

WILDLANDS AND LOCAL ECONOMIES IN THE WESTERN UNITED STATES

---

A THESIS

Presented to

The Faculty of the Department of Economics and Business

The Colorado College

In Partial Fulfillment of the Requirements for the Degree

Bachelor of Arts

By

Brandon S. Goldstein

May, 2008

# WILDLANDS AND LOCAL ECONOMIES IN THE WESTERN UNITED STATES

Brandon S. Goldstein

April 2008

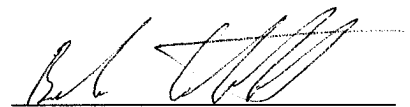
Mathematical Economics

## **Abstract**

The western United States is home to almost 460 million acres of federally protected lands. Much of this land exists as wild, natural land; these places enhance ecological quality and offer a variety of recreational opportunities. Local economies can benefit in many ways from the presence of these public wildlands. In addition to tourism, these lands attract businesses and professionals that seek quality environments. This thesis hypothesizes that the quantity of protected lands in a county is positively related to growth in population, income, employment, and establishments. Unlike previous research that has focused only on rural areas, this paper will evaluate this relationship in more urban areas as well. This link is analyzed using economic and land coverage data to derive Ordinary Least Squares (OLS) regression equations. This investigation reveals significant positive relationships between protected lands and economic vitality in local communities.

KEYWORDS: (Wildlands, Economies, West)

ON MY HONOR, I HAVE NEITHER GIVEN NOR RECEIVED  
UNAUTHORIZED AID ON THIS THESIS

A handwritten signature in black ink, consisting of a first name and a last name, written over a horizontal line.

Signature



## TABLE OF CONTENTS

Chapter	Page
ABSTRACT	ii
1. INTRODUCTION.....	1
The Issue.....	2
Study Design.....	3
2. LITERATURE REVIEW.....	7
Relevant Theory.....	13
3. BACKGROUND	
Historical Background.....	15
Public Wildlands in the West.....	20
Economic Transition.....	23
Wildlands and Modern Lifestyles.....	28
4. ANALYSIS AND RESULTS	
The Models.....	33
Expected Results.....	34
Statistical Framework.....	38
Running the Model.....	41
Diagnostics and Discussion of Results.....	48
5. CONCLUSION.....	58
APPENDIX.....	61
SOURCES CONSULTED.....	69

## LIST OF TABLES

3.1	Federal Ownership In Western Study Region.....	21
4.1	Expected Sign on Variables.....	37
4.2	Original Model 1970-2000: Population.....	42
4.3	Original Model 1970-2000: Income.....	42
4.4	Original Model 1970-2000: Employment.....	43
4.5	Original Model 1970-2000: Establishments.....	43
4.6	Original Model 2001-2005: Population.....	45
4.7	Original Model 2001-2005: Income.....	45
4.8	Original Model 2001-2005: Employment.....	46
4.9	Original Model 2001-2005: Establishments.....	46
4.10	Final Model 1970-2000: Population.....	49
4.11	Final Model 1970-2000: Income.....	49
4.12	Final Model 1970-2000: Employment.....	50
4.13	Final Model 1970-2000: Establishments.....	50
4.14	Final Model 2001-2005: Population.....	52
4.15	Final Model 2001-2005: Income.....	52
4.16	Final Model 2001-2005: Employment.....	53
4.17	Final Model 2001-2005: Establishments.....	53

## LIST OF FIGURES

3.1	Federal Lands in the Continental United States.....	22
3.2	The Total Economic Value of a Wildland Network.....	25
4.1	Study Area Counties by Type.....	40

## CHAPTER 1

### INTRODUCTION

The protection of wild and open lands in the western United States has been a contentious issue since the time of Teddy Roosevelt and Gifford Pinchot. Traditional western economies were based on the extraction and use of natural resources. Even so, land has been put aside and protected since the 19<sup>th</sup> century, largely for what political leaders regarded as its aesthetic beauty. Since then, social, biological, and economic research has shown that intact natural areas are valuable for a wide variety of reasons.

Many of these wild places contain beautiful landscapes. In addition, they provide opportunities for natural experiences and solace. Modern society tends to rely mostly on its own infrastructure; the world that man *built* has replaced the natural one. For this reason, some people have always desired to escape to places where the influence and presence of man is not seen. Today, many pursuits like camping and hiking reflect the urge for people to visit the wild and natural world.

Ecosystem health is another valuable consequence of preservation. Species within these systems are dependent upon one another, and human society has invested considerably in the overall health of ecosystems. Plentiful wildlife adds to the ‘outside’ experience that so many people seek. We also make direct use of water, trees, fish, game, and other plant life, all of which are important elements in a variety of ecosystems.



To demonstrate the real value of these factors, economic methods have proved to be useful. Many components of wildlands are deemed unimportant because they do not visibly contribute to man's economic well-being. What worsens this problem is that a great deal of natural capital is recognized as public property or the commons. People and organizations have been able to simply take what they needed from these natural stocks for a long time without considering the negative repercussions (a.k.a. externalities, because they do not show up in economic assessments).

Economic research has shed light on the value that ecosystems provide human society through services like the cleaning of air and water. Outdoor activities like hiking, fishing, hunting, and skiing bring significant revenue to a variety of areas, both rural and urban. On the other side, by keeping areas free from development, society loses out on revenue from new infrastructure and extracted resources. All factors must be considered if accurate economic estimates are to be made.

### **The Issue**

There is merit in attributing value to both the preservation and the development of land, but the economy is either helped or harmed in the end. Preservation on the local level may hinder economic growth by limiting the extraction and use of natural resources. In addition, labor-intensive jobs (i.e. mining, logging) tend to pay more than some service industry jobs. On the other hand, increased levels of tourism and recreation can provide an array of opportunities for economic success. The question that needs to be addressed is: Does the presence of preserved wild land actually benefit the economies of local areas and their communities?

The purpose of this paper is to test the hypothesis that preserved land economically benefits local communities. There are significant economic benefits derived from the recreation/tourism industries. Natural landscapes also draw individuals and families who choose to *permanently* reside in such places. This enhances the overall economic vitality of a place, especially if it is rural and isolated. I hope to demonstrate that areas with greater quantities of wildlands have greater population, income, employee, and establishment growth than areas without. If the data supports this hypothesis, it indicates that the “Old West” industries are diminishing in importance as “New West” industries replace them.

### **Study Design**

To test the validity of this hypothesis, this paper will analyze factors that contribute to a region’s economic health. These will be set as the dependent variables to be analyzed at the county level:

- Population Growth
- Income Growth
- Employment Growth
- Establishment Growth

These variables are expressed as rates of change because economic change depends directly upon growth/decline in these factors. This data will be for all counties in Arizona, Colorado, California, Idaho, Montana, New Mexico, Nevada, Oregon, Utah, Washington, and Wyoming excluding counties on the Pacific coast. This way, a

conterminous demographic unit is established, with similar economic activities throughout.

Further, each of these dependent variables will be examined for different rural/urban settings. These are:

- Metropolitan Counties
- Semi-Urban Counties
- Rural-1 Counties
- Rural-2 Counties

Metropolitan Counties are those having populations greater than 100,000. Semi-Urban Counties have populations less than 100,000 but with metropolitan populations greater than 2,500. Rural-1 Counties are counties with metropolitan populations fewer than 2,500 people that are adjacent to either Metropolitan or Semi-Urban Counties. Rural-2 Counties also have metropolitan populations under 2,500, and are not adjacent to Metropolitan or Semi-Urban Counties.

The dependent variables for each type of county will be set against a series of independent variables. These variables are:

- % Makeup as Wilderness Acres
- % Makeup as 1B Roadless Acres
- % Makeup as 1B-1 Roadless Acres
- % Makeup as 1C Roadless Acres
- % Makeup as NPS (National Park Service) Acres
- % Makeup as USFS (Forest Service) Acres
- % Makeup as FWS (Fish and Wildlife Service) Acres
- % Makeup as BLM (Bureau of Land Management) Acres
- % Change in Agricultural Income
- % (Agricultural Income)/(Total Income)

Historical data for the public land variables is very limited, and no accurate database exists from 1970 on. Fortunately, these categories of public land grow slowly, if at all, at the county level. Therefore, this study will assume that the acreage by county for these land categories remained constant between 1970 and today.

The next chapter will feature relevant theory as developed by other authors. Next, a background chapter will provide the historical, social, and geographic framework of the region this paper is studying. After setting up the regression models, I will explain my data and expected results. A series of Ordinary Least Squared (OLS) regressions will then be performed for the period between 1970 and 2000 and between 2001 and 2005.

The equations will be modified to omit unimportant variables and to isolate the significant ones. The goal is that the final equations provide empirical evidence supporting the relationship between land preservation and economic growth.

## CHAPTER 2

### LITERATURE REVIEW

There exists a significant body of research that analyzes specific ways in which environmental protection economically benefits society. Values of recreation and preservation (existence value) have been estimated using willingness to pay methods.<sup>1</sup> Some studies have examined how additional preservation of wilderness can bring in more recreational visitors and increase property values in nearby communities. Phillips at The Wilderness Society used hedonic pricing models to examine the relationship between increased acreage of nearby wilderness and higher local property values.<sup>2</sup> Other papers, such as that of Loomis and Richardson, looked at the values of ecosystem services to human society.<sup>3</sup>

Another area of study has examined the overall effects of wildland protection on large-scale economic indicators, like income and population. One such study used a survey to show that quality-of-life factors are of greater importance in business location decisions than traditional economic factors. Johnson and Rasker propose that areas with

---

<sup>1</sup> Richard G. Walsh, John B. Loomis, and and Gillman, Richard A., "Valuing Option, Existence, and Bequest Damands for Wilderness," *Land Economics* 60, no. 1 (February 1984): 14.

<sup>2</sup> Spencer Phillips, "The Economic Benefits of Wilderness: Focus on Property Value Enhancement," The Wilderness Society, Ecology and Economics Research Department, no. 2 (March 2004)

<sup>3</sup> John B. Loomis and Robert Richardson, "Economic Values of the U.S. Wilderness System." *International Journal of Wilderness* 7, no. 1 (April 2001): 31.

good environmental quality support entrepreneurial activity.<sup>4</sup> The authors argue that instead of traditional growth and development through the production of goods, modern economic development and population growth in rural areas can be largely attributed to the quality of life amenities that exist. “These qualitative location factors include environmental amenities, recreational opportunities, a relaxed lifestyle, low crime rate and other variables not accounted for in conventional business location literature.”<sup>5</sup> To explain this hypothesis, the authors look at two research questions: “What location values do entrepreneurs consider important when developing their businesses in the Greater Yellowstone Ecosystem?”<sup>6</sup> and “do the reasons for locating a business vary between long-time business owners (Old-timers) and newcomer business owners (Newcomers)?”<sup>7</sup> 500 firms in Madison, Gallatin, and Park counties in Montana were sampled from across the fields of businesses sorted by the Standard Industrial Classification Code (SIC). Of those contacted and asked to participate in a survey, 420 businesses supplied enough information to be used in the study.

Respondents were asked how economic, qualitative, community, and recreation values impacted their decisions concerning business location. Between the four categories, a total of fifteen factors were identified. Of these, ‘scenic beauty’, ‘quality environment’, and ‘a good place to raise a family’ were the three most important factors according to responses. Three economic factors (‘proximity to the university’, ‘costs of doing business’, and ‘overall tax structure’) were deemed the least important. In addressing the second question, respondents were grouped into old-timers and

---

<sup>4</sup> Jerry J. Johnson and Raymond Rasker, "The Role of Economic and Quality of Life Values in Rural Business Location," *Journal of Rural Sciences* 11, no. 4 (1995): 405.

<sup>5</sup> Ibid.: 406

<sup>6</sup> Ibid.: 407.

<sup>7</sup> Ibid.: 407.

newcomers. Old-timers felt that ‘a good place to raise a family’, ‘quality environment’, and ‘scenic beauty’ were the top three factors respectively. Newcomers’ top three were ‘scenic beauty’, ‘quality environment’, and ‘overall recreation opportunity.’ For both old-timers and newcomers, the economic factors were again of the least importance. Their findings indicate that environmental quality of life amenities may be able contribute to local economies more than traditional western industries.<sup>8</sup> Areas with wilderness characteristics and good environmental quality encourage an influx of new businesses. It also keeps established companies viable. This increases employment, income, and the overall health of local economies.

A paper from the Norwegian University of Science and Technology also evaluated the relationship between declines in wilderness and changes in macroeconomic variables. Land in 18 counties was divided into three categories based upon distance from human encroachments: greater than 5km, 3km, and 1 km (WL5, WL3, and WL1 respectively) from man-made establishments. Data was collected for these three wilderness types from 1988 and 1994 and expressed as percentages of total land area in each county. These percentages were set as dependent variables, run against GDP per capita, per capita GDP squared, and population density (people/km<sup>2</sup>) for each county. Another model was run where the dependent variable was expressed as the change in wilderness from 1988 to 1994.<sup>9</sup>

The resulting regression coefficients for GDP per capita and population density were negative and statistically significant. The coefficient for GDP per capita squared was positive, but insignificant overall. The strongest and most statistically significant

---

<sup>8</sup> Ibid.

<sup>9</sup> Anders Skonhoft and Håvard Solem, "Economic Growth and Land-use Changes: The Declining Amount of Wilderness Land in Norway." *Ecological Economics* 37 (2001): 289.



coefficients were seen when WL1 (land greater than 1 km away from encroachment) was set as the dependent variable. The authors inferred from this that economic growth has the greatest effect on land that is closest to human civilization. Their results show that economic growth and high levels of per capita GDP further encroach into wilderness, especially for the two broadest wilderness categories (WL1 and WL3). These findings reject the relationships defined by the Environmental Kuznets Curve (EKC), which say that beyond certain levels of economic well-being (defined by per capita income), environmental degradation slows down.<sup>10</sup>

Another study by Duffy-Deno relates the percentage of land made up by wilderness to population densities and employment densities in non-urban counties throughout the eight-state intermountain west (the Mountain West census division). Population density and employment density in 250 counties were observed for the years 1980 and 1990. Densities for both population and employment were modeled for a state of disequilibrium by including lagged population and employment effects. These densities were then set as dependent variables and run against a series of independent variables. These included dummy variables for location, unemployment, utility prices, and other factors affecting economic injections into local economies. Also included were the percentages of land made up by National Park Service (NPS), U.S. Forest Service (USFS), Bureau of Land Management (BLM), and Wilderness land. The regression equations were then run using Ordinary Least Squares (OLS).<sup>11</sup>

Opponents of wilderness argue that it limits employment in the resource economy. The author's results show that the overall effects of wilderness on employment

---

<sup>10</sup> Ibid.

