

Green Revenue? Local Governments and Wilderness Designation

*Ryan M. Yonk, Southern Utah University
Randy T Simmons, Utah State University
Brian C. Steed, Utah State University
Sarah Reale, Salt Lake Community College*

"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

Each of the 3,141 counties in the United States is unique, with a variety of physical characteristics. Of these, approximately 287 have areas designated as Wilderness Land within their boundaries. Many have argued about the costs and benefits of having this designated land within a county. Research has been completed examining the effects of Wilderness Land on local economies, quality of life, and the tourism industry; however, no research has been completed in regards to the effects Wilderness Lands on local government tax revenue.

The goal of this study is to explore the question: Do counties with designated Wilderness areas have more or less property and sales tax revenue than counties without Wilderness areas? Evaluating this question helps understand the larger question: Do designated wilderness areas increase or decrease government revenue in these counties? Our hypothesis is that the existence of Federal Wilderness Lands within a county increase that county's government revenue.

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.”

Literature Review

The Wilderness Act of 1964 has created a lengthy (and at times acrimonious) discussion among numerous parties 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 has on the local economies. Analysts on both sides of the argument have attempted to provide conclusions regarding the effect of these Lands, with varying results.

We have broken the literature into four different categories: protection of Wilderness Lands for amenity value, policy analysis which concludes Wilderness Land benefits the economy, and policy analysis which conclude Wilderness Lands have either a negative or zero economic effect.

Literature on Protecting Wilderness Lands For Amenity Value

For most environmentalists the goal of the Wilderness designation is to keep the land in a natural state. As urbanization, industrialization, and population rise in the United States, many want to ensure that some of the land is protected from

exploitation in any form. The Wilderness Act of 1964 helps further this goal by securing these lands from private ownership; the Act ensures that the federal government secures much of the environmentally unique land in the United States. Their argument is that by allowing this land to be protected, people can use the land for recreation and tourism. Further, they claim that people can “gain spiritual fulfillment and... preserve the intergenerational opportunities in safeguarding ecological integrity” (Morton, 1999).

Environmentalists emphasize the importance of preserving the natural land and provide data on the decline of the extraction industry. However, it is still quite common for regions with large Wilderness areas to rely heavily on resource extraction in their economy. In some instances community members and government officials fight against environmentalists to gain access to these resources. Communities have countered this discussion with a surplus of literature supporting the proposition that the Wilderness Lands limit economies of the communities that have previously or could potentially use the land for extraction purposes. Environmentalists present the argument that 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” (Lorah & Southwick, 2003).

Many also argue that the citizens living closest to the lands are those who are most affected, both positively and negatively, by the lands. “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” (Fretwell, 2004).

Environmentalists also fear that if the local residents have more control over how the land is used and managed they will stop the conservation of the natural ecosystems. However, in some instances government officials have created plans to ensure that the land stays preserved, ensuring that it remains a, “place of solitude and boundless beauty, a place that wildlife can call home and humans only visit” (Fretwell, 2004).

Although many authors in this category project that the Wilderness Lands provide a benefit to the economies of the local communities, no one has proven statistically that this has occurred within each county that contains Wilderness Lands. Scholars have done survey research showing that residents generally gain a positive utility from living near outdoor resources based on the intrinsic values of natural beauty.

Literature by Policy Analysts Who Conclude Wilderness Land Benefits the Local Economies

Many studies have been completed demonstrating that proximity to a Wilderness area helps the economies of the neighboring communities; one such study examined the population growth of these communities attributed to the aesthetic value of the area and the ability for many to work from any location. Many predicted that designating these lands as Wilderness would help the local economies through employment growth due to recreation and tourism opportunities surrounding the land. There are also studies that 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 (Lorah, 1996; Power, 1995, 1996; Rasker, 1995; Rudzitis, 1993, 1996). 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” (Power et al. 1995).

Some research has indicated that Wilderness designation plays a substantial role in attracting new migrants to a place or region (Rudzitis, 2000). 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 (Holmes & Hecox, 2004).

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” (Lorah & Southwick, 2003). 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.” This study found that employment in Wilderness counties grew faster in

construction (151 percent faster), services (129 percent), finance, insurance, real estate (115 percent) and trade (93 percent) (Lorah, 2000).

