	.012	.616
Earning Construction	.001	.001	.207
Earnings in Arts, Rec, Entertain	.000	.006	.901
Net Migration	7.193	3.912	.066*
Forestry, Fish, Hunt	.000	.011	.995
Constant	-56156.82	14121.76	.000***

*P<.10 **P<.05 ***P<.01

Table A-3: County expenditures for public welfare OLS results
Observations 3144
Pseudo R Sqr .8382

Variable	Coefficient	Standard Error	P Value
General Revenue	.0817	.010	.000***
Wilderness Lands (Dummy)	-16155.52	4208.952	.000***
Bureau of Reclamation	-2479.158	2696.152	.358
Dept of Defense	-245.637	237.854	.302
Forest Service	137.443	43.149	.001**
Fish and Wildlife	334.409	183.294	.068
National Park Service	-93.824	431.713	.828
Other Fed Lands	225.703	614.893	.714
Tribal Lands	133.770	74.757	.074
Tenn Valley Authority	-347.297	215.828	.108
County Area	.117	.0881	.181
Population	-.0197	.0097	.043**
Race	386.759	116.701	.001***
Household Income	-1.338	.332	.000***
Earnings in Mining	-.055	.0135	.000***
Earning in Wood	-.014	.010	.156
Earning Construction	-.001	.000	.132
Arts, Rec, Entertain	-.003	.004	.514
Net Migration	.023	3.064	.994
Forestry, Fish, Hunt	-.014	.013	.294
Constant	5782.64	8916.24	.517

*P<.10 **P<.05 ***P<.01

Table A-4: County expenditures in hospitals and health OLS results
Observations 3144
Pseudo R Sqr .8745

Variable	Coefficient	Standard Error	P Value
General Revenue	.089	.005	.000***
Wilderness Lands	-6627.28	3303.465	.045**

(Dummy)			
Bureau of Reclamation	520.474	1613.17	.747
Dept of Defense	111.73	259.082	.666
Forest Service	58.65	34.94	.093*
Fish and Wildlife	111.459	145.530	.444
National Park Service	526.035	292.354	.072*
Other Fed Lands	-103.969	447.088	.816
Tribal Lands	-43.802	73.993	.554
Tenn Valley Authority	826.607	618.367	.181
County Area	-.031	.064	.624
Population	-.006	.004	.148
Race	48.290	88.81	.587
Household Income	-.870	.222	.000***
Earnings in Mining	.004	.004	.396
Earning in Wood	-.003	.007	.682
Earning Construction	-.0006	.0006	.318
Arts, Rec, Entertain	.001	.002	.613
Net Migration	-1.245	2.090	.551
Forestry, Fish, Hunt	-.004	.006	.433
Constant	25018.08	7061.042	.000***

*P<.10 **P<.05 ***P<.01

Table A-5: County Expenditures on Highways
Observations 3144
Pseudo R Sqr .8670

Variable	Coefficient	Standard Error	P Value
General Revenue	.032	.0022	.000***
Wilderness Lands (Dummy)	2480.50	1508.92	.100
Bureau of Reclamation	1206.45	2002.213	.547
Dept of Defense	-79.481	87.114	.362
Forest Service	-13.737	16.951	.418
Fish and Wildlife	30.506	94.637	.747
National Park Service	-166.224	157.822	.292
Other Fed Lands	-320.952	182.747	.079*
Tribal Lands	46.595	27.152	.086
Tenn Valley Authority	-34.091	40.205	
County Area	.015	.037	.676
Population	.004	.002	.107
Race	13.305	28.767	.644
Household Income	.434	.111	.000***
Earnings in Mining	.014	.004	.001***
Earning in Wood	.001	.002	.427
Earning Construction	.000	.000	.322
Arts, Rec, Entertain	-.0008	.001	.470
Net Migration	-.663	1.135	.559
Forestry, Fish, Hunt	.003	.003	.424
Constant	-13650.78	3487.395	.000***

*P<.10 **P<.05 ***P<.01

Table A-6: Expenditures on Police
Police
Observations 3144
Pseudo R Sqr .9823

Variable	Coefficient	Standard Error	P Value
General Revenue	.0648	.0017	.000***

Wilderness Lands (Dummy)	1474.776	1066.591	.167
Bureau of Reclamation	469.8468	441.1796	.287
Dept of Defense	-11.343	73.422	.877
Forest Service	-13.238	10.721	.217
Fish and Wildlife	51.181	42.633	.230
National Park Service	108.28	89.063	.224
Other Fed Lands	-106.802	163.184	.513
Tribal Lands	14.909	19.038	.434
Tenn Valley Authority	33.829	45.449	.0457**
County Area	-.022	.0248	.370
Population	.0015	.0015	.293
Race	8.84	23.62	.708
Household Income	-.215	.070	.002***
Earnings in Mining	-.006	.001	.001***
Earning in Wood	-.001	.002	.501
Earning Construction	-.0003	.0001	.085*
Arts, Rec, Entertain	-.0003	.0007	.617
Net Migration	-.3653	.684	.594
Forestry, Fish, Hunt	.0005	.0022	.807
Constant	4001.95	2115.58	.059

*P<.10 **P<.05 ***P<.01

Table A-7: County expenditures on fire and protection
Observations 3144
Pseudo R Sqr .96449