<sup>11</sup> Kevin T. Duffy-Deno, "The Effect of Federal Wilderness on County Growth in the Intermountain Western United States," *Journal of Regional Science* 38, no. 1 (1998): 109.

density are actually positive. Economies were separated into resource-dependent and resource-nondependent counties. Resource-dependent counties were defined by resource-based employment making up more than 30% of total employment. For counties not dependent on resource extraction, the percent of wilderness was not statistically significant. However, for resource-dependent counties, the coefficient on the percent of wilderness was not only statistically significant at the 95% level, but positive as well. This contradicts past arguments that preserving land harms economies based on extracting natural resources. Still, the overall effects of wilderness on population and employment densities in rural counties were not significant.<sup>12</sup>

The author interprets his results to indicate that, on average, wilderness causes little harm to rural economies. He accepts the possibility that some counties may be harmed more than others, especially if the economy is largely based on the extraction of natural resources. He also acknowledges that some areas' economies may become stronger as a result of wilderness designation. The author concludes that wilderness is not necessarily economically unfavorable, and more research must be performed to adequately assess the impacts of wilderness designation. He suggests that further study include a greater area of analysis and incorporate roadless areas that are not federally designated.<sup>13</sup>

A study by Lorah looked at the relationship between wilderness and growth for economic indicators in 113 rural counties in the western United States. Counties were defined as rural by having populations under 2,500. These counties were then divided into 50 counties adjacent to metropolitan areas and the 83 that were not. Using GIS

---

<sup>12</sup> Ibid.

<sup>13</sup> Ibid.

analysis, the percentage of land made up by Wilderness Areas, Wilderness Study Areas, National Parks, and National Monuments in each county was found. These percentages were run against population, income, per capita income, and employment for the period between 1969 and 1996. The resulting Pearson's Correlation Coefficients were positive and statistically significant. Lorah interpreted this to indicate that wilderness does not impede economic growth. The author was careful not to say that the presence of wilderness *causes* economic growth. Still, there was an emphasis on the point that counties with larger amounts of wilderness and protected wildlands had greater rates of growth for employment, income, population, and per capita income.<sup>14</sup>

A paper by Holmes and Hecox analyzed how economic growth relates to wilderness area in the same 113 rural counties in the western U.S. Like the previous study, these rural counties were separated into 50 adjacent counties and 83 nonadjacent counties. The percentage of land in each county made up by Wilderness Areas was calculated. Growth figures for population, income, and employment between 1970 and 2000 were correlated with these percentages. As in the paper by Lorah, the correlation coefficients were positive and statistically significant. However, when the 50 adjacent counties were excluded, the correlations became stronger. This suggested to the authors that in regions that are geographically isolated from metropolitan areas, the presence of wilderness is significantly linked to economic development in communities.<sup>15</sup>

---

<sup>14</sup> "Population Growth, Economic Security, and Cultural Change in Wilderness Counties," *USDA Forest Service Proceedings, RMRS, P-15 2* (2000): 230.

<sup>15</sup> Patrick F. Holmes and Walter E. Hecox, "Does Wilderness Impoverish Rural Regions?" *International Journal of Wilderness* 10, no. 3 (December 2004): 34.

## Relevant Theory

The review of literature pertaining to the relationship between economic vitality and the presence of wilderness creates some implications to this study. First, the overall economic effects of wilderness designation could not be strictly defined as positive or negative. Most of the findings supported the argument that wilderness increases the economic health of rural communities. Still, most authors would not say that wilderness is the *cause* of economic health. In addition, the negative effects that wilderness designation can have on resource-based economies were recognized. Even so, I expect significant correlation between economic growth and the presence of preserved land, at least in rural areas.

Second, the geographic areas of study in this paper were put into context. Most past research dealt only with rural counties in the western United States. As discussed above, these counties are defined as having fewer than 2,500 people. My research will also evaluate rural counties, both adjacent and nonadjacent to metropolitan areas. In addition, I will look at larger counties; I believe that counties with much larger populations can benefit similarly to rural, isolated counties. In Johnson and Rasker's paper, one of the areas of study was Gallatin County in Montana. Gallatin County is not metropolitan, but it has a population significantly larger than 2,500. Analysis showed that even in Gallatin County, a quality environment with ample recreation opportunities draws immigrants and moving businesses. Whether this is the case in other 'semi-urban' counties will be seen in my analysis of available data.

The Norwegian study points toward a potential problem with developing rural economies. In Norway, undeveloped land closest to human civilization is at risk of

encroachment. Therefore, as rural economies develop, they may actually degrade the landscapes that brought the initial economic benefits. It is important to note that the Norwegian paper defined wilderness by the distance from human encroachment. In the United States, Wilderness and other forms of preserved land are formally protected. As such, the land in question is not lost to development and will, therefore, not be considered in my analysis.

## CHAPTER 3

### BACKGROUND

#### **Historical Background**

Traditionally, society regarded open land in the western United States as a resource to be used and exploited. By extracting raw materials such as timber, metal ores, and oil, people could earn a living wage while providing necessary commodities to the nation's economy. The ready availability of natural resources on public lands attracted great numbers of people and enterprises to the West. The federal government sold and leased hundreds of millions of acres to encourage westward development and economic development through land-based economies.

This process began soon after the United States gained its independence from Britain. After significant debate over western land claims, the Continental Congress passed the Land Ordinance of 1785. This laid the groundwork for the sale of public lands in the western United States. All land was to be surveyed and divided into 640-acre (minimum) plots that could then be sold.<sup>16</sup> Railroad companies and land speculators were able to purchase huge quantities of land; most ordinary farmers and ranchers could not afford to buy such large plots.<sup>17</sup>

---

<sup>16</sup> "American Agriculture and the Development of a Nation's Land Policy," in Iowa State University, Center for Agricultural History and Rural Studies [database online]. [cited 2008]. Available from <http://www.history.iastate.edu/agprimer/Page12.html>.

<sup>17</sup> Ibid.

The federal government would soon reduce the minimum acre requirements in attempts to allow average Americans to buy land on which they could make a living. Still, land speculators and corporations bought the vast majority of land sold at that time. In 1862, the government passed the Homestead Act, through which any adult citizen could claim 160 acres of surveyed land, providing they made improvements (i.e. clear forest, plow land, construct dwellings). At \$1.25 per acre, the act was intended to provide the nation's poor with a means to earn a solid income.<sup>18</sup> However, relatively few homesteaders could afford to develop farms. Of the 500 million acres sold between 1862 and 1904, about 420 million went to railroads and speculators.<sup>19</sup>

Concurrently, Congress passed the Pacific Railroad Acts of 1862 and 1864.<sup>20</sup> During the 1840s, the United States acquired California and Oregon, expanding the nation's territory all the way to the west coast. It became apparent that to effectively carry people and materials westward, the country needed large and efficient means of transportation. The act provided that for every forty miles of track each railroad company laid, it would receive 6,400 acres of public land and large government loans.<sup>21</sup> The railroads then had 30 years to repay these loans. The second act in 1864 doubled the land grants and authorized the railroads to sell their own bonds to raise additional funding.<sup>22</sup>

Similar legislation, like the Timber Culture Act (1873), the Desert Lands Act (1877), and the Reclamation Act (1902), continued the government's disposal of public

---

<sup>18</sup> Ibid.

<sup>19</sup> "Homestead Act (1862)." in [www.ourdocuments.gov](http://www.ourdocuments.gov), 100 Milestone Documents [database online]. [cited 2008]. Available from <http://www.ourdocuments.gov/doc.php?doc=31>.

<sup>20</sup> "Pacific Railway Acts," in *Encyclopedia Britannica Online* [database online]. [cited 2008]. Available from <http://www.britannica.com/eb/article-9057923/Pacific-Railway-Acts>.

<sup>21</sup> "Pacific Railroad Act," in *West's Encyclopedia of American Law, Answers.com* [database online]. [cited 2008]. Available from <http://www.answers.com/topic/pacific-railway-acts?cat=biz-fin#copyright>.

<sup>22</sup> *Pacific Railway Acts*

lands.<sup>23</sup> This type of development created thriving cities in geographically isolated areas. Industries and economies based on the extractive use of land became a new ethic for the western United States. Based on extractive industries and agriculture, western economies were able to flourish. It is this traditional economic background that stands in contrast to philosophies of preservation.

The first explicit western philosophies that began to appreciate the worth and importance of 'nature' emerged in the middle of the 19<sup>th</sup> century. Henry David Thoreau was one of the first to explicitly express thoughts concerning the value of the wild. Thoreau spent a number of years living in a homemade shack, growing a significant portion of his food, and traveling through the woods. This time that he spent away from civilization resulted in his most famous work, *Walden*. It demonstrated the many ways in which Thoreau recognized inherent value in wildlands.<sup>24</sup>

Since the turn of the 20<sup>th</sup> century, western wildlands emerged more and more into the public eye. Theodore Roosevelt, the 26<sup>th</sup> President of the United States, became one of the first great conservationists. With help and inspiration from John Muir<sup>25</sup> and Gifford Pinchot, he established some of the nation's first national parks and wildlife refuges.<sup>26</sup> Muir would go on to found the Sierra Club, which has continued to work for the preservation of wildlands across the country.<sup>27</sup>

---

<sup>23</sup> Woten, *American Agriculture and the Development of a Nation's Land Policy*

<sup>24</sup> Henry David Thoreau, *Walden and Other Writings of Henry David Thoreau* (New York: Random House, Inc., 1992)

<sup>25</sup> "Environmental Hero: Theodore Roosevelt," in Environmental Defense [database online], April 21 [cited 2008]. Available from <http://www.environmentaldefense.org/article.cfm?contentid=2759>.

<sup>26</sup> Wallace Stegner, "Striking the Rock," in *The American West as Living Space* The University of Michigan Press, 1987), 39.

<sup>27</sup> "John Muir Exhibit," in The Sierra Club [database online]. December 14 [cited 2008]. Available from [http://www.sierraclub.org/john\\_muir\\_exhibit/](http://www.sierraclub.org/john_muir_exhibit/).



In 1905, Roosevelt appointed Gifford Pinchot as the first chief of the United States Forest Service. He advocated the responsible use of the resources within National Forests, a practice that came to be known as ‘conservation.’ It was based upon a utilitarian concept promoting “the greatest good for the greatest number for the longest time.”<sup>28</sup> Pinchot’s approach to managing forests revolutionized the way natural resources were viewed and utilized throughout the United States.

A few years later, Aldo Leopold emerged as another early champion of land and wildlife preservation. After graduating from forestry school, he joined the newly formed Forest Service. In his time with the Forest Service, Leopold continuously studied the ecological significance of natural areas. He also became seriously involved in a number of efforts towards land conservation and restoration. Leopold was also noted for his experience in wildlife management.<sup>29</sup> Later in his life, he would publish “The Land Ethic”; this work elucidated the ways in which all components of the world, including humans, are dependent on one another. “The land ethic simply enlarges the boundaries of the community to include soils, waters, plants, and animals, or collectively: the land.”<sup>30</sup>

Bob Marshall was another advocate of wildlands in the early 20<sup>th</sup> century. From a young age, he was an avid outdoorsman, spending long periods traveling through the mountains and wilderness of the United States. In 1930, he received a PhD in plant

---

<sup>28</sup> "Pinchot and Utilitarianism," in USDA Forest Service, *The Greatest Good* [database online]. April [cited 2008]. Available from <http://www.fs.fed.us/greatestgood/press/mediakit/facts/pinchot.shtml#>.

<sup>29</sup> "Aldo Leopold," in The Aldo Leopold Foundation [database online]. [cited 2008]. Available from [http://www.aldoleopold.org/about/leopold\\_bio.htm](http://www.aldoleopold.org/about/leopold_bio.htm).

<sup>30</sup> Aldo Leopold, "The Land Ethic," in *A Sand County Almanac and Sketches here and there* (New York: Oxford University Press, 1949), 204.

physiology from John Hopkins University.<sup>31</sup> In the same year, he published an article entitled, "The Problem with the Wilderness," which described the "physical, the mental and the esthetic"<sup>32</sup> benefits that human society gains from preserving wild areas.

Marshall recognized the inherent conflict between the preservation of wildlands and the demand for the resources they held. Even so, he felt that the "small financial loss [that] ultimately results from the establishment of wilderness areas must be accepted as a fair price to pay for their unaccessible preciousness."<sup>33</sup> Before his death at age 38, Bob Marshall helped create The Wilderness Society and laid most of the groundwork for wilderness designation policy on Forest Service lands.<sup>34</sup>

Recent philosophies have continued to build upon the work of these early conservationists. In 1968, Garret Hardin published his article "The Tragedy of the Commons." In this paper, he observed the problem that arises when individual entities (people, companies, nations, etc.) seek to use a nonrival (can be used by more than one person) and nonexcludable (nobody has more right to use than another) commons. Hardin presents a pasture that is open to anyone who wants to keep cattle on it. Each individual seeks to maximize his/her individual utility, so he/she will put as many cattle as possible on this pasture. When everybody follows the same logic, the pasture becomes overcrowded and overgrazed. In the end, the commons becomes unusable and everyone suffers. Hardin extended this concept to the use of public lands, like National Parks, and even to pollution. He recognized that as long as people can minimize costs and maximize

---

<sup>31</sup> "A Wilderness Original: The Life of Bob Marshall," in The Mountaineers [database online]. Seattle [cited 2008]. Available from <http://oz.plymouth.edu/~lts/wilderness/marshall.html>.

<sup>32</sup> Bob Marshall, "The Problem of the Wilderness," *Scientific Monthly* 30, no. 2 (February 1930): 142.

<sup>33</sup> *Ibid.*: 46: .

<sup>34</sup> "Robert Marshall," in The Wilderness Society [database online]. [cited 2008]. Available from [http://www.wilderness.org/AboutUs/Marshall\\_Bio.cfm](http://www.wilderness.org/AboutUs/Marshall_Bio.cfm).

profits through a nonrival, nonexcludable commons, the end result is degradation and harm (economic, health, etc.) to the community at large.<sup>35</sup>

Another recent philosophy, deep ecology, is largely a continuation of Aldo Leopold's sense of community in "The Land Ethic." Fundamentally, this philosophy stems from the belief that all living things on the planet have inherent value. It is a belief supported by all natural systems, favoring no one species or ecosystem over another.<sup>36</sup> "This rejects the classic duality expressed by an anthropocentric view which says that nature and its processes are separate from humanity, and therefore exist solely for our use."<sup>37</sup> As such, deep ecology recognizes that policies need to change to encompass the interests of all living beings.<sup>38</sup>

### **Public Wildlands in the West**

The western United States is home to some of the nation's most pristine and ecologically significant tracts of federal land. For decades, National Parks such as Yellowstone and Zion have drawn visitors from all parts of the country to come and behold the natural beauty of the West.

