SUSTAINABLE DEVELOPMENT IN AMENITY-BASED COMMUNITIES OF THE GREATER YELLOWSTONE ECOSYSTEM

by

RYAN DENNIS BERGSTROM

B.S., Montana State University, 2006
M.S., Montana State University, 2008

AN ABSTRACT OF A DISSERTATION

submitted in partial fulfillment of the requirements for the degree

DOCTOR OF PHILOSOPHY

Department of Geography
College of Arts and Sciences

KANSAS STATE UNIVERSITY
Manhattan, Kansas

2012

Abstract

The Greater Yellowstone Ecosystem (GYE) is a large, nearly intact ecosystem with significant protection that has often been considered an ideal location to examine coupled human-environment interactions due to the region's complex mosaic of private and public lands, competing natural resource uses, and rapid population growth. A transition toward sustainability suggests that current societal and economic needs can be met while simultaneously maintaining the planet's life support systems for future generations.

To facilitate sustainability transitions it is imperative that the perceptions and experiences of local communities be documented. The objective of this study was to determine how residents of amenity-driven gateway communities (West Yellowstone and Red Lodge, Montana, and Jackson, Wyoming) surrounding Yellowstone and Grand Teton national parks perceive and experience their transition toward sustainability and the challenges inherent in that transition, how those perceptions inform locally produced and extra-local policies, and how institutions influence sustainability goals. Further, this study determined which factors contribute to these perceptions, and whether they differed spatially and temporally. To meet study objectives, a mixed methods approach was implemented, including the content analysis of local newspapers and key informant interviews.

Content analysis of local newspapers was used to investigate decision maker and stakeholder priorities for the local and regional environment, economy, and communities, and to determine what actions had been taken to promote sustainability. A total of 193 articles from *West Yellowstone News,* 287 articles from *Carbon County News*, and 333 articles from *Jackson Hole News & Guide* for the ten year period 2000-2009, were analyzed. Specific focal topics varied among the newspapers/communities, but in general terms the most discussed topics in West Yellowstone during this time were focused on natural resources, economic development, community development, sustainability and conservation, and growth and development. The most discussed topics for Red Lodge were community development, government services, tourism and

recreation, and growth and development. The most commonly discussed topics in Jackson were natural resources, growth and development, community development, and government services.

A total of 35 semi-structured interviews were conducted with key informants in the three study communities during the summer of 2010 to allow for specific questioning and to gain additional information. Definitions of sustainability differed based on the key informant's community, role in the community, and length of residence in the community. Overall, definitions of sustainability focused on the environment, the economy, and multi-generational or long-term thinking. The prioritization of the economy, environment, and society also differed based on community; however, there was overall recognition that each community was dependent upon the natural environment for economic vitality.

In all three study communities, dependence on tourism and recreation-based industries, the lack of a diversified economy, and continued growth and development have resulted in a disconnect between perceptions, priorities, and goals as they relate to sustainability. In addition, each community was focused on multiple goals that further complicated the fulfillment of sustainability objectives. The multi-goal orientation of study communities is reflected in the multiple visions that various decision makers and stakeholders have for the community and their futures. What is needed most is a hierarchical approach to a sustainability transition, with each community setting its own, as well as ecosystem-wide, goals, objectives, and visions.

Findings suggest that a transition toward sustainability is perceived and experienced differently based on local context. In the GYE, that context includes a tourism-based economy that is dependent upon the natural environment, a myriad of local, regional, national, and global stakeholders, and the presence of federal land agencies that are responsible for the sustainability of natural systems, freeing local communities to focus on the societal and economic dimensions of sustainability. A transition toward sustainability will be manifested differently in the Greater Yellowstone Ecosystem, and potentially other communities adjacent to protected lands, than it is other areas because of its unique milieu. While the close proximity of federal lands, including Yellowstone National Park, may complicate the sustainability discourse at times and

may, in certain instances, add additional challenges through extra-local control of change, these same federal lands may also favor a transition toward sustainability in amenity-driven gateway communities. In addition, the disparate socio-economic conditions present in study communities, as well as extra-local institutions and agencies, directly influence, and may at times further complicate, a transition toward sustainability.

This study is based on the theory that in order to successfully transition toward sustainability, a better understanding of coupled human and natural systems is critical, and because of the close couplings between human and natural systems in the Greater Yellowstone Ecosystem, and because of the unique challenges and conflicts present in the region, the GYE is an ideal location to study human-environment interactions. The use-inspired orientation of sustainability science aims to provide tangible, real-world, and place-based understanding of a transition toward sustainability. The contribution of this study to the field of sustainability science is the understanding that, while sustainability visions, goals, and objectives may be similar across a region, consideration of local contexts affecting goals and perceptions provides valuable insights that may inform sustainability pathways at local scales and, as a result, provide deeper understanding of global sustainability. One of these insights is that communities that seemingly have much in common due to their shared region, physical environmental surroundings, and history, the specific concerns to ensure place-based sustainability can show variability. Another important point from this research is that, while most depictions of sustainability are focused on three elements—the economy, society, and the environment—individuals also key in on multigenerational concerns.

SUSTAINABLE DEVELOPMENT IN AMENITY-BASED COMMUNITIES OF THE GREATER YELLOWSTONE ECOSYSTEM

by

RYAN DENNIS BERGSTROM

B.S., Montana State University, 2006
M.S., Montana State University, 2008

A DISSERTATION

submitted in partial fulfillment of the requirements for the degree

DOCTOR OF PHILOSOPHY

Department of Geography
College of Arts and Sciences

KANSAS STATE UNIVERSITY
Manhattan, Kansas

2012

Approved by:

Major Professor
Dr. Lisa M.B. Harrington

Copyright

RYAN DENNIS BERGSTROM

2012

Abstract

The Greater Yellowstone Ecosystem (GYE) is a large, nearly intact ecosystem with significant protection that has often been considered an ideal location to examine coupled human-environment interactions due to the region's complex mosaic of private and public lands, competing natural resource uses, and rapid population growth. A transition toward sustainability suggests that current societal and economic needs can be met while simultaneously maintaining the planet's life support systems for future generations.

To facilitate sustainability transitions it is imperative that the perceptions and experiences of local communities be documented. The objective of this study was to determine how residents of amenity-driven gateway communities (West Yellowstone and Red Lodge, Montana, and Jackson, Wyoming) surrounding Yellowstone and Grand Teton national parks perceive and experience their transition toward sustainability and the challenges inherent in that transition, how those perceptions inform locally produced and extra-local policies, and how institutions influence sustainability goals. Further, this study determined which factors contribute to these perceptions, and whether they differed spatially and temporally. To meet study objectives, a mixed methods approach was implemented, including the content analysis of local newspapers and key informant interviews.

Content analysis of local newspapers was used to investigate decision maker and stakeholder priorities for the local and regional environment, economy, and communities, and to determine what actions had been taken to promote sustainability. A total of 193 articles from *West Yellowstone News,* 287 articles from *Carbon County News*, and 333 articles from *Jackson Hole News & Guide* for the ten year period 2000-2009, were analyzed. Specific focal topics varied among the newspapers/communities, but in general terms the most discussed topics in West Yellowstone during this time were focused on natural resources, economic development, community development, sustainability and conservation, and growth and development. The most discussed topics for Red Lodge were community development, government services, tourism and

recreation, and growth and development. The most commonly discussed topics in Jackson were natural resources, growth and development, community development, and government services.

A total of 35 semi-structured interviews were conducted with key informants in the three study communities during the summer of 2010 to allow for specific questioning and to gain additional information. Definitions of sustainability differed based on the key informant's community, role in the community, and length of residence in the community. Overall, definitions of sustainability focused on the environment, the economy, and multi-generational or long-term thinking. The prioritization of the economy, environment, and society also differed based on community; however, there was overall recognition that each community was dependent upon the natural environment for economic vitality.

In all three study communities, dependence on tourism and recreation-based industries, the lack of a diversified economy, and continued growth and development have resulted in a disconnect between perceptions, priorities, and goals as they relate to sustainability. In addition, each community was focused on multiple goals that further complicated the fulfillment of sustainability objectives. The multi-goal orientation of study communities is reflected in the multiple visions that various decision makers and stakeholders have for the community and their futures. What is needed most is a hierarchical approach to a sustainability transition, with each community setting its own, as well as ecosystem-wide, goals, objectives, and visions.

Findings suggest that a transition toward sustainability is perceived and experienced differently based on local context. In the GYE, that context includes a tourism-based economy that is dependent upon the natural environment, a myriad of local, regional, national, and global stakeholders, and the presence of federal land agencies that are responsible for the sustainability of natural systems, freeing local communities to focus on the societal and economic dimensions of sustainability. A transition toward sustainability will be manifested differently in the Greater Yellowstone Ecosystem, and potentially other communities adjacent to protected lands, than it is other areas because of its unique milieu. While the close proximity of federal lands, including Yellowstone National Park, may complicate the sustainability discourse at times and

may, in certain instances, add additional challenges through extra-local control of change, these same federal lands may also favor a transition toward sustainability in amenity-driven gateway communities. In addition, the disparate socio-economic conditions present in study communities, as well as extra-local institutions and agencies, directly influence, and may at times further complicate, a transition toward sustainability.

This study is based on the theory that in order to successfully transition toward sustainability, a better understanding of coupled human and natural systems is critical, and because of the close couplings between human and natural systems in the Greater Yellowstone Ecosystem, and because of the unique challenges and conflicts present in the region, the GYE is an ideal location to study human-environment interactions. The use-inspired orientation of sustainability science aims to provide tangible, real-world, and place-based understanding of a transition toward sustainability. The contribution of this study to the field of sustainability science is the understanding that, while sustainability visions, goals, and objectives may be similar across a region, consideration of local contexts affecting goals and perceptions provides valuable insights that may inform sustainability pathways at local scales and, as a result, provide deeper understanding of global sustainability. One of these insights is that communities that seemingly have much in common due to their shared region, physical environmental surroundings, and history, the specific concerns to ensure place-based sustainability can show variability. Another important point from this research is that, while most depictions of sustainability are focused on three elements—the economy, society, and the environment—individuals also key in on multigenerational concerns.

Table of Contents

List of Figures

List of Tables

Acknowledgements

First, I would like to graciously thank my mentor and advisor, Dr. Lisa M.B. Harrington, for her leadership, generosity, and patience over the years. Thank you for sharing your passion for sustainability, and allowing me to carve out a niche for myself within the discipline. Also, thank you for your efforts in editing this and many other documents over the past three years. May you never see another 'within', 'further', 'many', or misplaced comma the rest of your career. To the rest of my committee: Dr. John Harrington Jr. (Geography), Dr. Kevin Blake (Geography), and Dr. Theresa Selfa (Environmental Sociology), I thank you for your constant guidance, encouragement, and support throughout this entire process and in all aspects of my education. I would also like to thank Dr. Kendra McLauchlan and Dr. Jeff Smith for their perpetual open door, solicited and unsolicited advice, and most importantly for their friendship. Lastly, I would also like to thank David Lyons at Century College in White Bear Lake, Minnesota, without whom I would have never been exposed to the discipline of geography.