Variable	**Coefficient**	**Standard Error**	**P Value**
General Revenue	.0264	.0008	.000***
Wilderness Lands (Dummy)	1295.277	556.668	.020**
Bureau of Reclamation	369.326	383.839	.336
Dept of Defense	-14.953	35.397	.673
Forest Service	-7.344	5.131	.152
Fish and Wildlife	19.888	37.191	.593
National Park Service	-3.623	38.546	.925
Other Fed Lands	-22.68	55.85	.685
Tribal Lands	-16.87	7.985	.035**
Tenn Valley Authority	16.415	18.966	.387
County Area	-.0294	.016	.081
Population	.001	.0006	.074*
Race	-40.019	11.234	.000***
Household Income	.076	.0369	.040**
Earnings in Mining	-.001	.001	.327
Earning in Wood	.001	.001	.322
Earning Construction	.000	.000	.840
Arts, Rec, Entertain	-.000	.000	.820
Net Migration	-.181	.296	.541
Forestry, Fish, Hunt	.000	.000	.260
Constant	588.346	998.994	.556

*P<.10 **P<.05 ***P<.01

Table A-8: Total debt in the county OLS results
Observations 3144
Pseudo R Sqr .9346

Variable	**Coefficient**	**Standard Error**	**P Value**
General Revenue	1.158	.095	.000***

Wilderness Lands (Dummy)	89013.73	36731.81	.015**
Bureau of Reclamation	60185.24	50729.92	.236
Dept of Defense	-2198.104	2053.903	.285
Forest Service	-1205.33	492.210	.014**
Fish and Wildlife	1323.481	1597.68	.408
National Park Service	-2722.69	1573.16	.084*
Other Fed Lands	33012.42	31080.3	.288
Tribal Lands	-890.999	588.246	.130
Tenn Valley Authority	2375.095	2008.414	.237
County Area	-1.304	1.025	.203
Population	.080	.055	.145
Race	-239.82	1037.175	.817
Household Income	-3.309	2.969	.265
Earnings in Mining	.622	.168	.000***
Earning in Wood	.150	.081	.064*
Earning Construction	.017	.0100	.082*
Arts, Rec, Entertain	.026	.0288	.351
Net Migration	-2.534	7.652	.886
Forestry, Fish, Hunt	.064	.062	.302
Constant	75970.51	54041.71	.160

*P<.10 **P<.05 ***P<.01

Table A-9: County local government payroll OLS results
Observations 3144
Pseudo R Sqr .9963

Variable	Coefficient	Standard Error	P Value
General Revenue	.0368	.0002	.000***
Wilderness Lands (Dummy)	147.084	243.471	.546
Bureau of Reclamation	-.875	108.90	.994
Dept of Defense	30.052	15.961	.060*
Forest Service	-5.834	2.250	.010***
Fish and Wildlife	-16.578	10.85	.127
National Park Service	-24.508	14.305	.087*
Other Fed Lands	9.499	28.421	.738
Tribal Lands	.648	4.396	.883
Tenn Valley Authority	2.959	14.455	.838
County Area	-.009	.008	.244
Population	.0005	.0003	.158
Race	-1.079	6.342	.865
Household Income	.032	.013	.013**
Earnings in Mining	.002	.000	.000***
Earning in Wood	.000	.000	.113
Earning Construction	.000	.000	.197
Arts, Rec, Entertain	-.0003	.0003	.282
Net Migration	-.215	.1524	.157
Forestry, Fish, Hunt	.000	.000	.834
Constant	-821.009	544.968	.132

*P<.10 **P<.05 ***P<.01

Table A-10: County expenditures on health OLS results
Observations 3144
Pseudo R Sqr .7734

Variable	Coefficient	Standard Error	P Value
General Revenue	.030	.005	.000***

Wilderness Lands (Dummy)	-5036.097	1913.738	.009***
Bureau of Reclamation	-151.0549	717.345	.833
Dept of Defense	202.594	122.585	.098
Forest Service	78.430	25.728	.002***
Fish and Wildlife	-58.839	76.229	.440
National Park Service	42.901	161.835	.791
Other Fed Lands	-196.178	112.823	.082*
Tribal Lands	-19.420	30.559	.525
Tenn Valley Authority	-172.843	59.59	.004***
County Area	.078	.067	.250
Population	-.005	.003	.093*
Race	-22.33	57.17	.696
Household Income	.0167	.159	.916
Earnings in Mining	-.005	.003	.162
Earning in Wood	-.0005	.0037	.888
Earning Construction	-.0001	.0002	.435
Arts, Rec, Entertain	.0008	.001	.604
Net Migration	-.997	1.051	.343
Forestry, Fish, Hunt	-.002	.002	.451
Constant	1724.215	3339.785	.606

*P<.10 **P<.05 ***P<.01

Table A-11: County expenditures on hospitals OLS results
Observations 3144
Pseudo R Sqr .7224

Variable	**Coefficient**	**Standard Error**	**P Value**
General Revenue	.058	.010	.000***
Wilderness Lands (Dummy)	-1591.191	3616.37	.660
Bureau of Reclamation	671.529	2014.776	.739
Dept of Defense	-90.860	251.537	.718
Forest Service	-19.773	45.997	.667
Fish and Wildlife	170.299	156.4295	.276
National Park Service	483.134	385.154	.210
Other Fed Lands	92.208	411.669	.823
Tribal Lands	-24.381	80.456	.762
Tenn Valley Authority	999.450	659.271	.130
County Area	-.109	.0797	.169
Population	-.0005	.003	.891
Race	70.621	116.691	.545
Household Income	-.877	.327	.007**
Earnings in Mining	.009	.007	.224
Earning in Wood	-.002	.0069	.694
Earning Construction	-.0004	.0005	.441
Arts, Rec, Entertain	.0006	.0032	.848
Net Migration	-.248	1.628	.879
Forestry, Fish, Hunt	-.002	.004	.540
Constant	23293.86	6582.361	.000***

*P<.10 **P<.05 ***P<.01