In addition to the famous parks and national monuments throughout the West, there are great quantities of other federally protected lands. Within the lower 48 states of the U.S., there are over 540 million acres of federal land. The area of this paper's study

---

<sup>35</sup> Garret Hardin, "The Tragedy of the Commons," *Science* 162 (1968): 1243.

<sup>36</sup> "Deep Ecology Movement," in Foundation for Deep Ecology [database online]. [cited 2008]. Available from <http://www.deepecology.org/movement.htm>.

<sup>37</sup> Brandon Goldstein, "Wildlands and Extractive Industries: An Economic Transition in the Rockies," *The Colorado College State of the Rockies Report Card* (April 2008): 86.

<sup>38</sup> *Deep Ecology Movement*

within the western United States holds almost 460 million acres, about 84 percent of the continental U.S. federal land total.<sup>39</sup>

The United States National Wilderness Preservation System (NWPS) contains some of the most pristine tracts of land that are left on the North American continent. They have been preserved for not only their natural beauty, but also for their contributions to the ecological integrity in the areas where they are located. Almost 87 percent of the 50 million acres of Wilderness within the continental U.S. are contained within this paper's study region. **TABLE 3.1** displays other acreage figures for federal lands within the study area:

<b>Federal Land Type</b>	<b>Acres</b>
Total Federal Lands	457,438,999
Bureau of Land Management (BLM)	174,159,754
Forest Service (FS)	157,645,078
Fish and Wildlife Service (FWS)	7,352,065
National Park Service (NPS)	20,493,201
National Wilderness Preservation System (NWPS)	43,329,545

**TABLE 3.1:** FEDERAL OWNERSHIP IN WESTERN STUDY REGION

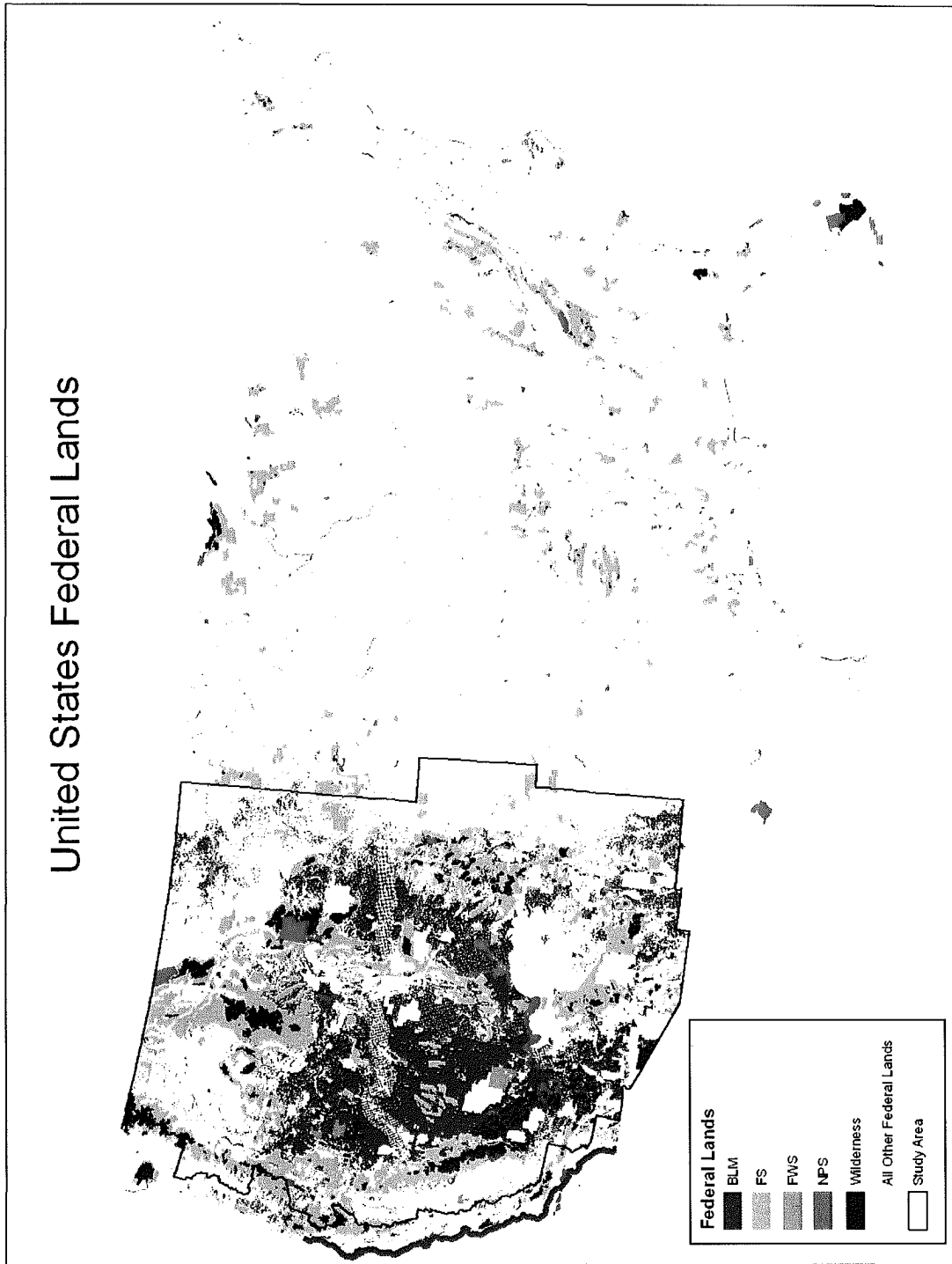
Source: USGS National Atlas GIS Layers

**FIGURE 3.1** shows these lands within the context of the continental United States:

---

<sup>39</sup> "GIS Data Layers," in *National Atlas of the United States* United States Geological Survey, 2007),

FIGURE 3.1: FEDERAL LANDS IN THE CONTINENTAL UNITED STATES



Source: USGS National Atlas GIS Data Layers, 2007

As a result of the sheer quantity of public lands in the western United States, the region continues to be regarded as wild and open territory. Exploration and development have changed the true nature of the West, and despite the vast size of the region, increasing populations continue to put pressure on the open lands that still exist. Wild landscapes do still remain, however, and the natural spirit that they represent is still embodied in the West.

### **Economic Transition**

The changing nature of western economies is a fundamental concept in this paper. Industries like mining, agriculture, and timber all provide raw materials from the earth. When western expansion and development were encouraged, these industries provided the financial means to develop successful cities and towns. Recently, as discussed above, the relative importance of economies based on resource extraction are diminishing. Taking their place are businesses that provide cultural services.

In the eight-state Mountain West census division, the number of mining employees grew from about 78,000 to 85,000 between 1939 and 2001, an increase of 9 percent. Over the same period, service and trade employee numbers for the region increased by almost 1580 percent, from about 280,000 to over 4.7 million.<sup>40</sup> In 2006, mining made up only 5 percent of GDP in the eight-state Rockies region. The same year, services accounted for almost 65 percent of the region's GDP.<sup>41</sup>

Today, western citizens are being presented with a "choice of an 'old' economy built on resource extraction or a 'new' economy built on clean environments, natural

---

<sup>40</sup> Goldstein, *Wildlands and Extractive Industries: An Economic Transition in the Rockies*

<sup>41</sup> "Gross Domestic Product by State," in US Department of Commerce, Bureau of Economic Analysis [database online]. October 26 [cited 2008]. Available from <http://www.bea.gov/regional/gsp>.

amenities, and renewable nature services.”<sup>42</sup> Since the 1990’s, studies have shown that people are drawn to areas with both good social and natural amenities. Natural resources are still of great monetary value, but “westerners also value the healthy lifestyles supported by clean air and water, abundant wildlife, and wide open spaces.”<sup>43</sup> In addition, the demand for raw materials derived from natural resources is steadily decreasing. Precision and efficiency have dominated the modern manufacturing business. “Many of the most valuable ‘products’ in today’s economy, like computer software and medical technology, require few raw materials.”<sup>44</sup>

In place of natural resource extraction, the demand for services has dominated recent economic growth in the West. On the same note, the need for physical labor is being replaced by the need for human capital,<sup>45</sup> some of our culture’s most valuable resources are the men and women who supply services. Professionals in medical, technological, legal, and financial fields all supply services. In the eight-state Rocky Mountain region of the western United States, services have come to account for almost 75 percent of total employment and 65 percent of total GDP. Extractive industry, on the other hand, only accounts for 3 percent of employment and 5 percent of GDP.<sup>46</sup> Trends in the Rockies region show that the services industry, already the largest component of the region’s employment, is continuing to grow. Mining and extractive industries are shrinking.<sup>47</sup>

---

<sup>42</sup> "What is a 'New West' Vs. 'Old West' Economy?" in [www.NewWest.net](http://www.NewWest.net) [database online]. April 9 [cited 2008]. Available from [http://www.newwest.net/city/article/what\\_is\\_a\\_new\\_west\\_vs\\_old\\_west\\_economy/C396/L396/](http://www.newwest.net/city/article/what_is_a_new_west_vs_old_west_economy/C396/L396/).

<sup>43</sup> Ibid.

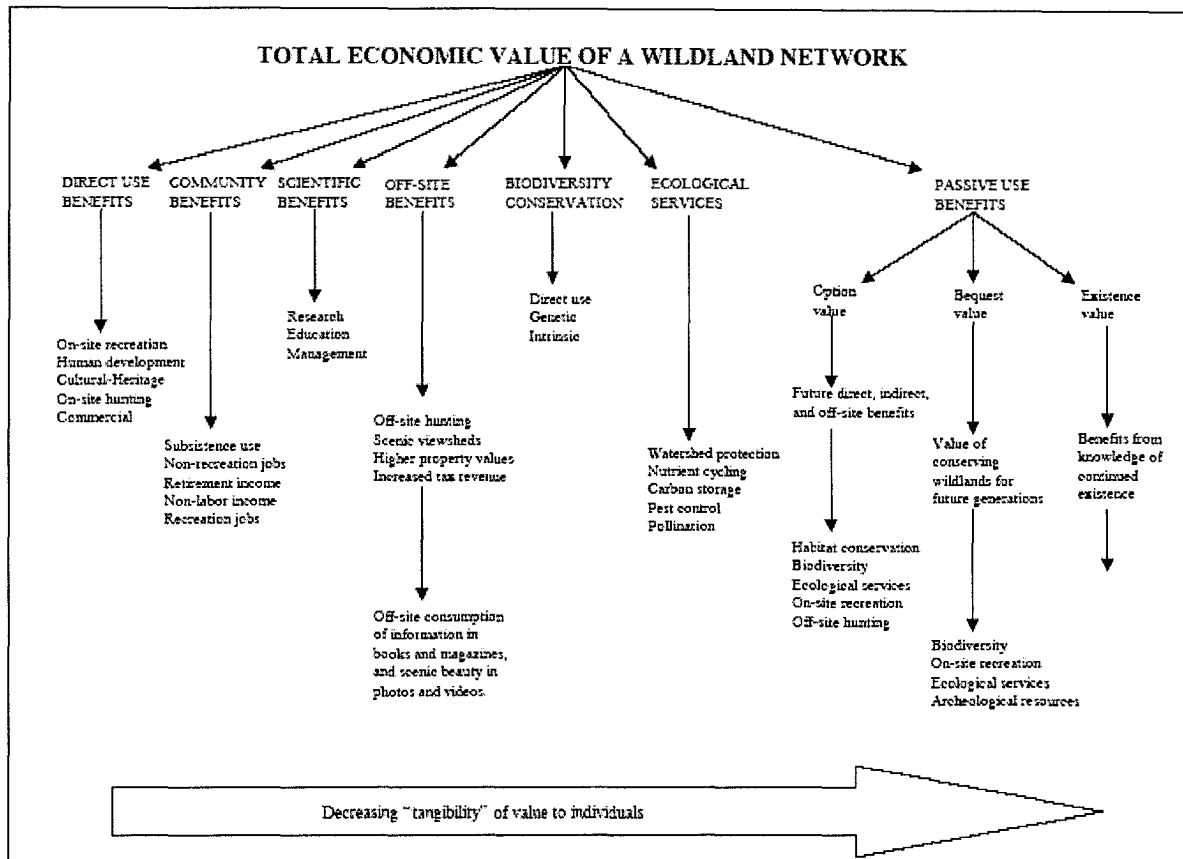
<sup>44</sup> Raymond Rasker, "A New Look at Old Vistas: The Economic Role of Environmental Quality in Western Public Lands," *University of Colorado Law Review* 65, no. 2 (1994): 371.

<sup>45</sup> Ibid.

<sup>46</sup> Goldstein, *Wildlands and Extractive Industries: An Economic Transition in the Rockies*

<sup>47</sup> Ibid.

Western communities have found, therefore, that it is no longer necessary to be a source of raw materials to be successful. In addition, modern studies have shown the economic value that the environment can hold. This is illustrated in **FIGURE 3.2**:



**FIGURE 3.2: THE TOTAL ECONOMIC VALUE OF A WILDLAND NETWORK**  
Source: Pete Morton. *The Economic Benefits of Wilderness*. The Wilderness Society. 1999.

This figure identifies the numerous ways that society economically benefits from natural ecosystems. There is a large body of research that attempts to quantify these economic benefits. Intact ecosystems provide ecological services, estimated to be worth as much as \$33 trillion annually on the global scale.<sup>48</sup> Benefits derived from recreation are also worth a great deal. One paper estimates the recreational benefits from 42 million acres of

<sup>48</sup> Robert Costanza et al., "The Value of the World's Ecosystem Services and Natural Capital," *Nature* 387 (1997): 253.



Roadless Areas to be worth \$600 million every year.<sup>49</sup> Another study found that recreation within designated Wilderness areas produces another \$600 million in economic benefits annually.<sup>50</sup> Nearby wildlands can even enhance property values.<sup>51</sup> Western communities have come to see that keeping wild lands intact is worth more to them than the resources that could be extracted. Many of the economic benefits that ecologically sound areas provide are indirect; they affect the *quality* of life instead of directly contributing financial stimulus.