I thank the Charles Redd Center for Western Studies – Summer Award for Graduate Students, and the Kansas State University Department of Geography – Graduate Student Research Grant, for funding a portion of the fieldwork for this project. Also, thank you to the Centre for Mountain Studies and the Kansas State University President's Travel Fund for their support in attending the Global Change in the World's Mountains Conference in Perth, Scotland. Lastly, I wish to thank the Department of Geography at Kansas State University for their support over the past four years and for providing me the opportunity to present my research at conferences across the country.

I would also like to thank the people of the Greater Yellowstone Ecosystem. Thank you for your hospitality, openness, and willingness to see me through this research. In addition, I wish to thank Natalie Scheilder for her tireless support and encouragement over the past two and a half years. Most importantly, I wish to thank my Father, my family, and my friends, for their support, guidance, wisdom, and patience. I could not have done any of this without each of you!

Dedication

To my family, I will always be indebted to you for everything you have done to see me to, and through, this chapter of my life.

Preface

I was 19 the first time I made the daunting journey, or at least it seemed at the time, from the flatlands of Minnesota to the Yellowstone Plateau. We spent our first night in the self-proclaimed "energy capital of the nation," Gillette, Wyoming. I recall sitting atop a hay bale and watching thunderstorms in nearly every direction, yet somehow far away. It was 3am, or there about, when we passed the Buffalo Bill Reservoir outside Cody, and not long after we holed up in Wapiti, the car nearly out of gas. For the next two weeks Rob, Brian and I lived out of a tent, dined on cans of beans, ravioli, and soup, all mysteriously absent of labels, and fished.

We fished the dawn light, when frost hung to the ground even in mid-summer, we fished in the day when it was far too warm for any sensible fish to rise, and we fished till dark when the threat from bears was more pronounced than our threat to any trout. My boss at the time, Joe, had taught me to cast a fly rod in Ridgway Parkway Park during our lunch breaks, but all those lessons fell apart the first time I stood beside the Yellowstone River. The smell of sulfur hung thick in the air, the clear waters of Tower Creek melding with the turquoise waters of the Yellowstone, and me without a chance in the world. Fish were caught in those two weeks, but it was not the fish that drew me back the following year, although it was as good of an excuse as any. It was Yellowstone itself that held my captivation, with its towering falls, hot springs, hot spots, geysers, and abundant wildlife We nearly hit a bison early one morning, and an annoying raven had the audacity to steal anything and everything from our camp.

The following year we ventured further afield, exploring Tower Creek, marveling at the power of nature as we passed solemnly under lodgepole pines burnt in the 1988 fires. We were some of the first to hear wolves howl at night after all those years in absence. We weathered a storm that brought enough hail it warranted a snowplow, and I for one caught a fish so incredibly large that when I took the hook out of its mouth it gave me a passing glance, maybe even a smile, slapped me twice across the face with its tail, and was lost forever (except of course in the photos of the 20 or so tourists who took the time to watch my misadventure. I often think of those tourists).

Then the Yellowstone magic stopped, and I did not return until I moved to Bozeman a decade later. I lived in the Greater Yellowstone Ecosystem for the better part of decade, and I am still a resident to this day (cheap fishing licenses). I have explored from the ridgeline of the Bridger Mountains to the Beartooth Plateau and south to that secret hot spring near the parks southern boundary where we barbequed in the midst of winter, and south further still to the Wind River Range, the Salt River Range, the triple-junction on the Targhee Pass, and the fertile fields of the Snake River Plain. It was a childhood any young boy dreams of, only I was nearly 30. However, the wonderment of the GYE made me, and still makes me, feel like a boy. Breathlessly summiting a new peak, the sound of trout rising, and endless fields of wheat against a snow-capped mountain backdrop. Greater Yellowstone is unique. It is special, and it holds a special place in my heart for these and so many other reasons.

When given the opportunity to study any location of my choosing, there could be but one. I thought I knew Greater Yellowstone, its people and its places, but the lessons learned on that first journey westward were the same lessons I learned over the past three years; the Greater Yellowstone is vast. Not only vast in the sense that you can stand atop Lone Peak and see Grand Teton Peak, but vast in the sense that all I thought I knew about the region was an idyllic perception from seeing one too many movies. Greater Yellowstone cannot be experienced in a car or through streaming media on your couch; it is the people, the towns, the run-down taverns, and quirky fly tiers. It is the stories of the people who lived here once upon a time before a river of change ran through it, and the hopes, dreams, and aspirations of those who now call it home.

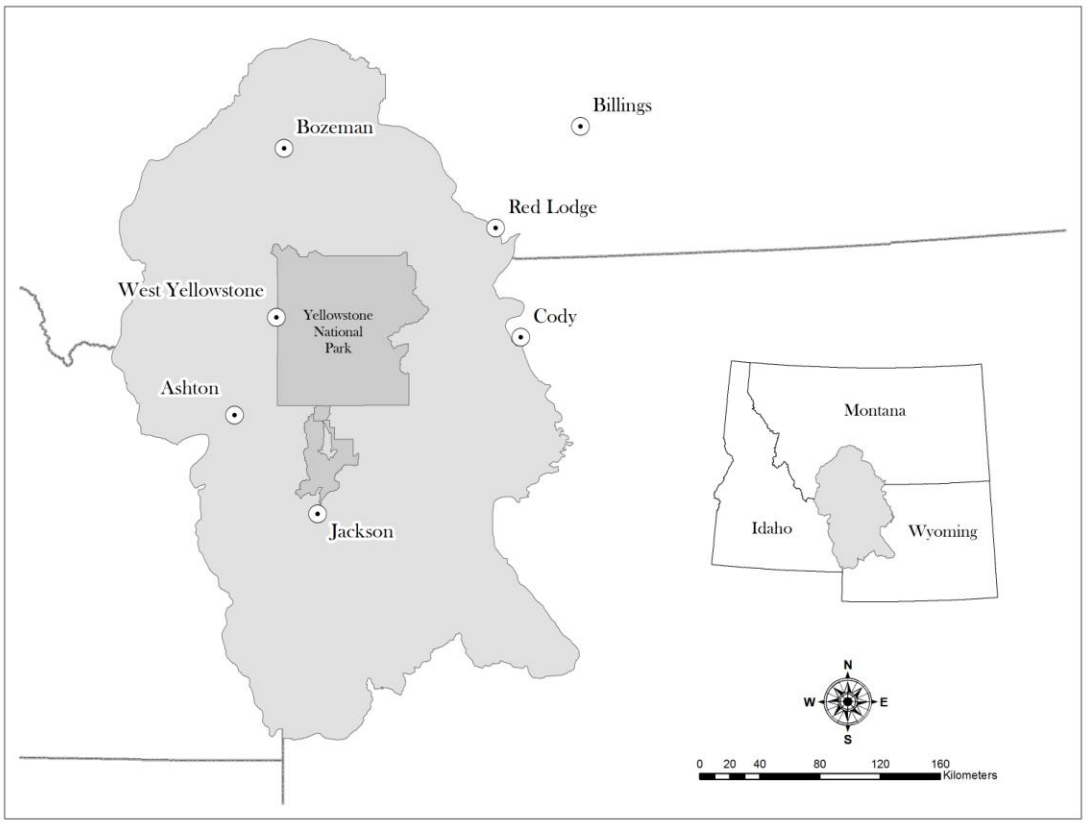
Chapter 1 - Introduction and Objectives

The mountains and valleys surrounding Yellowstone National Park, often referred to as the Greater Yellowstone Ecosystem (GYE) (Figure 1-1), cover an area over 20 million acres, spanning portions of three states (Montana, Idaho, and Wyoming). Included in the region are 2.5 million acres managed by the National Park Service (Yellowstone and Grand Teton National Parks), 11 million acres split among six National Forests (Beaverhead-Deerlodge, Bridger-Teton, Caribou-Targhee, Custer, Gallatin, and Shoshone), nearly 100,000 acres of the Nation Wildlife Refuge system, 1.5 million acres managed by state and tribal agencies, and five million acres of private land. The GYE is an ideal location to study the interactions and interdependencies of economic growth and environmental protection because of the region's complex mosaic of private and public lands, rapid population growth, and competing natural resource uses (Lynch et al. 2008).

Although the population of the U.S. Rocky Mountain West has grown at three time the national rate since the 1980's (Baron, Theobald, and Fagre 2000), the population in the GYE has grown by over 55 percent, with some communities increasing by as much as 275 percent (Hansen et al. 2002). This demographic shift has resulted in the transformation of local economic and socio-cultural characteristics, which are now focused on service and amenity industries, as opposed to traditional extractive industries (Smith and Krannich 2000).

The area's abundant public lands, which are typically located at higher elevations, were at one time seen as storehouses of natural resources available for exploitation, but today are used for multiple recreational activities, including hunting, hiking, fishing, and horseback riding. This trend toward recreational use, that may also be exploitive in nature, is dramatized by data indicating that recreational activities account for over 80 percent of forest-related employment in the GYE, while timber-related employment accounts for only 11 percent (Power 1991). The shift from resource consumption to recreational use is significant because the lost local economic inputs from extractive industries have been replaced with recreational and tourist activities. The changes place new and complex pressures on management agencies, local communities, and the

Figure 1-1 Traditional Boundary of the Greater Yellowstone Ecosystem (source: BSI 2011)



environment at a time when both mountain environments and issues of environmental, social, and economic sustainability are gaining increased attention. In addition, decision makers' face uncertainty in moving forward as a result of the coupled and complex nature of natural and human systems (Costanza et al., 1991) within the Greater Yellowstone Ecosystem.

Objectives

The primary objective of this study is to determine how residents and decision-makers (i.e., city, county, and state officials, business owners) of three public lands 'gateway' communities in the Greater Yellowstone Ecosystem perceive, prioritize, and act upon issues related to sustainability. Sustainability in this context is defined as the ability to maintain or improve economic, environmental, and societal conditions over the long term. Further, this study investigates which factors or drivers contribute to these

perceptions, whether they differ spatially and temporally, and whether they differ among decision-makers and stakeholders.

The conceptualizations, or meanings, of 'sustainability' and 'sustainable development' are directly influenced and created by individual perceptions. Conceptualizations are likely to vary spatially and temporally as a result of socio-economic characteristics, values, and behaviors of individuals and communities. It is critical to have a clear understanding of the varying conceptualizations of sustainability in a given community or region, as ambiguity in definitions may lead to differing goals, planning processes, and outcomes. To better understand the perceptions, priorities and goals of communities in the study area, this research has involved both environmental decision-makers (e.g., local and national government agencies), and stakeholders (business operators and residents), with recognition that there is overlap between stakeholders and decision-makers. Specific research questions connected to local perceptions and priorities of human-environment interaction (Tuan 1973; Murdoch and Clark 1994; Wilbanks and Kates 1999; Kates et al., 2001; Harrington and Lu 2002; Parris and Kates 2003; Haberl et al., 2004; Leiserowitz et al., 2005; Leiserowitz et al., 2006; Christensen et al., 2007; Kemp and Marten 2007; Vos 2007) include the following:

1.1 How do decision-makers and stakeholders define sustainability and sustainable development?

1.2 What are decision-makers' and stakeholders' priorities for the local and regional environment? The community? Have priorities shifted over time?