Others claim that there are noneconomic opportunities that draw people to live near Wilderness that have a positive effect on the economy through tourism and outdoor recreation. However, this theory 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 (Rudzitiz & Johnson, 2000).

The literature focuses primarily on the tourism the Wilderness Lands bring to the local economies. 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. Rothman explained that tourism offers the lure of economic prosperity without the environmental costs associated with extractive and manufacturing processes (Rothman, 1998). Rothman also explains 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" (Rothman, 1998).

Policy Analysts Who Conclude Wilderness Lands has a Negative or No Economic Effects

Three studies have found no statistically significant relationship between Wilderness Lands and local economics. 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 (Duffy-Deno, 1998). The study focused on the estimated population and employment growth of 250 nonurban counties from 1980 to 1990. In the end, the study was unable to reject the hypothesis that “Wilderness has had no effect on both population and total employment growth in these counties during the 1980s” (110). 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 (123). 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 (Deller, Tsai, Marcouiller & English, 2001).

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 (Fawson, Keith, Chang, 1996). 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” (Fawson, Keith, Chang, 1996).

There are analysts who have also found that there is a negative effect associated with Wilderness Lands and the economies of local neighboring 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 revealed that the claim that designated Wilderness areas have a positive influence on the local economies is false. In fact, this study found that the presence of Wilderness Lands has negative impact on the economies of the counties (Simmons, Yonk, Steed, 2010).

Literature Conclusions

The existing literature looks closely at the positive and negative effects of Wilderness Lands on the economies of the local communities. However, there has been no quantitative research conducted specifically on the effects of Wilderness Lands on local tax revenue; our research is intended to address this.

Theories

The theory that the presence of Wilderness Lands enhances the county's ability to provide to its residents is the dominant theory throughout the literature on the subject. As mentioned in our literature review, 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. This amenity is used to 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 the preceding is the case, Wilderness Lands would provide an increase in economic activity with a corresponding increase in sales and property taxes within the county, the measure we have chosen to examine in our study.

A contrasting theory, however, suggests that the presence of Wilderness Lands leads to a decrease in local government revenue due to the restrictions placed on land use. This forms our alternate hypothesis, that there is not a positive relationship between counties with the presence of Wilderness land and an increase in local tax revenue. The alternate hypothesis would suggest that the presence of Wilderness Lands actually has a negative effect on local government revenue.

Thus, our hypothesis is that the Federal Wilderness within a county increases that county's tax revenue. The null hypothesis is that Federal Wilderness within a county has no effect on that county's revenue. Lastly, the alternate hypothesis is that Federal Wilderness within a county decreases the local government revenue.

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.

- **Hypothesis:** Federal Wilderness within a county increases that county's revenue.
- **Null Hypothesis:** Federal Wilderness within a county has no effect on that county's revenue.
- **Alternate Hypothesis:** Federal Wilderness within a county decreases the local government revenue.

Our second set of hypotheses emerges from the first. These hypotheses address how Wilderness changes policy priorities in the counties where it is located. We expect increased expenditures in Wilderness counties across all types, if our hypothesis is confirmed, as they have more funds available for use. These hypotheses are:

- **Hypothesis:** Federal Wilderness within a county increases that county's expenditures.
- **Null Hypothesis:** Federal Wilderness within a county has no effect on that county's expenditures.

To test these hypotheses we used data from the Simmons, Yonk, and Steed dataset, which is composed of data from the U.S. Census Bureau and the Bureau of Labor Statistics. These data include 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 applied 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 use several control variables, which can be broken down into three categories: demographics, extraction, and recreation.

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 chosen related to 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 and wood product manufacturing and variables measuring employments in forestry, fishing, hunting, and agricultural support services.

Lastly, we have control variables that are 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. This approach allows us to correctly estimate the independent effect of only wilderness lands.

If the analysis demonstrates that the presence of Wilderness Land within the county increases tax revenue we can reject the null hypothesis (no effect) and the alternate hypothesis (a negative effect.)

The second set of models looks at expenditures within each county to understand money 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 test were used in this test. If the data shows that the presence of Wilderness Land within

the county increases or decreases expenditures in the county we can reject the null hypothesis of no effect.

Additional land types were incorporated in both tests to control for the presence of other Federally owned lands that might affect revenue. The Bureau of Reclamation, Department of Defense, Forest Service, Fish and Wildlife, National Park Service, other Federal lands, Tribal lands, and Tennessee Valley Authority, were the additional land types added with our dummy Wilderness variable. Lastly, 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.