Recently, these benefits have come to be widely recognized. In a series of town meetings throughout Montana, citizens made the protection of a quality environment the most important goal.<sup>52</sup> The natural amenities lending to the overall quality of life were seen to be more important than the land's natural resources. People want to escape from crowded, industrialized cities to the 'great outdoors' and a healthy living environment. In addition to contributing to local quality of life, these factors help to create a sense of place.<sup>53</sup> In the western United States, abundant wildlands and strong communities support local identities. This has inspired a large number of people to migrate to the West.

The West has experienced considerable economic growth from immigration. A study by Vias analyzed regional population and economic trends between 1970 and 1995.

---

<sup>49</sup> John B. Loomis and Robert Richardson, "Economic Values of Protecting Roadless Areas in the United States," Colorado State University, Department of Agricultural and Resource Economics; The Wilderness Society, Heritage Forests Campaign. (June 2000)

<sup>50</sup> Douglas J. Krieger, "Economic Value of Forest Ecosystem Services: A Review," The Wilderness Society. (March 2001)

<sup>51</sup> Spencer Phillips, "The Economic Benefits of Wilderness: Focus on Property Value Enhancement," The Wilderness Society, Ecology and Economics Research Department, no. 2 (March 2004)

<sup>52</sup> Rasker, *A New Look at Old Vistas: The Economic Role of Environmental Quality in Western Public Lands*, 379.

<sup>53</sup> Gundars Rudzitis, "Nonmetropolitan Geography: Migration, Sense of Place, and the American West," *Urban Geography* 14, no. 6 (1993): 574.

This paper employed regional adjustment models to analyze cause-and-effect relationships between local populations and economic growth. The results showed that economic growth, especially within the services industry, is driven by migration trends.<sup>54</sup> A different paper by Glaeser evaluated cities in the 2000 census with populations that were greater than 100,000 in 1990. Studying growth trends revealed that cities based upon the service industries grew faster than those based upon manufacturing. Higher median incomes and car-dependency, instead of public transportation, also supported faster growth. Western cities grew faster than cities in any other region, at an average rate of 19 percent.<sup>55</sup> These trends suggest that professional people have come to prefer less centralized, service-based cities in which to live. These aspects confirm a general preference for an environment with good quality of life factors being valued above good business-related elements.

Wildlands are important to Western society for a variety of reasons. They are a source of abundant natural resources. Timber, precious metals, oil, and gas all positively benefit local economies. Recently, however, the demand for raw materials has declined. The opportunity costs of preserving wildlands are not as significant as they were in Bob Marshall's time. Western communities have come to support service industries and the conservation of natural areas.

---

<sup>54</sup> Alexander C. Vias, "Jobs Follow People in the Rural Rocky Mountain West," *Rural Development Perspectives* 14, no. 2 (1999): 14.

<sup>55</sup> Edward L. Glaeser and Jesse M. Shapiro, "City Growth and the 2000 Census: Which Places Grew, and Why," The Brookings Institution, Center on Urban & Metropolitan Policy, (May 2001)

## Wildlands and Modern Lifestyles

People have come to see wild and open lands in a new light. They are no longer only valuable for the resources held within them. Ecologically intact areas have become quite important to people and businesses in the western United States.

As discussed in the previous chapter, good environmental quality has real drawing power. People value areas with good viewsheds and a minimum of crowding. People who move to the West are also drawn by the recreational opportunities that natural areas provide. From 1960 to 1996, annual visitor numbers in national forests grew from about 93 million to over 341 million, a change of 269%. Between 1960 and 2005, visitor numbers in National Parks increased 245%, from about 79 million to 270 million visitors annually. In 1965, about 3 million people visited our nation's Wilderness areas; by 1994, that figure had grown to just under 17 million.<sup>56</sup> The steep increases in visitor numbers have had significant impacts on nearby towns and cities. Revenue from tourism makes up a considerable portion of many local economies; communities near National Parks, National Monuments, and even ski areas largely survive on the tourist industry. These places also develop local economic frameworks by drawing people and businesses that appreciate the outdoors.

Public opinion concerning the use of public lands is the most revealing part of this cultural transition. Western communities have made it clear just how valuable wildlands are to them. Local movements have affected policies regarding the use of many open lands. Social values in the West are now based upon protection and preservation instead of development and extraction.

---

<sup>56</sup> Goldstein, *Wildlands Extractive Industries: An Economic Transition in the Rockies*

Oil and gas drilling has drawn considerable attention and criticism from western citizens, businesses, and environmental groups. Installing a drilling operation requires the construction of roads in addition to the rigs themselves. This can fragment wild landscapes, significantly diminishing the aesthetic value of some of these areas. This process can also critically affect wildlife through the degradation of habitat.

The Bureau of Land Management (BLM) issues more permits for oil and gas drilling than any other federal agency. The BLM is chartered to act as a responsible steward of the land. Instead, it has focused primarily on issuing permits.<sup>57</sup> From 1994 to 2003, the BLM issued 25,000 permits in Colorado, Montana, Wyoming, Utah, and New Mexico. From these permits, only 19,000 new wells have been created.<sup>58</sup> This surplus indicates the level of support the BLM offers to oil and gas drilling.

In some cases, the BLM has ignored public outcries against further drilling and habitat destruction. Areas like the Roan Plateau in Colorado and the Rocky Mountain Front in Montana are places of ecological significance as well as great natural beauty. In both cases, as well as many others, local citizens including ranchers and hunters have spoken out against further oil and gas development (see *Too Wild To Drill*, The Wilderness Society). Local citizens as well as Congressmen Salazar and Udall of Colorado have supported further protection of the Roan Plateau. In fact, of 75,000 public comments received, 98% were against opening the plateau to oil and gas development.<sup>59</sup> What is more, under the BLM's own assessments, 86% of available gas could be

---

<sup>57</sup> "Increased Permitting Activity has Lessened BLM's Ability to Meet its Environmental Protection Responsibilities," United States Government Accountability Office, Gas and Oil Development (June 2005)

<sup>58</sup> "Drilling in the Rocky Mountains? Not so Fast!: An Assessment of Surplus Drilling Permits & Leases on Federal Public Lands," The Wilderness Society, (April 11 2004)

<sup>59</sup> "Campaign Disappointed in BLM Decision to Immediately Lease Roan Plateau's Public Lands," in The Wilderness Society [database online]. June 8 [cited 2008]. Available from <http://www.wilderness.org/NewsRoom/Release/20070608.cfm>.

obtained without drilling directly into the ecologically important land on top of the plateau.<sup>60</sup> Despite the scientific evidence and lack of public support, the BLM began leasing its lands to gas developers in 2007.<sup>61</sup>

The 'Roadless Debate' has been another politically visible dispute concerning the protection of federal lands. President Clinton implemented the Roadless Area Conservation Rule in 2001. It gave additional protection to more than 58 million acres of land within National Forests. This rule was the product of about 20 years of development and public meetings. Over 600 meetings produced 1.7 million comments, 95 percent of which supported the protection of these areas.<sup>62</sup> In 2003, Wyoming U.S. District Court Judge Brimmer struck down the rule, citing violations of the National Environmental Policy Act (NEPA) as well as the Wilderness Act of 1964. This decision was appealed to the Tenth Circuit Court of Appeals; a California U.S. District Judge repealed it in 2006.<sup>63</sup> The debate has continued, however, leaving many Roadless Areas vulnerable to road development as well as extraction. Throughout the western United States, many voices have spoken out against the industries that threaten the ecological stability of Roadless wildlands.

An overwhelming majority of people would like to see further protection of western public lands. In 2007, Talmey-Drake Research & Strategy Inc. conducted a survey showing that most Colorado voters supported the protection of wilderness quality

---

<sup>60</sup> "86% of Plateau's Natural Gas Available without Drilling Top: Citizens Renew Push for Even-Handed Roan Plateau Plan," in Citizens' Campaign to Save Roan Plateau [database online]. February 24 [cited 2008]. Available from [www.saveroanplateau.org/press.htm](http://www.saveroanplateau.org/press.htm).

<sup>61</sup> *Campaign Disappointed in BLM Decision to Immediately Lease Roan Plateau's Public Lands*

<sup>62</sup> "Unwild America: If the Roadless Rule Doesn't Stand, We'll Soon be Out of Wilderness." in Field and Stream; The Greater Yellowstone Coalition [database online]. February 22 [cited 2008]. Available from [http://www.greateryellowstone.org/press/article.php?article\\_id=1618](http://www.greateryellowstone.org/press/article.php?article_id=1618).

<sup>63</sup> "Synopsis of Roadless Rule Court Decision," in The Wilderness Society [database online]. September 21 [cited 2008]. Available from <http://wilderness.org/OurIssues/Roadless/RoadlessDecisionSynopsis.cfm>.

lands. Talmey-Drake performed 617 random telephone calls to men and women across Colorado from a wide diversity of social and political backgrounds. Over 70 percent of those surveyed agreed that further wilderness should be protected for wildlife, recreation, and tourism purposes, while only 24 percent supported energy development and motorized recreation. The survey indicates that most Colorado citizens would support the designation of an additional one million acres of Wilderness. It was clear to most respondents that wildlands contribute both to local economies and to the identity of Colorado.<sup>64</sup> This widespread support for wildlands is no accident; people recognize that ecologically intact environments can provide considerable social and economic value.

Some communities have taken their support for wildland protection further. Local groups have collaborated with larger organizations to preserve ecologically important tracts of land. Working with companies such as the Trust for Public Land, communities, landowners, and local governments have been able to protect thousands of acres of land; this protection benefits local ecosystems and enhances the quality of recreation experiences as well.<sup>65</sup>

The success of western culture has come to rely upon the quality of nearby open lands. Wildlands support the quality of life that has drawn so many people to the western United States. They appreciate the natural beauty as well as the recreational opportunities that these lands offer. Still, the preservation of natural lands can impair the ability of some families to earn a living. There are still Western communities that are dependent upon natural resource extraction. For a family breadwinner who works in the timber industry, protecting a forest for the sake of 'ecological integrity' is not necessarily

---

<sup>64</sup> "Colorado Statewide Wilderness Poll," Talmey-Drake Research and Strategy, Inc.; The Wilderness Society, (May 2007)

<sup>65</sup> "The Trust for Public Land," [cited 2008]. Available from <http://www.tpl.org>.

a top priority. It is problematic to advocate preservation at the expense of people's livelihoods. However, as the standard of living increases and technology continues to develop, extractive practices are diminishing.

Cultural and natural amenities provide more than just monetary value. They continue to improve the quality of life that has become such an important element of contemporary life in the western United States. Citizens and their communities now recognize this value, and support for the preservation of wildlands has become prevalent throughout the West.

## CHAPTER 4

### ANALYSIS AND RESULTS

#### **The Models**

Regressions were performed to evaluate the relationship between preserved land and economic growth for the two periods analyzed in this paper. The following regression is carried out for each county type (Metropolitan, Semi-Urban, Rural-1, and Rural-2 counties, all defined in the introduction) for both the periods 1970-2000 and 2001-2005:

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10}$$

Y<sub>1</sub>: % Population Growth

Y<sub>2</sub>: % Income Growth

Y<sub>3</sub>: % Employment Growth

Y<sub>4</sub>: % Establishment Growth



The following are the independent variables that will be used in the regression equations:

X<sub>1</sub>: % Makeup as Wilderness Acres

X<sub>2</sub>: % Makeup as 1B Roadless Acres

X<sub>3</sub>: % Makeup as 1B-1 Roadless Acres

X<sub>4</sub>: % Makeup as 1C Roadless Acres

X<sub>5</sub>: % Makeup as NPS (National Park Service) Acres

X<sub>6</sub>: % Makeup as USFS (Forest Service) Acres

X<sub>7</sub>: % Makeup as FWS (Fish and Wildlife Service) Acres

X<sub>8</sub>: % Makeup as BLM (Bureau of Land Management) Acres

X<sub>9</sub>: % Change in Agricultural Income

X<sub>10</sub>: % Agricultural Income

### **Expected Results**

Here, the expected sign (positive/negative) and significance of each independent variable will be discussed:

- **% Makeup as Wilderness Acres (rural: positive, metro: negative)**: Past papers have shown that there is a positive and statistically significant correlation between Wilderness Acres and economic growth factors.<sup>66</sup> In addition, Wilderness areas attract significant amounts of tourism for recreation purposes. Land that is in proximity to Wilderness areas is more likely to be ecologically intact and aesthetically pleasing. As discussed in earlier chapters, this attracts immigration of people and businesses. Both of these stimulate local economies. On the other hand, counties with large tracts of

---

<sup>66</sup> Patrick F. Holmes and Walter E. Hecox, "Does Wilderness Impoverish Rural Regions?" *International Journal of Wilderness* 10, no. 3 (December 2004): 34.

wilderness may correspond to smaller urban areas. As such, when evaluating rural counties, I expect the coefficient on this independent variable to be positive and significant. The statistical significance, however, remains to be seen. In metropolitan counties, as development uses up the majority of available land, I expect the coefficient on this variable to be negative.

- **% Makeup as 1B Roadless Acres (uncertain):** 1B IRA's (Inventoried Roadless Areas) prohibit road construction and reconstruction. Although this contributes to the 'wild factor' of an area, it also limits direct access. Therefore, I will not presuppose either the sign or significance of this variable.

- **% Makeup as 1B-1 Roadless Acres (uncertain):** 1B-1 IRA's are recommended for Wilderness designation, in addition to prohibiting road construction and reconstruction. Once again, as access is difficult, the sign and significance of this variable are questionable.

- **% Makeup as 1C Roadless Acres (uncertain):** On 1C IRA's road construction and reconstruction is not prohibited. These areas are kept open to this type of development to account for existing mining and logging operations; access is easier, the environmental quality is uncertain. As with the other roadless variables, I will not presuppose the sign and significance of this variable.

- **% Makeup as NPS (National Park Service) Acres (positive):** As discussed in the background chapter, the National Park System draws great numbers of visitors every year. Many of the largest and most famous National Parks are in the western region being studied. I do not expect the parks to influence population significantly, as most nearby towns survive off of seasonal tourism. However, I believe that this revenue will

positively relate with other economic factors, especially income and employment. The statistical significance of this variable, on the other hand, is uncertain.

**-% Makeup as USFS (Forest Service) Acres (positive):** Like this country's National Park System, National Forests see large numbers of recreational visitors. Housing developments and towns often come right up to Forest Service areas. In addition, there are more National Forests distributed throughout the West than National Parks.<sup>67</sup> I therefore believe that the presence of National Forests can positively influence population as well as other economic factors. I also expect coefficients on this variable to be statistically significant.