1.2.a. Are social, economic, and environmental themes linked to sustainability and sustainable development?

1.3 Do priorities and perceptions vary with location or role within the community?

1.4 How do perceptions and priorities of decision-makers' and stakeholders' relationship to the environment relate to sustainability goals?

Because local to global changes and mitigation techniques employed to combat change are felt and addressed at local levels (Wilbanks and Kates 1999), understanding the agencies and institutions that influence local community decisions is important. Research questions are related to local perceptions of conditions, the availability, and dissemination of information, and the identification of institutions and agencies that facilitate or hinder actions intended to address sustainability concerns (Uphoff 1992; Macnagethen and Jacobs 1997; Guys and Rogers 1999; Wilbanks and Kates 1999; Kates et al., 2001; Nelson 2005; Carpenter et al., 2006; Carpenter et al., 2009). Topics relevant to power, connections, and action include the following:

2.1 What are decision maker and stakeholder perceptions regarding the level of local control over change?

2.2 What actions have been taken to promote sustainability?

2.2.a. Do these actions vary with location?

2.2.b. What further actions are desired by stakeholders?

In addition, individuals and communities must be cognizant of their vulnerability to future change (Smit and Wandel 2006), their ability to cope or adapt to change (Kates 2010), the potential techniques available to mitigate change (Kates 2010), and their resilience to change (Liu et al., 2007; Kates 2010). Because coupled human and natural systems interact across multiple scales, and changes within such systems may be non-linear in nature with high levels of uncertainty, it is important to understand how these systems adapt to and mitigate change (Cutter 2003; Fiksel 2006). Research questions are related to local perceptions of the vulnerability and resiliency of natural and human systems, as well as the ability of communities to cope with change (adapt and mitigate). Research questions 3.1-3.3 were developed after key informant interviews and the content analysis of local newspapers, and were not part of the initial study design. Their inclusion reflects the importance of these themes to local communities in the Greater Yellowstone Ecosystem and the overall sustainability discourse. Specific research questions include:

3.1. What are decision maker and stakeholder perceptions regarding their vulnerability and resiliency to change?

3.1a. How do perceptions of human and natural systems differ?

3.2 What are decision maker and stakeholder perceptions regarding their ability to adapt or mitigate change?

3.2a. How do perceptions of human and natural systems differ?

Sustainability is a normative concept, that is, it is oriented toward a state or set of conditions that ought to be. To facilitate decisions focused on a transition toward sustainability and the multi-dimensional objectives established to move toward sustainability, it is imperative to have a clear understanding of local perceptions and priorities. As the centerpiece of the GYE, the policies implemented by the National Park Service and other entities in relation to Yellowstone National Park (i.e., US Forest Service, non-government organizations, extractive industries etc.), have considerable influence over future gateway community development and natural resource management. This research will add to the scholarly discourse on the perceptions, priorities, and goals relevant to sustainable futures for local communities which can be used to inform decision makers and stakeholders of amenity-driven communities in the GYE, as well as contributing to the base of scholarly knowledge about local thinking and decision-making. Such understanding can help to guide resource management decisions. Beyond the region of focus here, the research approach may later be applied in other places, with results used by communities, landowners, and resource management agencies.

It is imperative that the perceptions and experiences of local communities regarding their environments be documented (Volker 1997; Rudzitis 1999), and better understanding of the goals, indicators, trends, and driving forces of changes at local scales are needed (Parris and Kates 2003) to improve understanding of nature-society relations. This research will add to the growing body of scholarship that seeks to understand the coupled and complex relationship between the natural environment and society. Specifically, it will improve understanding of how residents and regional and local decision-makers of amenity-driven North American communities perceive the

concept of sustainability, how those perceptions inform local and extra-local policies and are subsequently acted upon, and how institutions and agencies influence sustainability goals. The understanding to be gained is linked to questions of power, social and institutional interactions, and land use/land cover change, and will be particularly relevant for regions in which public land management agencies play important roles in determining resource management and land use. This study will also help to inform understanding of human-environment relations in a mountain region of the 'global North,' (where fewer studies are undertaken), as well as through the development of a replicable conceptual model for further studies. Lastly, it has been suggested that place-based research and comparative analyses of case studies may improve understanding of the causes of change and modes of interaction in fragile ecosystems, and may lead to the identification of conditions that support a transition toward sustainability (Lambin et al., 2003).

Structure of this Dissertation

Chapter two provides a review of literature relevant to the study of human-environment interaction, and sustainability studies. The primary focus of this chapter is the concept of sustainability, its historical, scientific, and conceptual roots from 1700 to the present, the challenge in defining sustainability, and the advancement of the field of sustainability science and technology. This is followed by a discussion of the ecosystem concept and ecosystem services, and a brief discussion of environmental perceptions.

Chapter three provides background about the Greater Yellowstone Ecosystem as a region. The chapter begins by defining the GYE, and the challenges inherent in the differing views of what constitutes the GYE, including the importance of the agencies that are charged with managing the region. This is followed by an overview of the region's physiographic character. A discussion of land use and land cover changes (timber harvest, forest fires, mineral extraction, and urbanization) experienced in the region, and a socio-economic examination of the region's counties, follows. Lastly, the primary conflicts experienced in the GYE, including bison management, wolf reintroduction, and winter access to Yellowstone National Park are examined.

Chapter four focuses on the history and culture of the GYE. The chapter begins with an examination of American Indians and their imprint on the landscape. This is followed by a discussion of the mountain men, fur trappers, prospectors, and government expeditions that mapped, charted, and explored the region, making it more accessible to early Euro-American settlers. An examination of the importance of the tourism and recreation industries to the region, and the rapid rise of amenity migrants, follows. The chapter concludes with an examination of the three study communities and their importance to the region as gateway communities to Yellowstone and Grand Teton National Parks.

Chapter five includes a review of the methods implemented in this study. Beginning with an overview of mixed methods techniques and grounded theory, the chapter then explores the techniques used in, and importance of, archival research, newspaper content analysis, and key informant interviews. The chapter also includes a discussion of coding techniques to transform qualitative data (such as interview transcripts and newspaper articles) into quantitative variables, and the statistical measures used to analyze them.

Chapter six presents the results of this study and their importance to the Greater Yellowstone Ecosystem. The chapter begins with the content analysis of local newspapers in study communities between 2000 and 2010, with each of the three study communities examined separately. For each community, results are focused on the major themes identified by content analyses, including economic development, community development, natural resource and land management, sustainability and conservation, development and growth, and tourism and recreation.

Chapter seven includes an analysis of key informant interviews organized by study community. Themes include definitions of sustainability that are divided further into economic, environmental, and societal definitions. This is followed by an examination of the triple bottom line, and the priorities communities place on economy, environment, and society. The perception of the largest challenges faced by study communities follows, as well as an examination of the uniqueness of that challenge to the community or region. Next, the perceptions of who controls change is explored, as well as the challenges that accompany control, with recognition that some change is

uncontrollable. An examination of key informant perceptions of how their community and region might change in the next two decades and the implications of such change concludes the key informant interview section of this chapter.

Chapter eight is a synthesis of results based on study community and details the perceptions, priorities, actions, and challenges faced as the three communities attempt to transition toward greater sustainability. Chapter nine is a brief summarization of major findings and discussion of further needs.

Chapter 2 - Review of the Literature

Sustainability and Sustainability Science

Although urban areas have begun more pronounced on the landscape in recent decades, the concept of rural sustainability has garnered increasing attention from a range of institutions, organizations, communities, and individuals. This increase in awareness and concern for rural environments is likely the result of the interaction and interdependency of both rural and urban landscapes (Starnes 1997), and their implications regarding the depletion of natural resources (Parris and Kates 2003).

The environmental impacts associated with fulfilling human needs and desires through increased production since the beginning of the industrial revolution have resulted in substantial degradation to the Earth's natural environment (Turner et al. 2007). It is projected that by the year 2100, Earth's population will reach between 10 and 11 billion people (NRC 1999), which will have dramatic repercussions for both rural and urban environments. This tremendous increase in population will place further stresses on the natural environment, as production increases to satisfy a growing populace, and the demand for land, energy, and materials to meet human needs intensifies (NRC 1999).

As Maxey (2006) notes, "the concept of sustainability offers valuable insights into and routes out of our contemporary crises," and allows for the potential mitigation of long-term impacts created through human activities. At the core of the concept of sustainability is the idea that people must reconcile societal goals with the natural limits of the environment (Clark and Dickson 2003). Further, sustainability in most instances implies the simultaneous satisfaction of all three elements (economic, environment, society) and their perpetuation into the future (Maxey 2006). Appreciation and understanding of relationships among the environment, the economy, and society is known by many terms, including the triple bottom line, the three pillars, or the 3 "P's" (people, planet, profit) (Rogers, Jalal, and Boyd 2008).

As Norton (2005) succinctly states, "sustainability is about the future, our concern toward it, and our acceptance of responsibility for our actions that affect future people." Because of this, the study of sustainability is in reality a symbolic concept (Parris and

Kates 2003), that seeks to better understand the character and interactions between the highly complex and dynamic natural world (Kates 2000), and the viewpoints, knowledge, awareness, and behavior of societies who rely on it for continued survival.

The Historical Roots of Sustainability

The antecedents of current attention to sustainability were developed during the late seventeenth and early eighteenth centuries, when writers such as John Evelyn and Hans Carl von Carlowitz postulated that society should not harvest forests beyond their carrying capacity, or their ability for re-growth, a concept referred to as *Nachhaltigkeit,* "setting up the forest" (Hansmann 2010; Wiersum 1995). In eighteenth century Europe, wood remained the only viable energy source and, combined with improvements in industrial processes and an expanding population base, the forests of Europe were in poor condition (Morgenster, 2007). The ideas first introduced by Evelyn and Carlowitz were furthered in 1811, when Georg Ludwig Hartig became chief of the Prussian Forest Service. He stated that not only should forests be valued and used by the present generation, but that they should be used and valued in a way that ensures that future generations may do the same (Zeide 2001), an idea later revisited by the World Commission on Economic Development in 1987 in defining sustainable development.

One of the first to understand fully the potential implications of resource scarcity was Thomas Malthus. In 1798, when Malthus began to write *An Essay on the Principle of Population,* he had firsthand knowledge of the impacts of the industrial revolution, including unemployment, poverty, and disease. He postulated that these issues were not a product of institutions, but rather the rapid and unchecked population growth the world was experiencing at the time. Unchecked population growth, he suggested, would result in diminishing returns on food supply, and subsequently living standards, as only a finite amount of quality arable land was available on earth. Today, scholars recognize the shortcomings in his population and diminishing returns theory, largely because he did not take into account technological innovations that facilitated upward trending production curves. However, his idea of environmental limits is often credited as a precursor to the modern concept of sustainability (Mebratu 1998; Brander 2007).