Results

General Revenue – Linear Regression			
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	.019	.015	.202

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

As Table 1.1 shows, the presence of Wilderness Lands does not affect general revenue, according to our initial linear regression, and thus we fail to reject the null hypothesis that the presence of Wilderness Lands increases the general revenue within a county. Therefore the presence of Wilderness Lands in a county might have no effect on the county's general revenue.

A number of the included control variables also returned significant coefficients indicating statistically significant effects of those variables. All coefficients of the included variables are reported in the regression tables to aid interpretation and replication of the analysis. Further research into them, especially the effect of the other public lands, could be a productive avenue for further research.

The second part of our first test used total tax revenue within a county as the dependent variable; the results are listed in Table 1.2.

Table 1.2
Tax Revenue
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	3742.477	2746.921	.173
Service			
Other Fed Lands	-7442.907	5324.125	.162
Tribal Lands	-1999.136	651.4231	.002***
Tenn Valley	1074.622	1411.622	.447
Authority			
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	.009	.006	.167
Construction			
Arts, Rec, Entertain	.071	.046	.126
Net Migration	-29.612	26.007	.255
Forestry, Fish,	.0613	.058	.295
Hunt			
Constant	877.964	71884.8	.990

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

As Table 1.2 shows, for counties with the presence of Wilderness Lands, general revenue P value was significant at the $P < .1$ level, and we can reject the null hypothesis that the presence of Wilderness Lands has no effect on revenue within a county. Thus, the presence of Wilderness Lands in a county appears to have an effect on the county's tax revenue. These results show an average increase of almost \$60,000.00 in tax revenue for counties with Wilderness Lands present.

The last test in this set was a linear regression looking at property tax revenue within a county, regressed against the presence of Wilderness Lands. It included the control variables and the additional land types. The results are listed in Table 1.3:

Table 1.3
Property Tax Revenue
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	.006	.004	.153
Construction			
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<.10 **P<.05 ***P<.01

As Table 1.3 shows, for counties with the presence of Wilderness Lands, property tax revenue P value was significant at the P<.10 level. Thus, the presence of Wilderness Lands in a county appears to have an effect on the county's property tax revenue. These results show an average increase of almost \$40,000.00 in property tax revenue to counties with Wilderness Lands.

The results of the models from the first test, looking at general revenue, total tax revenue, and property tax revenue within a county found no significance between Wilderness Lands and the county's general revenue. However, there was an association between the presence of Wilderness Lands and a county's property

tax and overall tax revenue. Consequently, we can reject the null hypothesis that Wilderness Lands have no effect on revenue. We can also reject the alternate hypothesis that Wilderness Lands have a negative effect on revenue within the county, because both the property tax and overall tax revenue were significant with positive coefficients.

Test #2 - County Expenditures

The second hypothesis test addresses how county expenditures are affected by the presence of Wilderness Lands. To test our second hypothesis, we regressed our dummy variable of wilderness presence on several 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.

Table 3.1
Area Total Expenditures¹
Observations 3144

Variable	Total Expend	Education	Public Welfare	Highways	Police	Fire and Protection	Total Debt	Gov't Payroll	Health and Hospitals
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	-1.45	.113	.117*	.015	-.022	-.029*	-1.304	-.009	-.031
Population	.021*	.022*	-0.197**	.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<.10 **P<.05 ***P<.01

¹ Full tables from each of the regressions are available in the appendix in tables 2.1-2.12.

The results of these tests provided mixed results amongst the different expenditure variables. The expenditures that were significant are: total expenditures, public welfare, highways, fire and protection, total debt, and health and hospitals.

The total expenditure variable was significant at the $P < .10$ level with a coefficient of \$9640.17. This test shows that with the presence of Wilderness Lands there is an increase in total expenditures for the county.

The public welfare expenditure variable was significant at the $P < .01$ level. However, there was a negative -\$16155.00 coefficient, suggesting that the presence of Wilderness Lands shows the counties spending less on public welfare than counties without Wilderness Lands.

The highways expenditure variable was significant at the $P < .10$ with a coefficient of \$2480.00 in net costs. The significance shows that counties with Wilderness Lands are spending more on highways than counties without Wilderness Lands.