**-% Makeup as FWS (Fish and Wildlife Service) Acres (positive):** The FWS contains some of the highest quality wildlands in the country. Wildlife tends to be plentiful in these areas, and many visitors come every year to see these animals. As such, I expect the coefficient on this variable to be positive. However, there are relatively few acres of FWS lands, relative to USFS lands, and they are widely dispersed. Therefore, I expect this variable to lack statistical significance in the majority of my equations.

**- % Makeup as BLM (Bureau of Land Management) Acres (positive):** Lands under the jurisdiction of the BLM range more widely than for other federal agencies. They are very popular for recreational use, but they also issue all permits for mining and gas/oil drilling on federal lands.<sup>68</sup> As a result, many BLM lands have become severely degraded, no longer fit for recreation or wildlife. I believe that BLM lands have much less influence on economic factors and population than do National Forests. Still,

---

<sup>67</sup> "GIS Data Layers," in *National Atlas of the United States* (United States Geological Survey, 2007),

<sup>68</sup> "Commercial use Activity on BLM-Managed Land, Fiscal Year 2002: Public Awards from Public Lands." in U.S. Department of the Interior [database online]. [cited 2008]. Available from <http://www.blm.gov/nhp/pubs/rewards/2003/data.htm>.

because of the sheer quantity and wide distribution throughout the West, they will be positively related with the growth that the region has experienced as a whole. I expect this correlation to produce statistically significant coefficients on the variable.

- **% Change in Agricultural Income (negative)**: This variable is used to account for the importance of some “Old West” economic activity to a region’s overall economy. If a local economy relies upon farming or ranching, agricultural income should increase alongside regional economic predictors. Overall, I believe that this variable will be negative. Whether or not it will be statistically significant is questionable.

- **% Agricultural Income (negative)**: This variable looks at the percent of total income brought in by agriculture. I expect population, income, employment, and establishments to be negatively related to this variable. Like the previous variable, statistically significance is questionable.

**Table 4.1** shows the variables that will be used, as well as whether they are predicted to be positive/negative:

<b>Variable</b>	<b>Positive or Negative</b>
Wilderness	+
1B Roadless	Uncertain
1B-1 Roadless	Uncertain
1C Roadless	Uncertain
NPS	+
USFS	+
FWS	+
BLM	+
Change in Ag. Income	-
% Ag. Income	-

**Table 4.1: EXPECTED SIGN ON VARIABLES**

## Statistical Framework

County level data for population, income, farming income, employment, and establishments are from the Regional Economic Information System (REIS) of the U.S. Bureau of Economic Analysis. Statistics for Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming were collected. These data were used to calculate percent growth for the periods from 1970 to 2000 and from 2001 to 2005. Economic statistics from 1969 to 2000 are grouped according to the Standard Industrial Classification (SIC). Statistics from 2001 to 2005, however, are under the North American Industry Classification System (NAICS). SIC codes and NAICS codes correspond imperfectly, making the accurate calculation of growth from 1970-2005 difficult. By evaluating the periods separately, I avoid this issue.<sup>69</sup> This also allows for the consideration of both short-term and long-term trends.

To represent 'Old West' industry, agricultural income was not my first choice. Agriculture is still widespread throughout the West and does not conflict with land preservation as much as extractive industries. I would have preferred to use income or employment from mining and/or forestry. Unfortunately, within the REIS database, these figures are unlisted for several counties. They are either under a certain level, undisclosed for proprietary reasons, or are simply unavailable for specific years. Data for agricultural income was more or less complete for the counties in my area of study. This way, all regressions will be performed based upon robust data sets. Data for the % Agricultural Income variable is from the last year in each period (2000 and 2005).

---

<sup>69</sup> Groupings under the two different classification systems do not match perfectly. See the U.S. Census Bureau 1997 NAICS and 1987 SIC Correspondence Tables: <http://www.census.gov/epcd/www/naicstab.htm>. Still, the classification codes are consistent enough to use the same variables for both periods.

Geographical Information System (GIS) software was used to map land classification layers over county layers. Metadata for county boundaries were from the U.S. Census Bureau. Boundary metadata for federal land types and Wilderness areas were downloaded from the National Atlas.<sup>70</sup> Of land classifications under the federal lands data layer, only BLM, FS, FWS, and NPS were used. Roadless Area boundaries metadata is from the Forest Service.<sup>71</sup>

Using GIS, the 11 states and their counties were selected. Then, counties along the Pacific coast in California, Oregon, and Washington were excluded. This produced the final set of 385 counties. Western counties were separated into the four categories (rural adjacent, rural nonadjacent, semi-urban, and metropolitan) according to 2000 Census populations and 2003 Rural-Urban Continuum Codes from the United States Department of Agriculture (USDA) Economic Research Service.<sup>72</sup> 2000 Census populations were part of the county layers used in GIS. Once this was done, the four final sets of data were complete. Metropolitan, Semi-Urban, Rural Adjacent, and Rural Nonadjacent sets consisted of 61, 221, 33, and 70 counties respectively.

**FIGURE 4.1** shows these counties divided into their respective types:

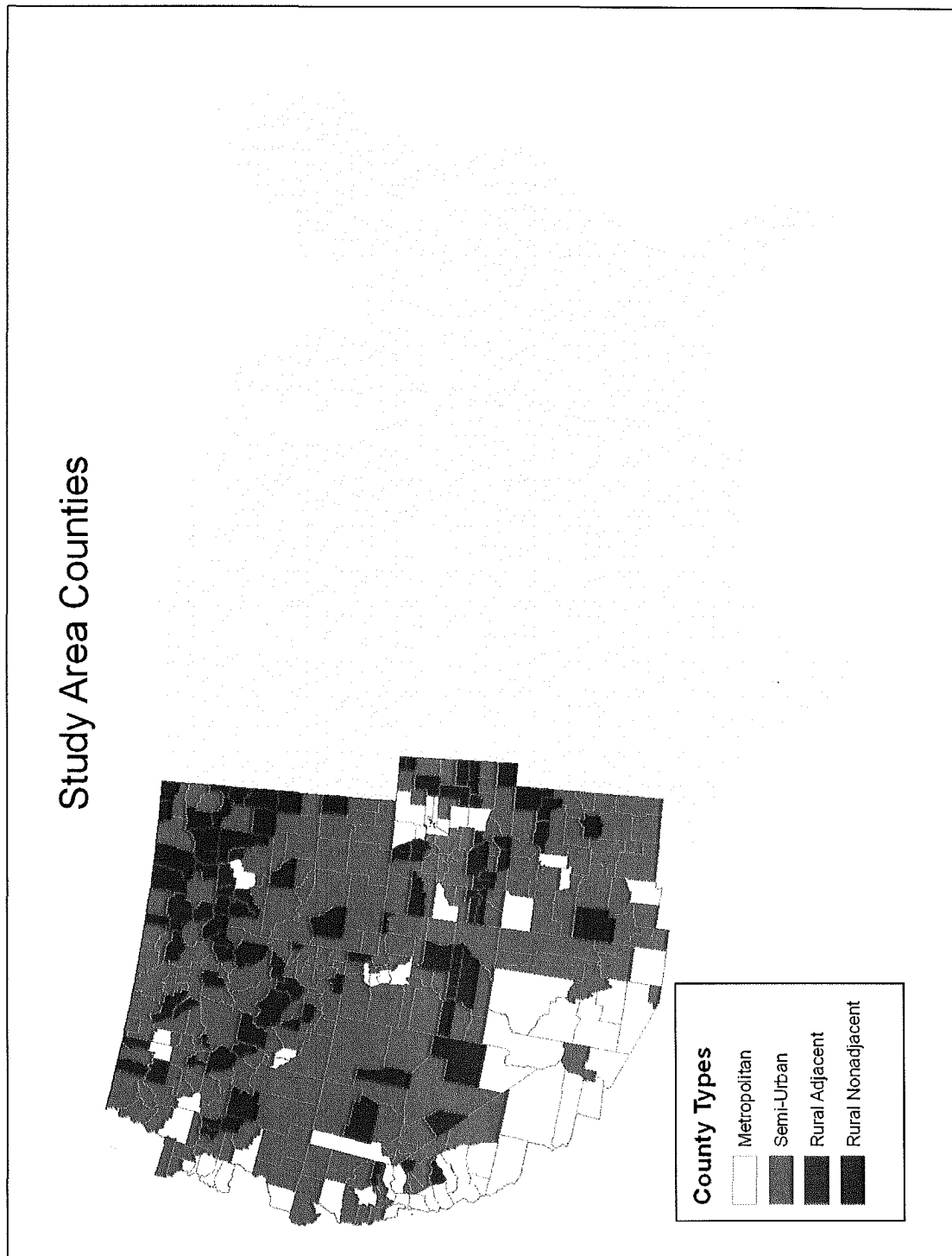
---

<sup>70</sup> *GIS Data Layers*

<sup>71</sup> "Roadless Area Conservation GIS Coverages," in USDA Forest Service [database online]. August 6 [cited 2008]. Available from <http://roadless.fs.fed.us/documents/feis/data/gis/coverages/index.shtml>.

<sup>72</sup> The 2003 Rural-Urban Continuum Codes were derived from 2000 Census results.

FIGURE 4.1: STUDY AREA COUNTIES BY TYPE



Source: U.S. Census GIS Data Layers, 2008





**TABLE 4.2: ORIGINAL MODEL 1970-2000: POPULATION**

Variable	County Type			
	Metropolitan	Semi-Urban	RuralAdjacent	RuralNonadjacent
Constant	131.8	74.87	10.33	2.58
Wilderness	-1.084	-0.4234	1.751***	-0.4342
B Roadless	-10.46	0.542	-1.45	-0.972
B-1 Roadless	2.4	-7.593	-12.55*	7.643***
C Roadless	8.025	1.027	0.582	-0.154
BLM	0.888	0.5818	1.238*	0.6889
FS	1.884	1.485	1.162	1.103
NPS	4.42	1.526	1.798	4.225
FWS	0.225	-9.29	-8.004	4.967
Farm Income	-0.2039	-0.0561**	0.0103	-0.0176
% Farm Inc.	5.75	-0.317	0.628	-0.6617
R <sup>2</sup>	12.8%	5.9%	55.7%	36.5%
R <sup>2</sup> -adjusted	0%	1.0%	31.1%	23.6%
F-statistic	0.7	1.2	2.3*	2.8***
n	60	202	29	60

(\*,\*\*,\*\*\* represent 10%, 5%, and 1% significance respectively)

**TABLE 4.3: ORIGINAL MODEL 1970-2000: INCOME**

Variable	County Type			
	Metropolitan	Semi-Urban	RuralAdjacent	RuralNonadjacent
Constant	1605.4	1092.5	471.7	548.6
Wilderness	-11.29	-4.012	12.613**	-4.145
B Roadless	-45.8	14.43	-10.67	-14.16
B-1 Roadless	97.0	-79.84	-126.8	49.28
C Roadless	73.73	15.78	16.23	-3.28
BLM	0.71	2.801	1.314	5.623
FS	16.64	12.19	10.81	10.467
NPS	14.94	11.14	6.66	32.67
FWS	-3.25	-106.9	-9.53	33.02
Farm Income	-1.728	-0.6048**	0.2315	-0.0773
% Farm Inc.	10.0	-4.95	-2.99	-6.52
R <sup>2</sup>	14.5%	8.0%	53.2%	19.3%
R <sup>2</sup> -adjusted	0%	3.2%	27.2%	2.9%
F-statistic	0.8	1.7*	2.1*	1.2
n	60	202	29	60

**TABLE 4.4: ORIGINAL MODEL 1970-2000: EMPLOYMENT**

Variable	County Type			
	Metropolitan	Semi-Urban	RuralAdjacent	RuralNonadjacent
Constant	244.6	123.6	24.99	20.28
Wilderness	-1.642	-0.846	2.643**	-0.384
B Roadless	-12.24	6.296	-0.575	-3.218
B-1 Roadless	-38.2	-21.22**	-23.26*	9.706
C Roadless	10.92	3.836	3.852	-0.995
BLM	0.031	0.259	0.346	2.455**
FS	3.313	2.561	1.605	2.155
NPS	3.66	1.505	0.693	4.831
FWS	-0.64	-14.48	-1.65	6.88
Farm Income	-0.2818	-0.1346***	0.0174	-0.0626
% Farm Inc.	-5.94	-0.478	-0.228	-0.396
R <sup>2</sup>	16.3%	11.9%	42.5%	23.0%
R <sup>2</sup> -adjusted	0%	7.2%	10.5%	7.3%
F-statistic	1.0	2.6***	1.3	1.5
n	60	202	29	60

**TABLE 4.5: ORIGINAL MODEL 1970-2000: ESTABLISHMENTS**

Variable	County Type			
	Metropolitan	Semi-Urban	RuralAdjacent	RuralNonadjacent
Constant	315.67	146.2	46.95	25.19
Wilderness	-0.283	-0.4668	1.41	1.09
B Roadless	-6.68	1.651	0.739	-3.971
B-1 Roadless	120.6	-12.85	-4.79	3.923
C Roadless	8.974	0.736	-0.176	-2.938
BLM	0.207	0.8222	-0.511	1.273
FS	1.47	3.415***	2.578	3.349**
NPS	1.801	3.72	10.37**	4.415
FWS	-3.869	-12.9	0.98	9.98
Farm Income	-0.138	-0.0895***	0.0276	-0.0491
% Farm Inc.	-27.0	-5.978	-4.37	-1.225
R <sup>2</sup>	27.0%	16.1%	71.1%	29.8%
R <sup>2</sup> -adjusted	12.1%	11.7%	56.0%	15.5%
F-statistic	1.8*	3.7***	4.6***	2.1**
n	60	202	29	60

These original equations from 1970 to 2000 immediately revealed some characteristics of each county type. For Metropolitan counties, no significant relationships emerged. In addition, F-statistics and R-squared values were low. Semi-Urban counties showed a statistically significant negative relationship between Agricultural Income and economic growth variables. In one case each, a significant relationship was seen for both the B-1 Roadless (negative) and for FS (positive) variables. F-statistics were significant, and R-squared values increased from Metropolitan counties. For both Metropolitan and Semi-Urban counties, the greatest adjusted R-squared values came out in the regression equations with Establishments Growth as the dependent variable.