Understanding of sustainability increased in several areas during the 19th century, including Alexander von Humboldt's observations of natural conditions and human effects, and calls for improved human health in Europe where it was thought that deteriorating health and sanitation conditions would hamper economic growth (Brand and Karvonen 2007). It would take a lawyer, businessperson, and politician from Woodstock, Vermont, to build upon the ideas of both Malthus and Humboldt, and suggest that the world's economic systems were completely dependent upon the natural environment. In 1864, George Perkins Marsh, in his environmental classic, *Man and Nature*, detailed human impacts on the environment, including deforestation, species distribution and abundance, and surface and groundwater depletion (Meyer 1999). Marsh felt that the environmental degradation he had seen in the northeastern United States was directly the result of human action, and that it was society's obligation to remedy the situation for future generations. He further suggested, in the language of the time, that the only way to establish sustainable human-environment systems was through mitigation of human actions through regulations imposed by the government, as well as self-regulation (Sweet 2002). Not only did *Man and Nature* provide a catalyst for the establishment of a forest preserve in New York's Adirondack Mountains, but it also led to political action to limit human impacts on the environment (Clark and Canter 1997).

By the early 20th century, scholars like Ernst Haeckel recognized the relationship and interdependence of human and natural systems, and in the process developed the field of ecology. In the mid 20th century, Rachel Carson brought these ideas to the masses in her 1962 book *Silent Spring* (Brand and Karvonen 2007). The book brought together the fields of toxicology and ecology to expose the impacts that agricultural pesticides were having on animal species and human health (Blutstein 2003), and suggested that—directly or indirectly—the industrial enterprise was responsible for the environmental degradation experienced at the time (Sikdar 2004). It has been suggested (Bybee 1991) that because of the central issues posed in *Silent Spring*, the book symbolized the growing environmental movement of the 1960s. In 1968, another book of equal importance in the environmental discourse was authored by Paul Ehrlich. The *Population Bomb* sold over two million copies worldwide and exposed millions to the finite carrying capacity of Earth and the tendency of over-consumption. The book was a

direct descendent of Malthus: it suggested that the only solutions to the environmental problems of the day were lower birthrates or higher death rates (Ehrlich and Ehrlich 2009).

It was also during the 1960s that national and international organizations began to discuss the recognition of human impacts on the environment. One of the first such efforts was the Convention on the Organization for Economic Cooperation and Development (OECD). On December 14, 1960, 34 countries met in Paris, France, to consider how best to obtain economic growth and increased standards of living in member countries (OECD 2011). Although the convention did not specifically address human-environment interactions, it was one of the first times that the term 'sustainability' or 'sustainable development' appeared in government documents. In 1964, the International Biological Program (IBP) was established to fill the growing demand for ecological knowledge. It was the hoped that by mapping and characterizing numerous natural environments and measuring their potential productive capabilities, the IBP would gain practical knowledge of the ability of earth to sustain humankind (Smith 1968). Specifically, the IBP began research on the capability of humans to adapt to changing environmental conditions. Nine sub-committees were formed to examine productivity, conservation, land use and management, human adaptability, and environmental physiology. The goal of these committees was to better understanding functioning ecosystems, as well as to determine the underlying implications of utilization of natural resources (Cain 1968). The IBP made two fundamental contributions to the sustainability discourse. First, thousands of peer-reviewed papers on the complexity of human-environment systems were published, as well as a 26-volume set that synthesized the program's results. Second, the Intergovernmental Conference for Rational Use and Conservation of the Biosphere (ICRUCB) was held in Paris in September, 1968. Known informally as the "Biosphere Conference," the ICRUCB was organized by UNESCO, attended by 300 delegates from over 60 countries, and was the first intergovernmental conference that specifically addressed sustainable development. The conference resulted in two major findings: 1) human use and conservation of natural resources should not be mutually exclusive, and 2) an interdisciplinary approach was necessary to meet this objective (UNESCO 1993).

Although intergovernmental organizations were the driving force behind research into sustainability and human-environment interactions, individual scholars were also contributing to the growing knowledge base. Prominent among them was Garrett Hardin, who published "The Tragedy of the Commons" in 1968. Using the example of medieval herders in Europe, he concluded that unrestricted access and demand for finite resources would result in over-exploitation of the resource itself (Ostrom et al. 1999). He also suggested that the same principles could be thought of in the context of national parks. In this scenario, a national park is the common resource, and with unrestricted access the value to visitors would be continually degraded.

By the end of the 1960s, government officials began to enact legislation to limit the detrimental effects of humans on the environment. The first such attempt was the National Environmental Policy Act of 1969 (NEPA). The purpose of the Act was to "encourage productive and enjoyable harmony between man and his environment…and to prevent or eliminate damage to the environment." Specifically, the Act required that environmental impact statement (EIS) be completed for all subsequent federal projects to insure that the undertaking would not affect the natural environment beyond acceptable levels. In the context of the Greater Yellowstone Ecosystem, the EIS process has become one of the most contentious issues as it often pits environmental organizations against local communities and federal agencies.

The ICRUCB was also responsible for establishing the Man in the Biosphere Program (MAB) in 1971. The primary theme of the program is the conservation of the natural environment. This was accomplished through the establishment of the Biosphere Reserve Program (BRP) to encourage preservation of important land areas and activities that would "demonstrate the value of conservation and its relationship to economic development" (Dyer 1988) As opposed to the IBP, MAB focused on management problems associated with human interactions with natural systems (Dyer 1988). The objective was to identify and protect unique biotic provinces, while simultaneously providing opportunities for environmental research and education (Franklin 1977).

The Club of Rome, made up of 30 scientists, economists, educators, and industrialists, began their Project on the Predicament of Mankind in 1972. The project had two objectives; the first was to increase knowledge of natural systems and the

constraints they impose on the human population. The second objective was to determine the dominant characteristics and behavior of world systems (Meadows et al. 1972). To accomplish these objectives, the Club of Rome commissioned economic modelers at MIT to forecast the pressures the world would face if current population growth trends continued for an additional 100 years. The results from the study were published in *The Limits to Growth*, with over 30 million copies sold in 30 languages. The book suggested a number of conclusions. First, to avoid crises related to unrestricted growth, changes to political, economic, and social systems would be necessary. Second, if the world made such adjustments, "ecological stability" might be possible. Lastly, the sooner adjustments were made, the more likely a sustainable outcome would be (Simmons 2000).

The United Nations held its first conference entirely dedicated to environmental issues in Stockholm, Sweden, in 1972. Representatives of 113 countries, 19 intergovernmental agencies, and 400 non-government organizations attended the UN Conference on the Human Environment, more commonly referred to as the Stockholm Conference (Hens and Nath 2003). The conference was an effort to develop a common outlook and set of principles that would guide preservation of the human environment. Human environment in this context referred to both the natural and the man-made environment. Twenty-six principles were adopted at the conference, with Principle Two suggesting that "The natural resources of the earth, including the air, water, land, flora and fauna and especially representative samples of natural ecosystems, must be safeguarded for the benefit of present and future generations through careful planning or management, as appropriate" (UNEP 1972). That year, Barbara Ward and René Dubos published *Only One Earth*, the official report of the Stockholm Conference. They cast the concerns revealed during the conference in social, economic, and political terms, and concluded that the differing values of individuals and nations were the primary catalyst for the problems, and that in order to create harmony in human-environment systems a common set of values was essential (Ward and Dubos 1972).

The first of two World Conservation Strategies was released in 1980 by the International Union for Conservation of Nature and Natural Resources (IUCN), with the objective of providing a more focused approach to conservation through the

"maintenance of essential ecological processes," and the policy guidance to do so. It was suggested that this objective was necessary because the Earth's capacity to support humankind was being reduced, and thus conservation would be essential to sustainable development. It also suggested several obstacles to achieving conservation, including the failure to integrate conservation and development, a lack of conservation support, and a lack a capacity to conserve (McCormick 1986; IUCN 1980). The Second World Conservation Strategy was released in 1991, and built upon the first by suggesting that a new ethic for sustainable living was required, and the integration of conservation and development was essential to long-term sustainability (IUCN 1991). The following year, the three-volume, 1000-page, *Global 2000 Report* by the US Council on Environmental Quality was released. The report was a 3-year effort initiated by President Carter to determine the long-term implication of world trends on population, resources, and the environment. The study predicted that by the year 2000 the world population would double, food production would increase by 90 percent, arable lands would only increase by four percent, regional water supplies would increase, the loss of forests would continue, and atmospheric concentrations of carbon dioxide and ozone would alter the Earth's climate (Speth 1980).

The jumping off point for most research in the field of sustainability was the UN's World Commission on Environment and Development report, *Our Common Future* (1987)(commonly known as the Brundtland Report), which focused on the consequences of environmental degradation in relation to economic and social development. The report stated that "sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs". The commission recognized the possibility for economic growth, but only if the environmental resource base is sustained (WCED 1987). The document is generally recognized as being responsible for bringing attention to the concept of sustainable development (Osorio et al. 2005). This is evidenced by the fact that between 1987 and 2001, nearly 3000 peer-reviewed articles (from 700 journals in 70 countries) cited the Brundtland report (Schubert and Lang 2005). The report also gave impetus to the planning of the UN Conference on Environment and Development (UNCED), held in Rio de Janeiro in 1992.

The Rio Earth Summit and its proclamation, Agenda 21, built upon the themes of the World Conservation Strategy, and produced 27 principles upon which sustainable development is to be based. Agenda 21 detailed symptoms and causes of unsustainability, and the methods to effectively implement sustainable development on a global scale (Hens and Nath 2003). Chapter 13 of Agenda 21 is particularly relevant to mountainous regions, such as the GYE. Prior to the Earth Summit, mountain regions received little recognition as areas of environmental concern. Traditionally, their biophysical and societal needs were perceived in the context of their disparate economic sectors, such as agriculture or forestry, which resulted in the marginalization of mountain environments and their inhabitants (Ives, Messerli, and Speiss 1997). Since 1992, mountain regions have been viewed as intrinsically important environments, as well as in relation to adjacent lowlands that rely on them for natural resources and ecosystem services. Chapter 13 specifically raised awareness of mountains, placing emphasis on their sustainability, protection of their natural resources, strengthening of information dissemination, and improved planning initiatives, as well as placing mountains on a list of prioritized environments. Mountain region concerns were later expanded upon to include conservation and diversity issues in both societal and biophysical realms (Ives, Messerli, and Spiess 1997; Sene and McGuire 1997). Rationale for this development stems from seven critical concepts. First, mountains are home to endemic and threatened species. Second, they oftentimes have large impacts on adjacent lowlands. Third, they are high-energy environments that need protection from human impacts. Fourth, they are cultural and natural resource storehouses. Fifth, they are aesthetic and recreational focal points. Sixth, they often demarcate international borders; and, lastly, they are prime locations for global change research (Thorsell 1997).