The fire and protection expenditure variable was significant at the $P < .05$ level with a coefficient of 1295.27. This shows that counties with Wilderness Lands are spending more on fire and protection for their county.

The health and hospital expenditure test was significant at the $P < .05$ level with a coefficient of -\$6627.28. This shows that counties with Wilderness Lands are paying less for health and hospital related expenditures than counties without Wilderness Lands.

The last expenditure variable that was significant was the total debt variable. This test was significant at the $P < .05$ level with a coefficient of \$89013.73. This test shows that counties with Wilderness Lands are more in debt than counties without Wilderness Lands.

Implications

In the first set of models, which examined the effects of Wilderness Lands on a county's revenue, we were able to reject the null hypotheses in the test for overall tax revenue and property tax revenue. However, we were unable to reject the null hypothesis on the test looking at general revenue.

These results indicate that the presence of Wilderness Lands in a county has a statistically significant effect on both overall tax revenue and property tax revenue collected by counties. The total tax revenue, which includes all taxes levied and collected, is an aggregated measure that explores how overall exactions are affected by the presence of wilderness. As an aggregate measure it is clear, given our other results, that this increase is partially due to the property taxes in the county. Because the effect on overall revenue is nearly \$20,000.00 greater than the effect of property tax, however, it seems likely that the effect on most tax categories including sales tax, for which data was unavailable, would be positive.

At least two potential explanations for these increases in tax revenue emerge from the way taxes, particularly property taxes, are calculated. Because property taxes are a function of both the property value and the tax rate set by the local elected officials, changes in either part lead to changes in the aggregate tax receipts. Ultimately, the answers to our research questions might be rooted in the county's

tax rates; however, because we do not have the data to measure this, we cannot make any conclusions.

Our first explanation is derived from the claims by some that Wilderness increases property values and the Wilderness land provides value to the county. As explained in many of the claims in the literature, Wilderness could potentially act as a resource for the county to gain revenue. This is done through property values within the county. If there is a high demand for land that is adjacent to the Wilderness Lands, one would expect the property values to increase and therefore, the property tax revenue would also increase.

The second explanation for the results of our test is that the Wilderness land is a cost to the county. The presence of Wilderness Lands in a county requires the county to provide extra services, and bear extra costs than counties without Wilderness Lands. Proof of this explanation could be exhibited in higher spending in county expenditures that relate to services the county has to provide with the presence of Wilderness Lands. To determine which explanation more accurately reflected the results from our tests, we took a closer look at the spending within these counties.

The revenue the county generates from taxes, both property and others, is what pays for the county services. These services include education, health, hospitals, fire, police, county employees, highways, and public welfare. In order to determine which explanation is correct, we asked if there is an increase in tax revenue in a county with Wilderness Lands, are there 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. Each model provided different results. In summary, counties with Wilderness Lands are spending more on total expenditures, highways, fire and protection, and health.

The expenditures in highways, fire and protection, hospitals and health are all costs that can be related to Wilderness Lands. For example, a county with Wilderness Lands might have more visitors to the area, thus they must spend more money on their highways to manage the amount of traffic to that county. Fire and protection might also be more expensive in a county with Wilderness Lands. Droughts, campfire accidents, and other visitor mishaps within the lands could increase fire danger in Wilderness Lands. This means the county is responsible for protecting the county from the fires that occur within the lands. As a result, the county has to spend more money on fire and protection because they are at a greater risk to fire damage than counties without Wilderness Lands.

Counties with Wilderness Lands are also spending more on the health of their county. Hospital and health expenditures are defined on the “basis of their primary or predominant purpose of improving health, regardless of the primary function or activity of the entity providing or paying for the associated health services.” The hospital portion of this expenditure includes costs the county bears to pay for hospitals. The hospital expenditure could include infrastructure, research funding, and facilities. 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. In summary, all of the expenditures that showed a positive significant result from the regression test could be related to the additional cost to run a county with Wilderness Lands.

More evidence of the costs a county bears 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. This lack of increase led us to ask, if counties are truly benefiting from an increase in tax revenue, why are they using the revenue to spend more money on highways and not education? Alternatively, why are they spending on hospitals and health and not their own payroll? If there is a county that is profiting in such a way our test showed, why are their expenses so unevenly distributed?