Rural Adjacent and Nonadjacent counties showed that a variety of land designation variables were significantly related to economic growth indicators. Variables like Wilderness, BLM, FS, and NPS were positive related, where other variables like B-1 Roadless were negative for Rural Adjacent counties and positive for Nonadjacent counties. Of the four economic indicators, the Population equations showed the most significant individual relationships between land designation variables and the dependent variable. Like Metro and Semi-Urban counties, Establishments equations had the greatest R-squared values. Below are the ORIGINAL regressions equations between 2001 and 2005:

**TABLE 4.6: ORIGINAL MODEL 2001-2005: POPULATION**

Variable	County Type			
	Metropolitan	Semi-Urban	RuralAdjacent	RuralNonadjacent
Constant	6.202	2.366	-0.376	-4.373
Wilderness	-0.044	-0.0121	0.0894	-0.00085
B Roadless	-1.055*	0.094	0.1871	0.1464
B-1 Roadless	-2.085	-0.1444	0.3704	0.3636
C Roadless	0.1865	0.025	0.01381	0.0801
BLM	0.0511	0.0116	-0.0428	-0.0152
FS	0.1019	0.0159	-0.0562	0.0857
NPS	0.1199	0.1147	0.0478	0.3943
FWS	-0.1718	0.1621	-0.057	0.7565
Farm Income	-0.00347	0.00049	0.00198	0.00106
% Farm Inc.	0.7371*	-0.0853	-0.1547	-0.0235
R <sup>2</sup>	19.2%	3.4%	41.4%	31.7%
R <sup>2</sup> -adjusted	2.7%	0%	8.8%	18.3%
F-statistic	1.17	0.7	1.3	2.4**
n	60	204	29	62

**TABLE 4.7: ORIGINAL MODEL 2001-2005: INCOME**

Variable	County Type			
	Metropolitan	Semi-Urban	RuralAdjacent	RuralNonadjacent
Constant	17.93	19.59	14.34	21.73
Wilderness	0.0422	-0.0147	0.1806*	0.0141
B Roadless	-0.5275	-0.0007	0.1914	0.0624
B-1 Roadless	-1.611	0.2587	0.4413	0.1649
C Roadless	-0.0482	-0.0282	0.0909	0.299
BLM	0.1524*	0.0568	-0.0299	0.018
FS	0.1239	-0.00002	-0.099	-0.0953
NPS	-0.3299	0.1123	-0.0405	-0.3939
FWS	-0.5153	0.991	-0.556	-0.023
Farm Income	0.00128	0.00176	0.0147	0.00284
% Farm Inc.	1.145*	-0.1968*	-0.094	-0.5154***
R <sup>2</sup>	16.3%	5.5%	25.7%	23.5%
R <sup>2</sup> -adjusted	0%	0.6%	0%	8.5%
F-statistic	0.95	1.1	0.6	1.6
n	60	204	29	62

**TABLE 4.8: ORIGINAL MODEL 2001-2005: EMPLOYMENT**

Variable	County Type			
	Metropolitan	Semi-Urban	RuralAdjacent	RuralNonadjacent
Constant	6.066	5.971	6.843	5.82
Wilderness	-0.0111	-0.00336	0.0962	0.0577
B Roadless	-1.1543**	0.0158	0.2296	0.1694
B-1 Roadless	0.179	0.1079	0.2751	0.3122
C Roadless	0.0543	0.0564	0.2862	0.1512
BLM	0.1331**	0.0476**	-0.09158	0.0178
FS	0.1392*	-0.00359	-0.1804**	-0.0752
NPS	0.1025	0.1119	-0.1789	-0.1698
FWS	-0.14	0.2824	0.4466	0.3689
Farm Income	-0.00065	0.00062	-0.0092	0.00173
% Farm Inc.	0.1416	-0.2084**	-0.1411	-0.1377
R <sup>2</sup>	27.3%	8.2%	42.1%	23.4%
R <sup>2</sup> -adjusted	12.5%	3.4%	9.9%	8.3%
F-statistic	1.8*	1.72*	1.3	1.6
n	60	204	29	62

**TABLE 4.9: ORIGINAL MODEL 2001-2005: ESTABLISHMENTS**

Variable	County Type			
	Metropolitan	Semi-Urban	RuralAdjacent	RuralNonadjacent
Constant	6.066	5.971	10.63	8.457
Wilderness	-0.0111	-0.00336	0.0157	0.06782
B Roadless	-1.1543**	0.0158	0.1428	-0.0671
B-1 Roadless	0.179	0.1079	0.6121***	0.0927
C Roadless	0.0543	0.0564	0.1395	-0.1557*
BLM	0.1331**	0.0476**	0.0431	0.1207***
FS	0.1392*	-0.00359	-0.0953*	0.0972
NPS	0.1025	0.1119	0.0207	-0.2766
FWS	-0.14	0.2824	-0.6441	-/1303
Farm Income	-0.00065	0.00062	-0.0123*	-0.0023
% Farm Inc.	0.1416	-0.2084**	-0.0712	-0.12107*
R <sup>2</sup>	27.3%	8.2%	70.1%	41.3%
R <sup>2</sup> -adjusted	12.5%	3.4%	53.6%	29.8%
F-statistic	1.8*	1.72*	4.2***	3.6***
n	60	204	29	62

Between 2001 to 2005, Metropolitan counties exhibited characteristics very different from the earlier period. A variety of different land designation variables were significantly related to economic indicators. The coefficients on these variables were both positive and negative. Semi-Urban counties revealed statistically significant relationships between the BLM (positive) and % Farm Income (negative) variables and growth in Employment and Establishments. % Farm Income was negative and significantly related to Income growth as well. R-squared values were usually low, but Employment and Establishments regressions showed higher values.

Like the period between 1970 and 2000, Rural Adjacent and Nonadjacent counties exhibited a range of statistically significant relationships (both positive and negative) between land designation variables and economic growth indicators. The majority of these significant relationships emerged with Employment and Establishments as the dependent variables. Also like the earlier period, equations from Establishments regressions showed the highest R-squared values.

In the initial runs of these equations, many of the land designation variables are positive as well as statistically significant, supporting my hypothesis that open lands significantly influence local economies. On the other hand, some of the independent variables, such as BLM and FS, which I expected to have positive effects on economies, ended up with negative coefficients in a number of cases (whether statistically significant or not). Metropolitan and Semi-Urban counties showed significant relationships between economic indicators and farm-related variables (either Farm Income or % Farm Income) in both study periods. However, even the coefficients on these variables were negative.

## **Diagnostics and Discussion of Results**

Independent variables that showed signs of multicollinearity were accounted for (see **Appendix A**). The dependent variables were often highly correlated. This is not surprising as much economic growth directly stems from population growth.

Independent variables, however, showed little correlation with one another. Statistically insignificant variables were then tested for joint significance and then removed from the model.

The Reset Test was used to detect errors in functional form. From this I discovered that for most county types, squared and cubed fits were strongly statistically significant. I then carried out specific tests by inserting squared and cubed independent variables into the equations and ran the regressions; for certain regressions, I found that the Wilderness, BLM, and B-1 Roadless variables were statistically significant in Semi-Urban, Rural Adjacent, and Rural Nonadjacent counties when the variables were squared or cubed. It is very likely I did not find or use other independent variables derived from the squared and/or cubed fits of the equations. By trial and error, this process of discovery and elimination would require every combination of the variables for each of the 36 regressions that were performed.

I chose to use the modified White's Test to detect heteroskedasticity. Equations that exhibited heteroskedasticity were estimated again using robust standard errors. The FINAL versions of the regression equations exclude statistically insignificant variables. These equations are presented below in **TABLES 4.10-4.17**:

**TABLE 4.10: FINAL MODEL 1970-2000: POPULATION**

Variable	County Type			
	Metropolitan	Semi-Urban	RuralAdjacent	RuralNonadjacent
Constant	160.9	85.72	24.45	-2.405
Wilderness	-	-	6.054***	-
(Wilderness) <sup>2</sup>	-	-	-0.06053***	-
B Roadless	-	-	-	-
B-1 Roadless	-	-	-	6.509***
C Roadless	9.885**	-	-	-
BLM	-	-	-	0.9067***
FS	-	1.142*	-	0.8796*
NPS	-	-	-	-
FWS	-	-	-	-
Farm Income	-0.1916**	-0.05706*	-	-
% Farm Inc.	-	-	-	-
R <sup>2</sup>	11.2%	4.3%	57.1%	27.5%
R <sup>2</sup> -adjusted	8.1%	3.3%	54.2%	24.2%
F-statistic	3.6**	4.5**	19.9***	8.3***
n	60	203	33	70

(\* , \*\* , \*\*\* represent 10%, 5%, and 1% significance respectively)

**TABLE 4.11: FINAL MODEL 1970-2000: INCOME**

Variable	County Type			
	Metropolitan	Semi-Urban	RuralAdjacent	RuralNonadjacent
Constant	1723.1	1118.2	391.4	326.4
Wilderness	-	-	53.49***	-
(Wilderness) <sup>2</sup>	-	-	-0.5643***	-
B Roadless	-	-	-	-
B-1 Roadless	-	-	-	-
C Roadless	92.93**	-	12.89*	-
BLM	-	-	-	31.49**
(BLM) <sup>2</sup>	-	-	-	-0.3151*
FS	-	11.92**	-	6.353*
NPS	-	-	-	-
FWS	-	-	-	-
Farm Income	-1.863**	-0.6359**	-	-
% Farm Inc.	-	-	-	-
R <sup>2</sup>	13.6%	5.9%	63.9%	21.2%
R <sup>2</sup> -adjusted	10.5%	5.1%	60.1%	17.6%
F-statistic	4.5**	6.4***	17.1***	5.9***
n	60	203	33	70



**TABLE 4.12: FINAL MODEL 1970-2000: EMPLOYMENT**

Variable	County Type			
	Metropolitan	Semi-Urban	RuralAdjacent	RuralNonadjacent
Constant	262.5	126.8	-0.97	14.49
Wilderness	-	-	13.51***	-
(Wilderness) <sup>2</sup>	-	-	-0.1436***	-
B Roadless	-	-	-	-
B-1 Roadless	-	-18.42*	-	-
C Roadless	15.145	-	4.662***	-
BLM	-	-	-	2.399**
FS	-	3.575**	-	1.8303**
NPS	-	-	-	-
FWS	-	-	-	-
Farm Income	-0.3302	-0.1423*	-	-
% Farm Inc.	-	-	-	-
R <sup>2</sup>	14.8%	10.5%	70.8%	17.3%
R <sup>2</sup> -adjusted	11.8%	9.2%	67.8%	14.8%
F-statistic	4.9***	7.8***	23.4***	6.9***
n	60	203	33	70

**TABLE 4.13: FINAL MODEL 1970-2000: ESTABLISHMENTS**

Variable	County Type			
	Metropolitan	Semi-Urban	RuralAdjacent	RuralNonadjacent
Constant	322.9	167.7	-13.75	17.78
Wilderness	-	-	7.994***	-
(Wilderness) <sup>2</sup>	-	-	-0.08694**	-
B Roadless	-	-	-	-
B-1 Roadless	-	-12.09	-	-
C Roadless	11.479	-	-	-
BLM	-	-	-	1.577**
FS	-	3.263***	3.154***	2.684***
NPS	-	-	9.407***	-
FWS	-	-	-	-
Farm Income	-	-0.0887*	-	-0.08367*
% Farm Inc.	-39.78***	-6.908**	-	-
R <sup>2</sup>	23.1%	15.0%	80.2%	24.7%
R <sup>2</sup> -adjusted	20.4%	13.3%	77.4%	20.7%
F-statistic	8.7***	8.7***	28.4***	6.1***
n	61	202	33	60

The final regression equations for the period between 1970 and 2000 for Metropolitan counties were very similar for all four economic measures. The C Roadless (positive) and Farm Income (negative) variables are significantly related to economic growth three of the four dependent variables. In the Establishments equation, % Farm Income replaced Farm Income. Both C Roadless and Farm Income lost their significance to Employment growth after running the equation with robust standard errors to account for heteroskedasticity. R-squared values ranged between about 10 and 20 percent.

In Semi-Urban counties, the FS (positive) and Farm Income (negative) variables are statistically significant in all four equations. Other variables, B-1 Roadless and % Farm Income, came out to be significant in the Employment and Establishments equations respectively. R-squared values are actually lower than those for Metropolitan counties in all four cases.

Wilderness (positive) and Wilderness<sup>2</sup> (negative) variables were significantly related to growth for all four economic measures in Rural Adjacent counties. C Roadless is positive and statistically significant in the equations where Income and Employment are the dependent variables. FS and NPS are positive and statistically significant for growth in Establishments. Adjusted R-squared values are quite good, between 54 and 77 percent, the highest with Establishments as the dependent variable.

In Rural Nonadjacent counties, the BLM and FS variables are significant and positive for all four dependent variables. Also, B-1 Roadless (positive), BLM<sup>2</sup> (positive), and Farm Income (negative) are statistically significant in Population, Income, and Establishments equations respectively. R-squared values ranged between about 15 and 25 percent.