Because of the vulnerability of mountainous regions, and because there is a limited knowledge base regarding these environments, there is a crucial need for continued research based on local perceptions (Ives, Messerli, and Rhoades 1997). Mountain regions of earth have been largely neglected by the larger scientific community, which has resulted in the lack of even basic understanding of the interdependencies and interrelationships between physical, biological, and cultural processes (Ives and Messerli 1990). The work that has been conducted is spatially

uneven, with the vast majority of work being conducted in the Himalayan-Karakorum-Hindu-Kush, African, and Andean regions, with little attention paid to the mountainous regions of North America (Smethurst 2000).

In 2000, the Millennium Declaration was released and summarized the findings and resolutions of all UN conferences over the past decade and listed the Millennium Development Goals. The first six goals deal specifically with poverty reduction. The seventh goal is to ensure environmental sustainability through "reversing the loss of environmental resources and improving access to environmental services" (Hens and Nath 2003). The World Summit on Sustainable Development, or the Johannesburg Summit as it is commonly known, was held in 2002. It was the largest UN-organized conference up to that date, with 9000 delegates from 191 countries, over 8000 representatives from major groups, and over 4000 members of the media. The conference focused on strategies for more effective implementation of Agenda 21 and the recognition of interconnections among poverty, the environment, and natural resource use. Although it was agreed that Agenda 21 was a reliable and effective document, the primary shortcoming was in the inability of organizers and signatory nations to implement the sustainable development strategies it contained (Hens and Nath 2003; Nath 2003).

Two additional documents are worthy of note as they have been perceived as being critical to sustainability and sustainable development during the past decade. The first is the *Millennium Ecosystem Assessment* (MA) of 2005, which assessed the consequences of environmental change on human populations. The assessment consisted of five technical volumes and six synthesis reports, and involved the collaboration of 1360 scientists and experts from across the globe. Their conclusion was that human activities have resulted in a future where the proper functioning of the earth's ecosystems is not guaranteed. In order to reverse this, it was suggested that modification to current policy and practice were necessary (MA 2011). The second document, *Our Common Journey*, published by the National Research Council, examined the connection between research, technology, and societal efforts to achieve sustainability to improve human well-being. The document also predicted potential future development pathways, and

their implications for a sustainability transition, as well as the greatest threats to sustainability and the indicators of those threats (NRC 1999).

The countless papers, books, volumes, conferences, summits, and intergovernmental projects focused on human-environment systems and sustainability have produced an expanding scientifically-derived knowledge base. While there can be no doubt that our knowledge has increased significantly during this time, especially as it relates to human-environment interactions, the question of whether we have moved any closer toward the objectives of these initiatives and a sustainability transition remains. The challenge is to harness the combined results into real world, tangible actions.

Defining Sustainability

According to the Oxford English Dictionary (2011), the word "sustainability" is derived from the Latin verb *sustinēre, "*to hold up", and the Latin suffix *ābilis*, "capable of", and can be defined formally as the ability "to keep in being; to cause to continue in a certain state; to keep or maintain at the proper level or standard; to preserve the status of."

The jumping off point for most research in the field of sustainability is the description of sustainable development provided in the Brundtland Report (WCED 1987): "sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.". The primary idea behind this definition is that each generation will provide its successor with a productive base (economic, environmental, and societal) that is at least as large and healthy as it inherited from the past generation (Dasgupta 2007). Although this definition may seem straightforward, it is in fact highly contentious. A concern by many with the WCED definition is that while it focused on the economic and societal dimensions of sustainability, it neglected the environmental sphere (Beder 1994). However, the Brundtland Report did suggest that future economic growth should be based upon policies that sustain resource bases. The report also suggested that technological innovations were one potential method by which to sustain environmental resources, although these innovations also contained inherent risks (WCED 1987).

One of the fundamental issues regarding sustainability today is the inability of researchers, institutions, and agencies to agree upon an over-arching definition of the term. Hardoy et al. (1992) identified over 80 separate definitions of sustainability (Vought and Hutchinson 2011). Because of the normative and subjective nature of the terms sustainability and sustainable development, and the need to have working definitions that may be applied in specific situations when actions are being taken, authors and agencies have found it necessary to develop individual definitions of the terms, which has in many instances caused further confusion about the concept. A lack of a unified definition stems from the numerous objectives (environmental, economic, social), contexts, goals (equilibrium, growth, reduction), and scales (spatial and temporal), employed by groups in relation to the concept (Vos 2007; Parris and Kates 2003). However, ambiguous definitions may also be advantageous in certain instances, as they allow for locally adapted solutions based on local concerns (Kemp and Martens 2007). Sustainability goals are highly normative and subjective (Kates 2000) derived from social consensus (and often not science). Kemp and Martens (2007) suggest that its normative and subjective nature prohibits concise definition because solutions tend to be applicable for specific regions, but not the whole of society. Solutions also tend to be long-term, and may have unintended associated risks that are unknown in advance, as well as involving trade-offs.

In the context of the GYE, the normative nature of sustainability is well expressed in the definitions used by management agencies and communities. For example, the mission of statement of Yellowstone National Park states,

> Preserved within Yellowstone National Park are Old Faithful and the majority of the world's geysers and hot springs. An outstanding mountain wildland, with clean water and air, Yellowstone is home of the grizzly bear and wolf and free-ranging herds of bison and elk. Centuries-old sites and historic buildings that reflect the unique heritage of America's first national park are also protected. Yellowstone National Park serves as a model and inspiration for national parks throughout the world. The National Park Service preserves, unimpaired, these and other natural and cultural resources and values for the enjoyment, education, and inspiration of this and future generations (YNP 2003).

Although not explicitly stating or defining sustainability or sustainable development, the YNP mission statement does suggest that its primary goal is to preserve the natural and cultural resources in the park for current and future generations. The U.S. Forest Service furthers this multi-generational definition with their mission to "sustain the health, diversity, and productivity of the Nation's forests and grasslands to meet the needs of present and future generations" (USFS 2011). Among gateway communities, definitions vary considerably based on comprehensive, strategic, and marketing plans, and in some instances are not present at all. For example, while the 2009 marketing plan from the West Yellowstone Chamber of Commerce suggested that their long-term vision "places high value on existing assets, amenities and natural resources," the authors do not specifically address how to maintain such assets over the long-term (WYCC 2009). The Red Lodge (2008) growth policy suggested that the "town's dedicated citizenry not only enjoys access to recreational opportunities in this scenic location but also demonstrates a commitment to environmental protection and sustainability." Although the growth policy specifically mentions sustainability and addresses the promotion of sustainable building practices and other environmentally friendly projects, no specific definition of the term was given. Finally, the community of Jackson, Wyoming, mentioned the term sustainability repeatedly throughout its 2011 comprehensive plan, especially in regards to energy use. However, while the document includes over 20 pages of definitions, sustainability is not included.

Conceptual Models of Sustainability

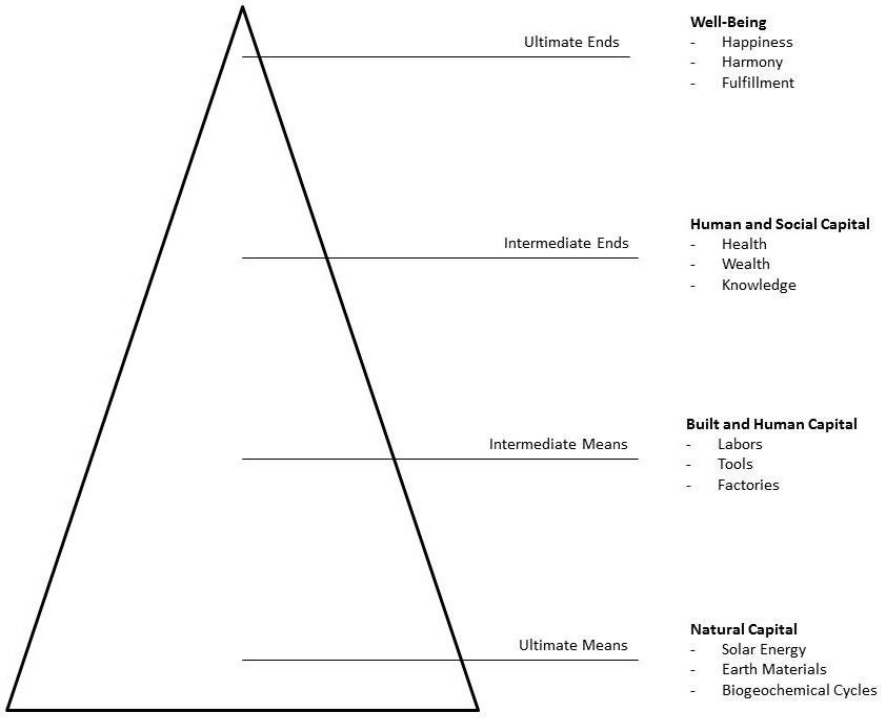
The conceptual framework of sustainability and sustainable development is based on three dimensions: economic, environmental, and societal. As Kemp and Marten (2007) suggest, the economic dimension refers to employment opportunities and wealth, the environmental dimension refers to natural resources, biodiversity, and environmental quality, and the societal dimension refers to health and well-being. The concepts of sustainability may also be thought of in terms of conceptual models meant to simplify the coupled and complex relationship between sustainability dimensions. According to Todorov and Marinova (2009), five major categories of conceptual models help to better communicate what is meant by sustainability. Pictorial visualization models, such as the

Venn diagram that represents the triple bottom line, are powerful tools that provide opportunities to reach larger audiences, but have limited informative capabilities. Quantitative models traditionally focus on a particular discipline (e.g. economics, engineering) and as such are unable to depict holistic perspectives, nor are they able to address local to global perspectives or stakeholder perceptions. Physical models, "smaller physical versions of systems that allow visualization," are designed to reduce uncertainty, especially in relation to environmental systems at local scales, and are thus poor at modeling global systems. Conceptual models, such as Meadows' (1998) Sustainability Pyramid, allow for a multi-generational, global perspective, but are often poorly adapted to local problems. Standardized models, such as sustainability indicators, depict particular activities and attempt to relate interactions between complex systems, although their temporal resolution is dependent upon the long-term acquisition of data. Below, two of the most commonly cited sustainability models are discussed: Meadows' Sustainability Pyramid, and the sustainable development or 'triple bottom line' Venn diagram.

Meadows' Sustainability Pyramid

In 1973, Herman Daly, an ecological economist at the University of Maryland, proposed a hierarchical structure to human-environment relations, which was later modified by Meadows (1998). The premise of the pyramid (Figure 2-1) was to place humanity in a hierarchical framework with the natural environment as its foundation, and human happiness, identity, freedom, and fulfillment at its apex (Quental et al. 2010). The base of the pyramid (ultimate means) signified the basis for all human needs, natural capital. Natural capital consists of solar energy, earth materials, biogeochemical cycles, and the biosphere, that are transformed by humans to create the next level of the pyramid, intermediate means. Intermediate means consist of built and human capital such as labor, tools, and factories that utilize ultimate means. The political and economic spheres of society values, manage, and distribute these 'inputs' to achieve higher level goals, or

Figure 2-1 Meadows' Sustainability Pyramid (source: Meadow 1998)



or intermediate ends. Intermediate ends include both human and that are the building blocks, instruments, or outputs to achieve ultimate ends, or human well-being (Meadows 1998). Ultimately, what both Daly and Meadows were suggesting was that without a healthy, vibrant, and functioning natural system, economic and societal systems will eventually fail.