Additionally, our test showed that counties with Wilderness Lands have 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. 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 we initially thought to be an amenity to the county could actually be a hindrance.

Although many say that the reason the property and sales taxes are higher in these counties is because of an influx of tourism and recreation, none of my tests

looked at expenditures within the county as a reason for tax increases. Therefore, we infer that the reason there is an increase in tax revenue in counties with Wilderness Lands is because the counties have higher tax rates in these counties because the counties cost more money to function. The counties are bearing the costs of Wilderness by raising the tax rates within the county.

A positive increase in property values one would see, related to the Wilderness Lands, is the value of property increasing because of demand for the land, not because of the county's need for more revenue. Yet, there is no increase in any expenditure outside of the necessary costs to running a county. Further, there was no sign of spending in education, public welfare, or local government payroll. In summary, this increased spending in expenditures within a county make the Wilderness a net cost to the county, not a revenue builder.

Conclusions

Although there are a variety of discussions on both sides of the spectrum, the best way to analyze the effects of Wilderness Lands on the counties for which they reside is by breaking the analysis into multiple sections. The first part is the question that was approached by many in our literature review: does the presence of Wilderness Lands have an effect on economic activity within a county? Early studies showed that there was a relationship between economic activity in a county and the presence of Wilderness Lands. However, a more recent study completed by Simmons, Yonk, and Steed with methods similar to those we used in this research looking globally at all of the counties in the United States, showed that there is a

negative relationship between the economic activity in a county and the presence of Wilderness Lands.

The next step of the analysis of the effect of Wilderness Lands on the counties in which they reside is to examine the relationship between government revenue and counties with Wilderness Lands. This is the part of the analysis that our research covers. We first hypothesized that the presence of Federal Wilderness within a county increases that county's revenue.

To test our hypothesis, we looked specifically at the revenue variables, property tax, general tax revenue, and general revenue and their relationship with Wilderness Lands in a county. We were unable to reject the null hypothesis on this test due to the lack of relationship with general revenue; however, there was a relationship found between the presence of Wilderness Lands and the county's property tax and total tax. This relationship was significant at the $P < .10$ level.

These results led us to conduct a second test looking at the costs a county bears with the presence of Wilderness Lands. The second hypothesis was that the Federal Wilderness within a county increases that county's expenditures. There were nine expenditure models tested, results of which provided mixed results amongst the different expenditure variables. However, the expenditures that were significant are total expenditures, public welfare, highways, fire and protection, total debt, and health and hospitals.

These results led us to draw multiple conclusions about the effects of Wilderness Lands on the county's government revenue. Although not all of the tests were significant, there was a positive correlation between Wilderness Lands and the

county's property tax revenue. However, once we completed our second test and saw where the counties with Wilderness Lands were spending their money, we concluded that although counties with Wilderness Lands have higher property tax revenue, they are possibly only raising their local tax rates to cover the costs associated with the presence of Wilderness Lands. This was proven through the test examining the relationship between county expenditures and the presence of Wilderness Lands. Counties are spending more money on expenditures that help provide support for the Wilderness Lands. Because of the extra costs associated with having Wilderness Lands within a county, the counties are spending more on fire and protection, hospitals and health, and highways.

There has been a lack of consensus among authors on the effects Wilderness Lands have on local economies, the environment, and the counties in which they reside. The goal of our research was to provide an analysis on the missing pieces of the research. To this point, there was no analysis done specifically on the effects Wilderness Lands have on local government tax revenue. Through our two-part test, we found that sales and property taxes in counties with Wilderness Lands are higher than those that do not have the presence of Wilderness Lands. However we also found that expenditures in counties with Wilderness Lands are more than expenditure costs in counties without Wilderness Lands.

Appendix

Table 2.1
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 2.2
Expenditures in Education
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 2.3
Public Welfare
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 2.4
Hospitals and Health
Observations 3144
Pseudo R Sqr .8745

Variable	Coefficient	Standard Error	P Value
General Revenue	.089	.005	.000***
Wilderness Lands (Dummy)	-6627.28	3303.465	.045**
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 2.5
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 2.6
 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 2.7
 Fire and Protection
 Observations 3144
 Pseudo R Squ .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 2.8
Total Debt
 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 2.9
Local Government Payroll
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 2.11
 Health
 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 2.12
Hospitals
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

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