**TABLE 4.14: FINAL MODEL 2001-2005: POPULATION**

Variable	County Type			
	Metropolitan	Semi-Urban	RuralAdjacent	RuralNonadjacent
Constant	7.556	1.9741	-0.211	-3.387
Wilderness	-	-	0.07247*	-
B Roadless	-1.3224**	-	-	-
B-1 Roadless	-	-	0.3573	-
(B-1) <sup>3</sup>	-	-	-	0.001373***
C Roadless	-	-	-	-
BLM	-	-	-	-
FS	0.12622**	0.0694**	-	0.1067***
(FS) <sup>3</sup>	-	-0.00001*	-	-
NPS	-	-	-	-
FWS	-	-	-	-
Farm Income	-	-	-	-
% Farm Inc.	-	-	-	-
R <sup>2</sup>	9.8%	2.2%	18.5%	24.1%
R <sup>2</sup> -adjusted	6.7%	1.3%	13.1%	21.9%
F-statistic	3.17**	2.4*	3.41**	10.65***
n	61	221	33	70

**TABLE 4.15: FINAL MODEL 2001-2005: INCOME**

Variable	County Type			
	Metropolitan	Semi-Urban	RuralAdjacent	RuralNonadjacent
Constant	19.411	18.7482	13.074	20.438
Wilderness	-	-	0.17427***	-
B Roadless	-	-	-	-
B-1 Roadless	-	-	-	-
C Roadless	-	-	-	-
BLM	0.0751	0.07751***	-	0.07008
FS	-	-	-	-
NPS	-	-	-	-
FWS	-	-	-	-
Farm Income	-	-	-	-
% Farm Inc.	0.8961**	-0.3154***	-	-0.5624***
R <sup>2</sup>	5.8%	7.1%	20.1%	22.2%
R <sup>2</sup> -adjusted	2.6%	6.2%	17.6%	19.9%
F-statistic	1.81	8.28***	7.81***	9.56
n	61	220	33	70

**TABLE 4.16: FINAL MODEL 2001-2005: EMPLOYMENT**

Variable	County Type			
	Metropolitan	Semi-Urban	RuralAdjacent	RuralNonadjacent
Constant	5.891	6.3627	4.619	6.885
Wilderness	-	-	0.08216*	-
B Roadless	-1.2**	-	0.37**	-
B-1 Roadless	-	-	0.4706†	-
(B-1) <sup>3</sup>	-	-	-	0.0014092**
C Roadless	-	0.0922**	-	-
BLM	0.13173***	-	-	-
(BLM) <sup>3</sup>	-	0.000012**	-	-
FS	0.1616***	-	-0.12658**	-
NPS	-	-	-	-
FWS	-	-	-	-
Farm Income	-	-	-	-
% Farm Inc.	-	-0.22759***	-	-0.17948**
R <sup>2</sup>	25.4%	8.3%	26.5%	17.4%
R <sup>2</sup> -adjusted	21.5%	7.1%	16%	14.9%
F-statistic	6.47***	6.55%	2.53*	7.04***
n	61	220	33	70

† (significant at 11% level)

**TABLE 4.17: FINAL MODEL 2001-2005: ESTABLISHMENTS**

Variable	County Type			
	Metropolitan	Semi-Urban	RuralAdjacent	RuralNonadjacent
Constant	17.0983	10.91	11.25	8.34
Wilderness	-	-	-	0.08183***
B Roadless	-	-	-	-
B-1 Roadless	-	-	0.4832***	1.7972
(B-1) <sup>3</sup>	-	-	-	-0.004261
C Roadless	-	-	0.1975*	-
BLM	0.10244***	0.05743**	-	0.09851***
FS	-	0.05224***	-0.07681*	-
NPS	-	-	-	-
FWS	-	-	-	-
Farm Income	-	-	-0.019973***	-
% Farm Inc.	-0.6769***	-0.2421***	-	-0.15334***
R <sup>2</sup>	31.1%	14.5%	62.7%	46.6%
R <sup>2</sup> -adjusted	28.7%	13.3%	56.5%	42.4%
F-statistic	13.08***	12.22***	10.09***	11.15
n	61	220	29	70

Regression equations for Metropolitan counties showed that the BLM (positive) and % Farm Income (negative) variables are significantly related to Income and Establishments growth. BLM was also significantly related to Employment growth. B Roadless (negative) and FS (positive) variables are significantly related to Population and Employment growth. R-squared values are reasonably significant for the Employment and Establishments equations.

Semi-Urban counties showed significant relationships between economic growth and a variety of land designation variables. FS and FS<sup>3</sup> are positive and statistically significant in the Population equation. BLM and BLM<sup>3</sup> are positive and significant in the Income equation. Both are significant in the Establishments equation as well. % Farm Income is statistically significant and negative in the Employment and Establishments equations. R-squared values were low, the highest being in the teens in the Establishment equation.

Rural Adjacent counties painted an interesting picture. Wilderness and B-1 Roadless are positive and significantly related to growth in Population and Employment. Wilderness is also significant to Income growth, but this came down to a univariate regression. The exact relationship cannot, therefore, be interpreted from this equation. However, from the significant and positive relationship Wilderness has to other economic indicators, we can infer a consistent effect across the four economic measures. FS is negative and significantly related to Employment and Establishment growth. This is the one of few land designation variables to show these effects. B Roadless is positive and significant to Employment growth. C Roadless (positive) and % Farm Income (negative) were significant to Establishments growth. R-squared values were low for the most part

(about 15 percent), except for Establishments, which had an adjusted R-squared value of over 56 percent.

A variety of variables are significant in Rural Nonadjacent counties as well. B-1<sup>3</sup> is significant to growth in Population, Employment, and Establishments, positive in the first two, and negative for Establishments. FS and BLM are positive and significant to Population growth and Establishment growth respectively, and % Farm Income is negative and significant to Income, Employment, and Establishment growth. R-squared values were about 20 percent for Population, Income, and Employment. The R-squared value for Establishment growth was higher, at over 42 percent.

Coefficients on almost all land designation variables are statistically significant and, more importantly, positive. The exceptions are the FS, Wilderness<sup>2</sup>, BLM<sup>2</sup>, and B-1<sup>3</sup> variables where they appear within most of the Rural Adjacent and Rural Nonadjacent regressions for both time periods. In addition, the statistically significant Farm Income and % Farm Income variables were negative for nearly all of the regression equations. The exception was the effect of % Farm Income on Income in Metropolitan counties from 2001-2005. These results support my hypothesis that western economies benefit from the presence of wildlands, and no longer depend on extractive industries.

Discovering variables that held statistical significance to the selected economic indicators was the most important goal of this study. However, it is also essential to evaluate the actual effects that coefficients have on the dependent variables. The land designation variables are formatted as percentages of land area, and the dependent variables are expressed as growth percentages. For example, a coefficient of positive one on the Wilderness variable indicates that for every percent increase in land designated as

Wilderness, growth in the economic indicator increased by one percent as well. In addition, when the dependent variable is measured in tens or hundreds of thousands, one hundredth of a percent still amounts to a unit change of 100 or 1000 respectively.

The R-squared values that came out for the regression equations, especially those of Rural Adjacent counties, were quite significant. Rural Nonadjacent counties also had reasonably significant R-squared values. Metropolitan and Semi-Urban counties had relatively low R-squared values. However, I did not expect high R-squared values when the study began. I could not assume that the presence of wildlands would explain considerable amounts of the variance within economic growth variables. There are a variety of other factors that certainly have more direct and significant effects on income and employment for example, especially within more urban county types. This paper is not attempting to analyze these factors, so I was not concerned explicitly with R-squared values. These other factors are significant, but revealing statistically significant relationships between economic growth and land designations was the real goal. However, the relatively high R-squared values that did emerge in several regression equations were encouraging, especially for Establishments growth. This supports Johnson and Rasker's hypothesis stating that the presence of wildlands attracts businesses to create a good entrepreneurial environment.<sup>73</sup> These significant R-squared values indicate that in some areas, economies may be strongly linked to the amount and quality of nearby wildlands.

Another issue that I encountered was that upon removing variables from certain equations, other variables would simultaneously lose their significances. In some cases,

---

<sup>73</sup> Jerry J. Johnson and Raymond Rasker, "The Role of Economic and Quality of Life Values in Rural Business Location," *Journal of Rural Sciences* 11, no. 4 (1995): 405.

this led to the possibility of univariate regressions. To avoid this, I left the last somewhat significant variable in, although this skews the analysis. In another case, Employment Growth was set against the two remaining significant independent variables; the resulting equation was heteroskedastic. When robust standard errors were calculated, both independent variables lost their significance. The regression results in these cases, therefore, cannot be used to evaluate the underlying relationships. They are still indicative of the general effects that land designation has on economic growth.

Despite these issues, the majority of the results support my hypothesis. Larger amounts of federally protected lands are significantly related to economic growth. As previous studies have shown, this is especially true in rural areas. This study confirms this and also reveals the link between the presence of protected land and economic growth in Semi-Urban and Metropolitan counties within the western United States. These relationships, although not as strong as in rural counties, show the importance of wildlands to local economic success in towns large and small throughout the West.



## **CHAPTER 5**

### **CONCLUSION**

Since the time of ‘Manifest Destiny,’ the natural landscapes of the western United States have provided people with the means to live and to succeed economically. In the 1800s and through much of the 1900s, abundant natural resources provided this means. Timber, metal, and petroleum products created jobs; people still make a living extracting, processing, and selling these products. Western open lands were the perfect opportunity to start a successful extractive enterprise. Many companies continue to do so today; they employ tens of thousands of people and inject millions of dollars into local economies.

Recently however, trends have shown that intact wildlands are worth more to people and society than the raw materials they hold. Past research has shown that there is a statistically significant correlation between the presence of federally protected lands and economic growth in rural areas. This study hypothesizes that local communities and economies of all types can benefit from the presence of wildlands. By taking federal designation variables and running them against economic variables, I obtained results that support this hypothesis. The results show that there are positive statistically significant relationships between natural landscapes and growth in levels of population, income, employment, and establishments. In addition, R-squared values indicate that the independent variables could be used to explain considerable amounts of the variance

exhibited by the economic dependent variables. In particular, growth in the number of establishments shows that the presence of a quality environment can be an important factor in business-location decisions.

These significant relationships do not, however, indicate that the presence of wildlands *causes* economic growth and vitality. There are a variety of factors that promote immigration as well as successful businesses. Contemporary research has made it clear that wildlands may be related to this success. The factors that encourage the protection of land may also help to draw people and create a lucrative economic base. Still, the relationship between natural landscapes and quality of life is unmistakable. By advancing this standard of living, it is very possible that the presence of protected wildlands is a causal factor when considering economic growth.

Further study, of course, is required to clarify this relationship. One issue that this paper did not directly address is levels of community affluence. This can give an indication of not only how well the economy is doing, but also how successful the members of the community have become. Including per capita income growth as a dependent variable could do this. Time-series analysis could also be performed; if up to date archives existed for the quantities of federal land in each county and the relative changes in acreage (if any), it would provide a great statistical data set for this type of research. Better organization and identification of economic bases and the regions that exhibit them would also contribute to research in this field. By separating existing economies into further subdivisions, more precise analysis could be performed regarding the relationships between the presence of protected land and economic growth.

The understanding of the relationship between protected land and economic growth is continuing to develop. It will afford us the opportunity to make more educated decisions concerning the future use of wildlands. By showing how valuable these natural landscapes are to local economies and the people they support, we can continue to foster economic and cultural success in the American West.

## APPENDIX: CORRELATION BETWEEN INDEPENDENT VARIABLES

### A.1: Metropolitan Counties (1970-2000)

	Wilderness	B	B_1	C	BLM
B	0.193 0.135				
B_1	-0.043 0.743	0.268 0.037			
C	-0.004 0.977	0.083 0.524	0.087 0.505		
BLM	0.051 0.698	-0.219 0.089	-0.106 0.416	-0.009 0.946	
FS	0.254 0.048	0.599 0.000	0.409 0.001	0.437 0.000	-0.226 0.079
NPS	0.546 0.000	0.077 0.553	0.030 0.817	-0.033 0.803	0.335 0.008
FWS	0.154 0.235	-0.166 0.202	-0.074 0.570	-0.146 0.262	0.172 0.186
FMINC70_00	0.238 0.067	0.003 0.980	0.005 0.970	-0.094 0.474	0.136 0.301
%AG_00	0.387 0.002	-0.166 0.202	-0.130 0.320	-0.161 0.214	-0.052 0.689
	FS	NPS	FWS	FMINC70_00	
NPS	0.049 0.706				
FWS	-0.294 0.021	0.028 0.830			
FMINC70_00	-0.100 0.447	0.088 0.506	0.130 0.324		
%AG_00	-0.191 0.141	0.063 0.630	0.247 0.055	0.471 0.000	

\*\*\*CELL CONTENTS: Pearson Correlation  
P-Value

## A.2: Semi-Urban Counties (1970-2000)

	Wilderness	B	B_1	C	BLM
B	0.496 0.000				
B_1	0.199 0.003	0.242 0.000			
C	0.245 0.000	0.259 0.000	0.347 0.000		
BLM	-0.173 0.010	-0.206 0.002	-0.097 0.150	-0.043 0.521	
FS	0.504 0.000	0.550 0.000	0.363 0.000	0.614 0.000	-0.279 0.000
NPS	0.211 0.002	0.036 0.594	0.054 0.425	0.037 0.586	0.022 0.748
FWS	-0.065 0.338	-0.055 0.418	-0.026 0.701	-0.063 0.352	0.156 0.020
FMINC70_00	-0.130 0.064	-0.038 0.593	-0.045 0.524	-0.153 0.029	0.036 0.609
%AG_00	-0.172 0.011	-0.143 0.034	-0.111 0.104	-0.222 0.001	-0.028 0.686
	FS	NPS	FWS	FMINC70_00	
NPS	0.060 0.376				
FWS	-0.105 0.120	-0.033 0.629			
FMINC70_00	-0.037 0.603	-0.039 0.577	0.074 0.297		
%AG_00	-0.291 0.000	-0.085 0.212	0.126 0.063	0.325 0.000	

### A.3: Rural Adjacent Counties (1970-2000)

	Wilderness	B	B_1	C	BLM
B	0.168 0.350				
B_1	0.140 0.436	0.205 0.251			
C	0.095 0.601	0.502 0.003	0.585 0.000		
BLM	-0.226 0.206	-0.069 0.701	-0.137 0.446	-0.039 0.831	
FS	0.323 0.067	0.519 0.002	0.595 0.000	0.792 0.000	-0.248 0.164
NPS	0.305 0.084	-0.066 0.715	-0.083 0.648	0.011 0.949	0.031 0.863
FWS	-0.111 0.538	-0.139 0.441	-0.078 0.667	-0.175 0.331	0.591 0.000
FMINC70_00	-0.025 0.896	0.026 0.891	0.054 0.777	-0.085 0.656	0.144 0.448
%AG_00	-0.289 0.109	-0.248 0.171	0.029 0.873	-0.190 0.299	0.045 0.806
	FS	NPS	FWS	FMINC70_00	
NPS	-0.019 0.915				
FWS	-0.187 0.299	-0.063 0.729			
FMINC70_00	-0.435 0.016	-0.168 0.375	0.064 0.739		
%AG_00	-0.420 0.017	-0.157 0.392	-0.068 0.711	0.511 0.005	

## A.4: Rural Nonadjacent Counties (1970-2000)

	Wilderness	B	B_1	C	BLM
B	0.640 0.000				
B_1	0.082 0.498	0.416 0.000			
C	0.657 0.000	0.432 0.000	0.160 0.187		
BLM	-0.002 0.984	-0.091 0.454	0.019 0.878	0.162 0.180	
FS	0.676 0.000	0.610 0.000	0.199 0.099	0.617 0.000	-0.049 0.684
NPS	-0.067 0.581	-0.066 0.588	-0.045 0.712	0.092 0.451	0.292 0.014
FWS	-0.086 0.478	-0.110 0.365	-0.058 0.632	-0.127 0.294	0.055 0.654
FMINC70_00	-0.250 0.054	-0.086 0.513	-0.133 0.312	0.020 0.882	0.299 0.020
%AG_00	-0.284 0.018	-0.215 0.075	-0.090 0.461	-0.244 0.043	-0.090 0.464
	FS	NPS	FWS	FMINC70_00	
NPS	0.030 0.805				
FWS	-0.198 0.100	-0.062 0.611			
FMINC70_00	-0.208 0.110	0.122 0.354	-0.030 0.819		
%AG_00	-0.386 0.001	-0.053 0.666	0.074 0.544	0.466 0.000	