Elkington's Triple Bottom Line

In 1998, economist John Elkington published the book *Cannibals with Forks: The Triple Bottom Line of 21st Century Business*. In his book, Elkington merged the three dimensions of sustainability, the environment, economy, and society, into a single concept, the triple bottom line. Elkington suggested that corporations should expand beyond their traditional focus on profits and returns on investment to include environmental and social dimensions (Slaper 2011; Kuhlman and Farrington 2010; Stenzel 2010). The triple bottom line suggested that an equal emphasis should be placed on each of the three dimensions, and that no individual dimension should take precedence without consideration of the consequences to subsequent dimensions. However, some

have argued that balance is never fully achievable, and that trade-offs or compromises between dimensions must be taken into consideration by corporations, communities, and individuals (Coffman and Umemoto 2010).

The traditional conceptual model of the triple bottom line first suggested by the Brundtland Report (WCED 1987) represents sustainability dimensions as separate and independent systems (Figure 2-2). In this model, sustainability dimensions rarely interact, although when interaction and integration occur (i.e., attempts to balance the triple bottom line) sustainability is achieved. The prioritization of, or lack of focus on, any single dimension results in an unsustainable system. In contrast, it has been argued (e.g., Mebratu 1998; Harrington 2011) that sustainability dimensions do not exist as separate systems, but rather that they are intricately embedded in a coupled and complex system where no single dimension can adequately function without the others (Figure 2-3). In this way, the economy is embedded in and dependent upon society, and society is embedded and dependent upon the goods and services provided by the environment (Harrington 2011). In this model, sustainability is only achieved through recognition of the embedded nature of the three dimensions, and simultaneous prioritization of each.

The Concept of Sustainability

Quental et al. (2010) suggested three scientific approaches that are relevant to understanding sustainability: ecological economics, sustainability transition, and sustainability science.

Ecological Economics

Ecological economics is a transdisciplinary field that attempts to address the relationship between economic and ecological systems, and places considerable emphasis on environmental-economic interactions. Economics and ecology are viewed as being central to contemporary environmental crises, and are thought to be a means to facilitate sustainability into the future. To reach sustainability, ecological economics suggests that ecosystem services (the goods and services human derive from ecosystem functions) must be incorporated into traditional economic accounting systems.

Figure 2-2 Traditional Triple Bottom Line Model (source: Harrington 2011)

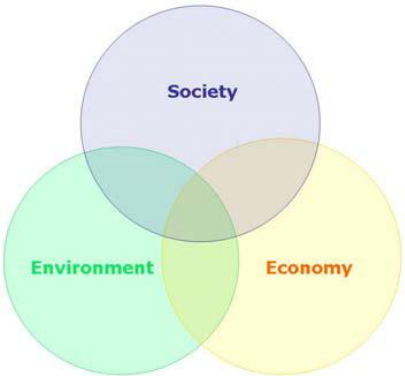
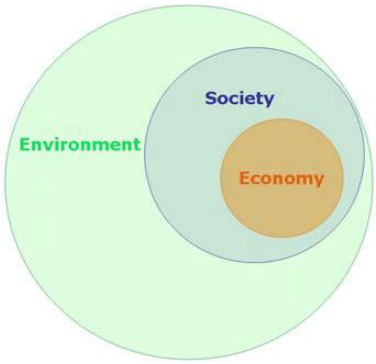


Figure 2-3 Embedded Model (source: Harrington 2011)



Although valuing ecosystem services is often difficult and fraught with uncertainty, several methods have been suggested to accomplish the task. The conventional methods by which ecosystem services are evaluated is by determining consumer willingness to pay, or willingness to be taxed for services. This method, while idealized and unable to represent true valuation adequately, is a useful starting point. A second method is based on a biophysical basis so that values are derived from the long-term cost of reproducing ecosystem services. In both instances, valuation of ecosystem services is based on our ability or willingness to move beyond short-term appreciation for such services and instead focus on their multi-generational importance (Costanza et al. 1991). As Ropke (2005) suggested, ecological economics is based on the premise that the economy is embedded in the environment, and as such, our economy is limited by the longevity and sustainability of the environment (Quental et al. 2010).

Sustainability Transition

A transition toward sustainability was defined by the National Academy of Sciences' Board on Sustainable Development (NRC 1999) as the ability of society to "meet its needs by moving away from action that degrades the planet's life support systems and living resources, while moving forward toward those that sustain and restore these systems and resources." In order to achieve a successful transition toward sustainability, trends that favor a transition must be accelerated, while those that impede it must be slowed. To facilitate such a transition the Board suggested three questions, "what is to be sustained, for how long, and what is to be developed?" In an effort to understand better these questions, Parris and Kates (2003) reviewed internationally negotiated agreements related to the environment and development. Results suggested that consensus exists and agreements are better articulated and institutionalized for meeting human needs than for those of environmental systems. Because issues relating to a transition toward sustainability vary spatially and temporally, it is critical that we have a better understanding of the goals, indicators, targets, trends and driving forces of changes at local scales (Parris and Kates 2003). Goals are the broad, over-arching objectives that one seeks to reach, indicators are a quantitative means by which to measure progress in relation to goals, targets are a quantitative measure of where one hopes to be, trends are changes to progress, and driving forces are the processes that influence one's ability to meet the stated goal. It has been suggested that the emerging field of sustainability science is well poised to assess and facilitate a transition towards sustainability (Kates and Parris 2003).

Sustainability Science

Sustainability science is a research paradigm, field of research, and integrative science that has emerged in recent years to bridge traditional scientific disciplines and human activities (Kates 2000). Sustainability science is integrative, seeking to connect knowledge of sustainability and a transition toward sustainability with action (Kates 2010). Sustainability science is not scale dependent, and instead focuses attention on the interaction of global processes and local ecological and social characteristics (Kates et al., 2001). In this context, sustainability science is in reality a symbolic concept (Parris and Kates 2003), or an approach to understand the character and interaction between the

highly complex and dynamic natural world (Kates 2000) and the viewpoints, knowledge, awareness, and behavior of society with a view toward moving society(ies) toward more sustainable conditions (NRC 1999).

Although many scholarly endeavors have attempted to lay out and describe a framework for sustainability science, to date, I believe the best example is Robert Kates' (2010) *Readings in Sustainability Science and Technology*. This review will be based on his guiding document, with supplemental sources to broaden the discussion. As Kates suggested, there are three fundamental qualities of sustainability science that identify it as a value-driven approach to support a sustainability transition: its use or needs orientation, its focus on human-environment systems, and its goal of integrated understanding. Sustainability science attempts to improve understanding of complex human-environmental interactions and seeks to find solutions to the issues facing a sustainability transition, with the ultimate goal of creating knowledge and moving that knowledge into action.

Sustainability science differs from traditional environmental and development-oriented research in a number of distinct manners (Kates 2010; Clark 2007). First, in contrast to basic, or what Kates defined as "curiosity-driven" science, sustainability science is use-inspired as it is focused on the problem(s) it is attempting to solve and not the discipline or method it employs to solve the problem. Second, because humans are both a part of nature through their dependence on its available goods and services, and apart from nature by their ability to affect it through their actions, sustainability science seeks to examine the coupled and complex nature of human-environment interaction and systems. Third, sustainability science attempts to integrate knowledge from a vast array of sources. As opposed to interdisciplinary research that attempts to bring together scientists from disparate fields to collaborate individually on given problems, and multidisciplinary research where scientists understand the problem collectively, sustainability science implements transdisciplinary research. In transdisciplinary research, scientists transcend their individual disciplines to frame questions that require integrative understanding of the problem under examination (Kates 2010).

Because solutions to a sustainable transition are often based on the values, attitudes, and behavior of individuals or groups, sustainability science attempts to identify

and analyze these traits as well as the subsequent actions of groups or individuals. It does so by identifying values related to the human use of the earth; the valuation of both social and natural capital in economic terms; and values, attitudes, and actions specifically as they relate to sustainability. Analyses undertaken in sustainability science focus on the causes, consequences, and processes related to a sustainability transition. Specifically, the discipline examines long-term trends and transitions, and interactions, impacts, and responses to a sustainable transition (Kates 2010).

Kates and Parris (2003) suggest a number of global trends that make a transition toward sustainability complex and difficult. The first threat is on-going violence (war and crime) that not only takes human lives, but also diverts and exploits natural resources. Second, although global population growth rates have declined since their peak in the 1960s, rural to urban and international migration have increased in recent decades; the challenge is to accommodate an increasing urban population base while simultaneously reducing environmental degradation associated with such a change. Third, improvements in health and well-being, and a reduction in global poverty, have made a sustainability transition a possibility, but they have also revealed the disparities that continue to exist and a shifting in disease patterns from infectious to chronic diseases in the developing world. Fifth, as production and consumption increase to meet growing demands, we will rely more heavily on technological innovations to reduce the impacts of increased and often harmful consumption patterns. Global environmental change is arguably the largest challenge faced by a sustainability transition, although such changes have the potential to be mitigated since they are largely the response of human actions to meet growing needs. As Kates and Parris (2003) suggest, the a sustainability transition will require that society "accelerate trends that favor a transition and slow the trends that impede them."

Domains of Sustainability Science Research

Kajikawa (2008) analyzed ten domains of sustainability research that are applicable to both human and environmental interactions, and while this list is not exhaustive, it allows for a better understanding of the plethora of phenomena and processes that sustainability science must incorporate. First, are issues related to climate change and the driving forces of such change (primarily increased carbon dioxide in

Earth's atmosphere). Second, biodiversity, both floral and faunal, is disturbed through human manipulation of the landscape. Third, are changes over time in agriculture, and its associated impacts on economies and the environment, as well as changes to soil productivity through use. Fourth, is fisheries, which are being depleted through over-harvesting, and is further compounded by changes in the temperature and chemical make-up of the earth's hydrosphere brought about by agriculture and other land use changes. Fifth, is forestry, that is impacted through the extraction of timber for industrialized, and non-industrialized uses, as well as the impacts associated with shifting forestry policies that influence disturbance regimes, primarily forest-fires. Sixth, are energy and resources depletion that allow economies and societies to grow, but which often come at the expense of resources that are non-renewable, or uses that may result in unintended consequences such as the increased release of carbon dioxide into the atmosphere via combustion. Seventh, are water related impacts, that extend beyond the earth's oceans, and primarily focus on freshwater reserves that sustain populations throughout the world. Particular issues related to water include the availability of potable drinking water worldwide and the prospects of water shortages in the future, as aquifers decline through extensive extraction. Eighth, is economic development, which all societies to some degree strive toward. As a principle component of the triple bottom line, economies at global, regional, and local scales are of critical importance to sustainability issues. Ninth, is the health of the earth's population that is directly impacted by the extraction and use of natural resources, the process of globalization that increasingly allows the transmittal of diseases rapidly across the globe, and the lifestyle choices that each of earth's inhabitants make in their daily lives, most notably consumption, which is responsible in most cases for driving the first nine attributes. A majority of these themes are also noted in articles such as Vitousek et al. (1997), regarding human's domination of the earth's ecosystems, and Ruth DeFries and collogues (2007) article that looks at the impacts of land use change across the earth.