## A.5: Metropolitan Counties (2001-2005)

	Wilderness	B	B_1	C	BLM
B	0.193 0.135				
B_1	-0.043 0.743	0.268 0.037			
C	-0.004 0.977	0.083 0.524	0.087 0.505		
BLM	0.051 0.698	-0.219 0.089	-0.106 0.416	-0.009 0.946	
FS	0.254 0.048	0.599 0.000	0.409 0.001	0.437 0.000	-0.226 0.079
NPS	0.546 0.000	0.077 0.553	0.030 0.817	-0.033 0.803	0.335 0.008
FWS	0.154 0.235	-0.166 0.202	-0.074 0.570	-0.146 0.262	0.172 0.186
FMINC01_05	0.068 0.603	-0.037 0.777	0.083 0.528	-0.026 0.842	-0.001 0.992
%AG_05	0.438 0.000	-0.132 0.310	-0.123 0.345	-0.128 0.324	-0.093 0.477
	FS	NPS	FWS	FMINC01_05	
NPS	0.049 0.706				
FWS	-0.294 0.021	0.028 0.830			
FMINC01_05	-0.018 0.891	0.159 0.224	-0.036 0.786		
%AG_05	-0.142 0.274	0.096 0.461	0.223 0.084	0.053 0.688	



## A.6: Semi-Urban Counties (2001-2005)

	Wilderness	B	B_1	C	BLM
B	0.496 0.000				
B_1	0.199 0.003	0.242 0.000			
C	0.245 0.000	0.259 0.000	0.347 0.000		
BLM	-0.173 0.010	-0.206 0.002	-0.097 0.150	-0.043 0.521	
FS	0.504 0.000	0.550 0.000	0.363 0.000	0.614 0.000	-0.279 0.000
NPS	0.211 0.002	0.036 0.594	0.054 0.425	0.037 0.586	0.022 0.748
FWS	-0.065 0.338	-0.055 0.418	-0.026 0.701	-0.063 0.352	0.156 0.020
FMINC01_05	0.046 0.510	0.029 0.678	0.024 0.737	0.081 0.247	0.032 0.650
%AG_05	-0.168 0.012	-0.166 0.014	-0.107 0.113	-0.223 0.001	0.032 0.642
	FS	NPS	FWS	FMINC01_05	
NPS	0.060 0.376				
FWS	-0.105 0.120	-0.033 0.629			
FMINC01_05	0.005 0.944	-0.027 0.701	-0.036 0.611		
%AG_05	-0.311 0.000	-0.093 0.168	0.102 0.132	0.094 0.182	

## A.7: Rural Adjacent Counties (2001-2005)

	Wilderness	B	B_1	C	BLM
B	0.168 0.350				
B_1	0.140 0.436	0.205 0.251			
C	0.095 0.601	0.502 0.003	0.585 0.000		
BLM	-0.226 0.206	-0.069 0.701	-0.137 0.446	-0.039 0.831	
FS	0.323 0.067	0.519 0.002	0.595 0.000	0.792 0.000	-0.248 0.164
NPS	0.305 0.084	-0.066 0.715	-0.083 0.648	0.011 0.949	0.031 0.863
FWS	-0.111 0.538	-0.139 0.441	-0.078 0.667	-0.175 0.331	0.591 0.000
FMINC01_05	-0.372 0.047	-0.480 0.008	-0.259 0.175	-0.297 0.117	-0.028 0.886
%AG_05	-0.269 0.137	-0.195 0.286	-0.054 0.768	-0.109 0.552	-0.026 0.886
	FS	NPS	FWS	FMINC01_05	
NPS	-0.019 0.915				
FWS	-0.187 0.299	-0.063 0.729			
FMINC01_05	-0.402 0.031	-0.065 0.739	0.241 0.209		
%AG_05	-0.248 0.172	-0.067 0.714	0.001 0.996	0.276 0.147	

## A.8: Rural Nonadjacent Counties (2001-2005)

	Wilderness	B	B_1	C	BLM
B	0.640 0.000				
B_1	0.082 0.498	0.416 0.000			
C	0.657 0.000	0.432 0.000	0.160 0.187		
BLM	-0.002 0.984	-0.091 0.454	0.019 0.878	0.162 0.180	
FS	0.676 0.000	0.610 0.000	0.199 0.099	0.617 0.000	-0.049 0.684
NPS	-0.067 0.581	-0.066 0.588	-0.045 0.712	0.092 0.451	0.292 0.014
FWS	-0.086 0.478	-0.110 0.365	-0.058 0.632	-0.127 0.294	0.055 0.654
FMINC01_05	-0.089 0.492	-0.112 0.386	-0.045 0.726	-0.058 0.655	0.015 0.910
%AG_05	-0.301 0.011	-0.267 0.026	-0.162 0.181	-0.243 0.043	-0.095 0.435
	FS	NPS	FWS	FMINC01_05	
NPS	0.030 0.805				
FWS	-0.198 0.100	-0.062 0.611			
FMINC01_05	-0.053 0.683	-0.025 0.845	-0.098 0.447		
%AG_05	-0.403 0.001	-0.092 0.447	0.128 0.293	-0.007 0.956	

## SOURCES CONSULTED

### Empirical Studies

- "Population Growth, Economic Security, and Cultural Change in Wilderness Counties."  
*USDA Forest Service Proceedings, RMRS, P-15 2* (2000): 230.
- Costanza, Robert, Ralph d'Arge, Rudolf de Groot, Stephen Farberk, Monica Grasso, Bruce Hannon, Karin Limburg, Shahid Naeem, Robert V. O'Neill, Jose Paruelo, Robert G. Raskin, Paul Suttonk, and van den Belt, Marjan. "The Value of the World's Ecosystem Services and Natural Capital." *Nature* 387 (1997): 253.
- Duffy-Deno, Kevin T. "The Effect of Federal Wilderness on County Growth in the Intermountain Western United States." *Journal of Regional Science* 38, no. 1 (1998): 109.
- Glaeser, Edward L., and Jesse M. Shapiro. "City Growth and the 2000 Census: Which Places Grew, and Why." The Brookings Institution, Center on Urban & Metropolitan Policy. (May 2001).
- Holmes, Patrick F., and Walter E. Hecox. "Does Wilderness Impoverish Rural Regions?" *International Journal of Wilderness* 10, no. 3 (December 2004): 34.
- Johnson, Jerry J., and Raymond Rasker. "The Role of Economic and Quality of Life Values in Rural Business Location." *Journal of Rural Sciences* 11, no. 4 (1995): 405.
- Krieger, Douglas J. "Economic Value of Forest Ecosystem Services: A Review." The Wilderness Society. (March 2001).
- Loomis, John B., and Robert Richardson. "Economic Values of Protecting Roadless Areas in the United States." Colorado State University, Department of Agricultural and Resource Economics; The Wilderness Society, Heritage Forests Campaign. (June 2000).
- Loomis, John B., and Robert Richardson. "Economic Values of the U.S. Wilderness System." *International Journal of Wilderness* 7, no. 1 (April 2001): 31.
- Phillips, Spencer. "The Economic Benefits of Wilderness: Focus on Property Value Enhancement." The Wilderness Society, Ecology and Economics Research Department, no. 2 (March 2004).

Rasker, Raymond. "A New Look at Old Vistas: The Economic Role of Environmental Quality in Western Public Lands." *University of Colorado Law Review* 65, no. 2 (1994): 371.

Rudzitis, Gundars. "Nonmetropolitan Geography: Migration, Sense of Place, and the American West." *Urban Geography* 14, no. 6 (1993): 574.

Skonhoft, Anders, and Håvard Solem. "Economic Growth and Land-use Changes: The Declining Amount of Wilderness Land in Norway. Ecological Economics. Vol. 37. 2001. Pp. 289-301." *Ecological Economics* 37 (2001): 289.

#### Scholarly Articles

Goldstein, Brandon. "Wildlands and the Demise of Extractive Industries: An Economic Transition in the Rockies." *The Colorado College State of the Rockies Report Card* (April 2008).

Hardin, Garret. "The Tragedy of the Commons." *Science* 162 (1968): 1243.

Marshall, Bob. "The Problem of the Wilderness." *Scientific Monthly* 30, no. 2 (February 1930): 142.

Vias, Alexander C. "Jobs Follow People in the Rural Rocky Mountain West." *Rural Development Perspectives* 14, no. 2 (1999): 14.

Walsh, Richard G., John B. Loomis, and Gillman, Richard A. "Valuing Option, Existence, and Bequest Damands for Wilderness." *Land Economics* 60, no. 1 (February 1984): 14.

#### Reports

"Increased Permitting Activity has Lessened BLM's Ability to Meet its Environmental Protection Responsibilities." United States Government Accountability Office, Gas and Oil Development. (June 2005).

"Drilling in the Rocky Mountains? Not so Fast!: An Assessment of Surplus Drilling Permits & Leases on Federal Public Lands." The Wilderness Society. (April 11 2004).

### Books

Leopold, Aldo. "The Land Ethic." In *A Sand County Almanac and Sketches here and there*. New York: Oxford University Press, 1949, 204.

Stegner, Wallace. "Striking the Rock." In *The American West as Living Space*. The University of Michigan Press, 1987, 39.

Thoreau, Henry David. *Walden and Other Writings of Henry David Thoreau*. New York: Random House, Inc., 1992.

### Websites

"Pacific Railway Acts." in Encyclopedia Britannica Online [database online]. [cited 2008]. Available from <http://www.britannica.com/eb/article-9057923/Pacific-Railway-Acts>.

"The Trust for Public Land." [cited 2008]. Available from <http://www.tpl.org>.

"Campaign Disappointed in BLM Decision to Immediately Lease Roan Plateau's Public Lands." in The Wilderness Society [database online]. June 8 [cited 2008]. Available from <http://www.wilderness.org/NewsRoom/Release/20070608.cfm>.

"John Muir Exhibit." in The Sierra Club [database online]. December 14 [cited 2008]. Available from [http://www.sierraclub.org/john\\_muir\\_exhibit/](http://www.sierraclub.org/john_muir_exhibit/).

"Pinchot and Utilitarianism." in USDA Forest Service, The Greatest Good [database online]. April [cited 2008]. Available from <http://www.fs.fed.us/greatestgood/press/mediakit/facts/pinchot.shtml#>.

- "86% of Plateau's Natural Gas Available without Drilling Top: Citizens Renew Push for Even-Handed Roan Plateau Plan." in Citizens' Campaign to Save Roan Plateau [database online]. February 24 [cited 2008]. Available from [www.saveroanplateau.org/press.htm](http://www.saveroanplateau.org/press.htm).
- "Roadless Area Conservation GIS Coverages." in USDA Forest Service [database online]. August 6 [cited 2008]. Available from <http://roadless.fs.fed.us/documents/feis/data/gis/coverages/index.shtml>.
- "Commercial use Activity on BLM-Managed Land, Fiscal Year 2002: Public Awards from Public Lands." in U.S. Department of the Interior [database online]. [cited 2008]. Available from <http://www.blm.gov/nhp/pubs/rewards/2003/data.htm>.
- "Environmental Hero: Theodore Roosevelt." in Environmental Defense [database online]. April 21 [cited 2008]. Available from <http://www.environmentaldefense.org/article.cfm?contentid=2759>.
- "Pacific Railroad Act." in West's Encyclopedia of American Law, Answers.com [database online]. [cited 2008]. Available from <http://www.answers.com/topic/pacific-railway-acts?cat=biz-fin#copyright>.
- "Pacific Railroad Act." in West's Encyclopedia of American Law, Answers.com [database online]. [cited 2008]. Available from <http://www.answers.com/topic/pacific-railway-acts?cat=biz-fin#copyright>.
- "Aldo Leopold." in The Aldo Leopold Foundation [database online]. [cited 2008]. Available from [http://www.aldoleopold.org/about/leopold\\_bio.htm](http://www.aldoleopold.org/about/leopold_bio.htm).
- "Deep Ecology Movement." in Foundation for Deep Ecology [database online]. [cited 2008]. Available from <http://www.deepecology.org/movement.htm>.
- "Homestead Act (1862)." in [www.ourdocuments.gov](http://www.ourdocuments.gov), 100 Milestone Documents [database online]. [cited 2008]. Available from <http://www.ourdocuments.gov/doc.php?doc=31>.
- "Robert Marshall." in The Wilderness Society [database online]. [cited 2008]. Available from [http://www.wilderness.org/AboutUs/Marshall\\_Bio.cfm](http://www.wilderness.org/AboutUs/Marshall_Bio.cfm).

- "Synopsis of Roadless Rule Court Decision." in The Wilderness Society [database online]. September 21 [cited 2008]. Available from <http://wilderness.org/OurIssues/Roadless/RoadlessDecisionSynopsis.cfm>.
- "A Wilderness Original: The Life of Bob Marshall." in The Mountaineers [database online]. Seattle [cited 2008]. Available from <http://oz.plymouth.edu/~lts/wilderness/marshall.html>.
- "What is a 'New West' Vs. 'Old West' Economy?" in [www.NewWest.net](http://www.NewWest.net) [database online]. April 9 [cited 2008]. Available from [http://www.newwest.net/city/article/what\\_is\\_a\\_new\\_west\\_vs\\_old\\_west\\_economy/C396/L396/](http://www.newwest.net/city/article/what_is_a_new_west_vs_old_west_economy/C396/L396/).
- "Unwild America: If the Roadless Rule Doesn't Stand, We'll Soon be Out of Wilderness." in Field and Stream; The Greater Yellowstone Coalition [database online]. February 22 [cited 2008]. Available from [http://www.greateryellowstone.org/press/article.php?article\\_id=1618](http://www.greateryellowstone.org/press/article.php?article_id=1618).
- "American Agriculture and the Development of a Nation's Land Policy." in Iowa State University, Center for Agricultural History and Rural Studies [database online]. [cited 2008]. Available from <http://www.history.iastate.edu/agprimer/Page12.html>.

#### Other Data

- "Colorado Statewide Wilderness Poll." Talmey-Drake Research and Strategy, Inc.; The Wilderness Society. (May 2007).
- "Gross Domestic Product by State." in US Department of Commerce, Bureau of Economic Analysis [database online]. October 26 [cited 2008]. Available from <http://www.bea.gov/regional/gsp>.
- "GIS Data Layers." In *National Atlas of the United States*. United States Geological Survey, 2007.
- "Measuring Rurality: Rural-Urban Continuum Codes." in USDA Economic Research Service [database online]. April 8 [cited 2008]. Available from <http://www.ers.usda.gov/Briefing/Rurality/RuralUrbCon/>.