In Chapter 3, Kajikawa's research domains are examined in the context of the Greater Yellowstone Ecosystem. Although the domains of research described by Kajikawa are by no means all-inclusive, nor the discussion of those themes in the GYE

exhaustive, they do provide a basis for synthesis of the fundamental challenges the region faces in its transition towards sustainability.

Adaptation, Vulnerability, and Resilience

To understand the complexity of sustainability issues, individuals and communities must be cognizant of their vulnerability to future change, their ability to cope with change, and the potential techniques available to mitigate change. Adaptation is the response to actual, expected, or perceived changes or threats that may occur in the environment, economy, or society, and may include adjustments or coping mechanisms based on institutions, societal behavior, and technologies (Kates 2010; Kajikawa 2008; Smit and Wandel 2006). Vulnerability is the sensitivity of a system to perturbations, and is context specific, varying temporally and spatially (Smit and Wandel 2006). The field of vulnerability science has emerged to address circumstances that limit or improve the adaptive capacities of people and places, and focuses on interactions among social, natural, and built environments (Cutter 2003). Resilience, on the other hand, is the ability of the system to maintain integrity after a given change (Liu et al. 2007), or the capacity to absorb perturbations induced through human-environment interactions and return to a stable state (Kates 2010). The resilience perspective addresses social-ecological systems, but pays particular attention to non-linear dynamics, thresholds, and uncertainties (Folke 2006).

Interactions between human and environmental systems transpire across a variety of scales, from local to global, and force systems to respond as they reach or exceed limits, boundaries, thresholds, or tipping points. The ability of natural and social systems to be sustained over the long-term depends on their ability to respond and adapt to uncertainty and disruptions (Fiksel 2006). Interactions between nature and society that lead to or prohibit a sustainability transition may also be guided by interventions in the form of regulations, economic incentives, or persuasion. Because human-environment systems are complex, it is not always obvious which interventions will lead to a sustainability transition, and choices are often pursued based on previous experience, ease of implementation, and precedent. Regulations are the laws and norms that attempt to control behavior, whether institutional or societal. Economic incentives attempt to shape behavior through economic stimulus, while persuasion encourages a particular

behavior through information. These types of interventions are directed, controlled, and administered through governance. Although governance often is thought of as stemming from government organizations, it may also be administered through corporations and society as a whole (Kates 2010).

Sustainability indicators

One of the other fundamental differences that set sustainability science apart from other scientific disciplines is its implementation of integrative methods and models. These include long-term, place-based studies, the comparison of both long and short-term case studies, the identification of sustainability indicators, and analytical methods that assess the driving forces behind long-term trends (Kates 2010).

In order for society to successfully transition toward sustainability, it must have the ability to monitor and assess changes and progress (Kates 2010). The most common method for tracking change is through sustainability indicators. While numerous indicators currently exist, such as gross national product or the human development index, they do not adequately assess the interactions of human and environmental systems (United Nations 1992). Sustainability indicators allow stakeholders and decision makers to determine what is to be sustained and what is to be developed (Kates et al. 2005). In addition, sustainability indicators allow for "advocacy, participation and consensus building, and research and analysis." Due to the ambiguous nature of sustainability, the multiple purposes behind measuring sustainable development, and complexity of data acquisition methods and monitoring and measurement techniques, no universally accepted set of sustainability indicators has been identified, although over 500 attempts have been made by the scientific community. Specific types of indicators include the Genuine Progress Indicator, which measures the economic contributions of households and volunteer work, The World Economic Forum's Environmental Sustainability Index, the World Conservation Union's Wellbeing Index, and the Ecological Footprint Index (Parris and Kates 2003). The Ecological Footprint Index (Wackernagel and Rees 1996) measures the amount of land and water that the world's population would need to provide adequate resources at current consumption rates, mitigate wastes, and remain sustainable. The model was originally designed to estimate the land area required to sustain an urban area, as urban areas have higher population

densities and thus require more land to grow food, accumulate water, and absorb waste products than rural areas (Brander 2007). Today the model can be implemented to determine not only the ecological footprint of urban or rural areas, but more importantly the footprint of individuals, governments, or corporations.

Driving Forces

A better understanding of the driving forces and processes that lead toward or away from more sustainable conditions is also critically important. In an attempt to determine the driving forces of tropical deforestation, Geist and Lambin (2002), differentiated between proximate, or direct, and underlying drivers of change. Proximate drivers require immediate action and often involve human activities at the local level. Examples include agricultural expansion, timber extraction, and development. Underlying driving forces are social processes that underlie proximate drivers and while they may operate at the local level, their impact is often experienced at larger spatial scales. Examples include demographic change, economic and institutional characteristics, and policy decisions. In the GYE, proximate drivers include the conversion of agricultural lands to subdivisions (Gosnell and Travis 2002), mineral extraction (Stoughton and Marcus 2000), and tourism and recreation activities that degrade the natural environment (Johnson unpublished manuscript). Indirect drivers include rapid population growth during the last three decades (Gude et al. 2005), federal land use policies (Yochim 1999), and a lack of uniform planning and zoning policies (Compas 2007).

In relation to human needs, Parris and Kates (2003) suggested that hunger and lack of education are primary driving forces away from a sustainability transition. In order to mitigate the negative effects of hunger, they suggested that a reduction in world population and in income disparities would promote and accelerate positive trends toward sustainability. Adult literacy rates could be improved by reducing family sizes, hiring additional teachers, and increasing funding for education. Other researchers focus more on the reduction of consumption rates, rather than reduced populations (Parris and Kates 2003). Parris and Kates (2003) also suggested that the stabilization of greenhouse gases and the availability and maintenance of fresh water supplies are critical to reducing degradation of life-support systems. In order to stabilize greenhouse gas emissions,

economic growth would need to focus more heavily upon "those who need it most, and toward less emission-intensive activities", while technological innovations are needed to reduce emissions.

Land Change Science

Because of the coupled and complex nature of human-environment systems, a better understanding of interactions is needed to facilitate effective decision and policy-making. Land change science attempts to understand the dynamic nature of land use and land cover change—an important component of human-environment interactions—at multiple spatial and temporal scales through observation and monitoring (Turner et al. 2007). Land change science can be thought of as a sub-discipline of sustainability science primarily through its primary objectives, and its integrative approach, namely the integration of social, natural, spatial sciences. One drawback associated with such an integrative approach, however, is data and methodological incompatibility, including analytical problems such as data aggregation and inference across spatial and temporal scales (Rindfuss et al. 2004). One particularly insightful addition to sustainability science has been the coupling of land change science and political ecology. Like sustainability science and land change science, political ecology addresses coupled systems, although it focuses specifically on an examination of critical, gendered, and post-modern theories. This allows sustainability science the ability to be better "informed of the limitations of generalization and provided with a foundation upon which to assemble place-based approaches to land dynamics" (Turner and Robbins 2008).

The Ecosystem Concept and Ecosystem Services

Nearly 120 years after Alexander von Humboldt studied relationships between organisms and their environment, and 60 years after Ernst Haeckel first used the term ecology to describe the study of nature, in 1935 Arthur Tansley coined the term and introduced the concept of ecosystems (Golley 1996). Tansley was the first to recognize that organisms could not be separated from their physical environment, a common practice of ecologists at the time. Specifically, he suggested that ecosystems involved the

complex interaction of the biome (or biota) and the environment, and that these two systems strove for equilibrium (Golley1996).

Ecologists prior to the nineteenth century observed that plant and animal communities were arranged in recurring patterns in space and in time. The first to study an entire ecosystem, in this instance Lake Geneva in Switzerland, was August Forel. Between 1892 and 1904, he researched and published work on the interactions of the lake's biota and the aquatic environment, and suggested that these interactions were the dominant force in the life cycle of the lake. Study of terrestrial systems occurred as well, including research by E.A. Birge and Chancey Juday, who conducted studies on species composition and later applied theories such as thermodynamics, biogeochemistry, and productivity (Golley 1991).

Work in the first half of the twentieth century was focused at the organism level. Of particular note in this era was Frederic Clements, who suggested the metaphor of superorganisms, or the concept that communities had life cycles similar to organisms, including birth, growth, and death (Golley 1991). This was followed by the idea of wholism, with the two largest proponents being Jan Christian Smuts and John Phillips (Golley 1991). Phillips advanced the concept of wholism as it applied to ecological communities, specifically that plants and animals could collectively be thought of as existing in a biotic community (Golley 1991). Arthur Tansley focused on the concept of the system, which had previously been adopted by the larger scientific community. The systems approach recognized that complex individual parts interacted to produce order and patterns in the system (Golley1991; Golley 1996).

The first empirical use of Tansley's concept of the ecosystem was by Raymond Lindeman, who studied Cedar Bog Lake in Minnesota (Golley 1996). Lindeman's goal was to study all aspects of the lake's biota simultaneously, including biotic food cycles and their relation to ecological succession of organisms. From this research, he published "*The Trophic-dynamic Aspect of Ecology*" in 1942, where he suggested that nature was organized by ecological systems that have origins and phases of development that lead to equilibrium. His effort to define quantitatively the lake's biota, and thus ecosystem, helped promote interest in ecosystems (Golley 1996).

Eugene Odom presented the principles of ecology in an organized manner and was responsible for moving ecology past its previous focus on natural history and abundance of organisms to an empirical examination of ecosystems (Golley 1996). Odom expanded Tansley's concept to include several critical ideas now taken for granted. First, the Earth itself is the largest ecosystem, and the biosphere is where ecosystems operate. Ecosystems can be thought of as varying spatially from a small pond to the biosphere. Odom also suggested that organisms influence the abiotic environment. Arguably most important to modern-day ecology and the study of human-environment interactions, he suggested that humans have the capacity to dramatically alter ecosystems (Golley 1996).

Between 1955 and 1965, research related to ecosystems expanded greatly as a result of funding through the Atomic Energy Commission (AEC) (Golley 1991). The AEC was interested in determining the impacts of radioactive material in the environment and its concentration in the biosphere. From this research two major areas of emphasis evolved: attempts to estimate global productivity through the acquisition of data related to population dynamics and trophic levels, and ecosystem accounting, where inputs to and outputs of the system must be balanced. Beginning in 1964, the International Biological Program (IBP), a multi-national organization of scientists, was established to use ecological and biological concepts to solve human problems (Golley 1991).

In the United States, Odum and Arthur Hasler were assigned to the IBP committee to study both terrestrial and aquatic systems in 1967. The result was the realization of the interconnection between terrestrial and aquatic systems, as well as further development of Frederic Clements' idea of the biome (Golley 1991). The biome concept was widely accepted and applied in the US, including projects in grasslands, deserts, tundra, and coniferous and hardwood forests. With limited funding, and a lack of synthesis between scientists working in different biomes, the project eventually failed, but in the process provided a baseline data set for future scientists (Golley 1991). One of the primary catalysts for the US IBP Biomes Project was the effort by F. Herbert Bormann to establish a research program focused on the watershed level and on the interaction between terrestrial and aquatic biota (Golley 1991). Located at the US Forest Service (USFS) Hydrological Research Facility at Hubbard Brook in the White

Mountains of New Hampshire, the facility continues to operate today. Based on the efforts of the IBP Biome Project, in conjunction with the work carried out at Hubbard Brook, Burns (1992) suggested that the power of the ecosystem concept stems from its holistic nature, emphasizing the connections between organisms and the environment in both space and time.

By the 1980s, the ecosystem concept had gained wide acceptance in the scientific and management communities. Research since has focused on the original goals of the IBP—resolving human problems—primarily through the idea of sustainability of natural systems . Ecosystem management has been the approach taken to meet these goals by integrating the activities of humans (political, economic, and social), with the conservation or preservation of nature. The recognition that collaboration between scientists, managers, decision makers, and stakeholders is of critical importance (Pavlikakis and Shihrintzis 2000), due to the complex, multi-faceted, and socially contentious nature of managing ecosystems (Chee 2004), has driven more recent research.

Ecosystem Services

The growing recognition of the ecosystem concept spurred interest and study of interactions of ecosystems with, and benefits to, human society. The benefits human society receives from ecosystems, both directly and indirectly, are known as ecosystem services (Costanza et al. 1997). Bennett et al. (2005) argued that, as demand for ecosystem services has increased, human society has attempted to increase productivity by modifying ecosystems. However, in order to manage ecosystems effectively, society must focus on the long-term sustainability of ecosystem services. One method of enhancing long-term sustainability has been realized through improvements in technology that may act as proxies for ecosystem services (Daily 1997a). However, it has also been suggested that long-term management of ecosystem services will involve tradeoffs between services and the potential benefits and/or risks inherent in technological adaptations (Bennett et al. 2005). Human use of ecosystem services has the potential to leave the services depleted or destroyed. Specific threats to ecosystem services include the destruction of services through human activities, most notably

destruction of habitat and the introduction of non-native, invasive species; the alteration of biogeochemical cycles through the burning of fossil fuels and use of fertilizers; unsustainable agricultural practices; pollution; and the overharvesting of fisheries (Daily 1997a)

Capital may take several forms, including natural capital (e.g., trees, minerals, atmosphere), manufactured capital (e.g., technology), human capital (e.g., intellect), and others. The natural capital provided through ecosystems, combined with other types of capital, is essential in enhancing human well-being (Costanza et al. 1997). The services provided by ecosystems are generated through solar energy and natural cycles (Daily 1997a), and provide critical life-support to human society, including "the purification of air and water, detoxification and decomposition of wastes, regulation of climate, regeneration of soil fertility, and production and maintenance of biodiversity" (Daily 1997b). Other services provided by ecosystems include primary production, where carbon in the atmosphere is fixed by plants to produce organic compounds (food) through photosynthesis. Terrestrial plant life is crucial, as it moderates the earth's climate biophysical processes, such as the amount of incoming solar radiation that is reflected back to space through albedo, and balances latent and sensible heat fluxes (DeFries and Bounous 2004).

Daily (1997b) has suggested that, unless current trends in the depletion of ecosystem services are curtailed immediately human society has the potential to permanently impair ecosystems and the goods and services they provide within decades. It has also been suggested that if appropriate actions are taken in the near future, many ecosystem services could be restored. Because threats to ecosystems are increasing, there is a growing need to identify and monitor provisioning services.

A critical concern of the long-term sustainability of ecosystem services is that the goods and services they provide are not adequately represented in commercial markets, and thus are often neglected in the decision-making process (Constanza et al. 1997). As Daily (1997a) suggested, valuation of ecosystem services is difficult because it involves philosophical issues and the defining of societal objectives which are both subjective in nature. Societal goals are subjective because value systems, the normative and moral

framework society uses to infer importance, vary given local contexts and goals, which results in differing valuations of ecosystem services (Farber et al. 2002).

One program that financially compensates private landowners who protect and enhance ecosystem services in the US is the Conservation Reserve Program (CRP). The program is designed to provide annual payments to landowners to help mitigate soil erosion and sedimentation into lakes and streams, and to improve water quality, wildlife habitat, and terrestrial and aquatic resources. According to the USFS, programs like CRP promote the importance of ecosystem services to human well-being, provide incentives to sustainably manage fragile lands, encourage restoration of previously degraded lands, and inspire individuals to fully consider their consumption of natural resources (USDA 2007). In addition, Wu and Lin (2010) found that participation in the CRP resulted in a 5-14% increase in average farm values in the Intermountain West. However, challenges exist in the program, including a 20% decrease in enrolled acres due to changes in the Food, Conservation, and Energy Act of 2008, and an increase in agricultural commodity prices since 2006 that has resulted in increased program costs and the potential for decreased landowner interest (Hellertein 2010).

An assessment of the consequences of human impacts on ecosystems and ecosystem services was undertaken by the UN in 2000. Conceptually, the Millennium Ecosystem Assessment (MA) looked at what services ecosystems provided society, how those services benefited society, and how humans altered ecosystems (Carpenter 2008). Because ecosystems are complex and dynamic and thus poorly understood, the primary goal of the MA was to synthesize existing knowledge regarding changes to ecosystems through a multi-scale, integrated assessment that would be useful to decision-makers (Bennett et al. 2005). Overall, the study found that not only was the use of ecosystem services by society increasing through increased population and consumption, but also that a variety of causes were driving these changes, including poorly managed institutions and policy implementation, and significant gaps in scientific understanding of ecosystems (Carpenter 2009). More specifically, the MA had four main findings. First, over the past half century humans have modified ecosystems further and at a higher rate than any other point in human history. The catalyst for this rapid increase was the need to meet society's demands for food, water, and other essential life-supporting services, the result

of which was an irreversible loss of biodiversity. Second, the use of ecosystem services has resulted in gains to both human well-being and economic development, but gains were not evenly distributed across the globe, and such gains came at a cost to existing and future ecosystem services. Third, degradation would continue to grow throughout the first half of the twenty-first century. Finally, although difficult, reversing degradation could be accomplished through changes in policies, institutions, and practices (MA 2005).

A key mountain ecosystem in North America is centered on Yellowstone National Park, established in 1872; it is generally recognized as the world's first national park. Nearby Grand Teton National Park was established in 1929, but it was not until the 1970s that scientists (e.g., John and Frank Craighead) began to recognize the complexity and interconnectedness of the region's natural systems. In order to preserve and protect species in these parks, most notably grizzly bear, it was found that management of adjacent lands, which also serve as critical habitat throughout the year, is equally important (Pritchard 1999). The recognition of the coupled and complex nature of the Yellowstone region spurred the introduction of ecosystems into scientific discourse, and in the process created the concept of the Greater Yellowstone Ecosystem. The United Nations (UNESCO) also recognized the biological and cultural importance of the region when it gave Yellowstone World Biosphere Reserve Status in 1972, and named it a World Heritage Site in 1978 (Freemuth and McGreggor-Cawley 1998).

Rural Studies

Although residents of rural areas are the clear minority in the US, most of the country's land area, including the majority of its natural resources, is rural. As such, the management and conservation of rural areas is of primary concern to the nation on its transition toward sustainability (Brown and Swanson 2007). Since the end of World War II, rural landscapes across the industrialized world have seen dramatic shifts in economies, social characteristics, and land uses. These shifts, though not spatially uniform, have largely been the result of a restructuring in the primary industries, and the uneven development of secondary sectors. Walford (2003), Evans et al. (2002) and Ilbery and Bowler (1998) suggest that productivism, the dominant model for modern

economies, is focused on the concentration of increased outputs by a decreasing number of producers, the intensification of output levels, and the specialization of output by individual farms to selected products, or what Woods (2005) terms intensification, concentration, and specialization. In addition, Wilson (2001) postulated seven distinct dimensions of productivism that differentiate it from post-productivism: ideology, actors, food regimes, agricultural production, agricultural policies, farming techniques and environment impacts. Modifications based on the ideals of productivism resulted in a transition from a rural, pre-productivist landscape (prior to about 1940), with high environmental sustainability and quality, and low land use intensity, into an increasingly degraded environment, especially in relation to soil erosion, pollution, high land use intensity, and decreased community cohesion (Wilson 2001).

As opposed to productivism, post-productivism has been characterized by a reversal to an increased number of farmers on smaller tracts of land (dispersion), an increase in labor demands, a decrease in mechanization, and an increase in low-skilled laborers producing multiple products, while making better use of the land (Walford 2003; Ilbery and Bowler 1998). Woods (2005) termed these transformations as extensification, diversification, stewardship, and enhanced values. Further, Wilson (2001) suggested that the seven dimensions of productivism are supplanted by an ideology of anti-exceptionalism, and a contested countryside, where the corporate actors that dominated productivism are reduced, resulting in less emphasis on production. He further suggests that a decoupling of current subsidies and price guarantees is reduced in the post-productivist model, which will in turn decrease the environmentally degrading practices of the past. All of these modifications would result in a transition from a rural, productivist landscape with low environmental sustainability, and high land use intensity, into an increasingly improved environment, with low land use intensity (Wilson 2001), decreased capitalist bonds and increased community cohesion.

The rise of productivism has largely been the result of increased globalization in the developed world. The process of globalization has resulted in a decrease in local and regional power, and an increase of capitalist influences at the global scale. Woods (2005) suggested that globalization has taken three primary forms in rural environments: globalization of economics, of mobility, and of culture, all of which have had lasting

impacts on the economies, societies, and environments of the rural landscape. The globalization of economics is most noted in intensified global trade and regulations, which has resulted in an increase in agricultural specialization. The increase in specialization has been facilitated by the rise of global corporations, whose vertical and horizontal integration and large purchasing power have been accompanied by negative impacts to rural communities. The globalization of mobility has influenced not only the transfer of goods, services, and capital, but also people, which has caused declines in the stability of local communities. Finally, the globalization of culture, primarily through the media, has resulted in an idealistic view of rural landscapes and cultures, creating conflicts especially in relation to urban to rural migration (Woods 2005).

In addition to the changes witnessed in agriculture mentioned above, rural economies have also shifted in recent decades from traditional production-based activities to service-based activities. Since the latter half of the 20th Century, rural areas have seen an increase in the service sector, including education, health and social services, retail operations, leisure and tourism industries, and the relocation of financial and corporate industries. Woods (2005) suggested that this transformation has resulted in three critical trends in rural economies: a fragmentation of economic opportunities at the local level, an increased dependency on extra-local institutions and markets, and a shift from locales of production, to those of consumption.

Barkley (1995) suggested that rural communities as a whole face challenges related to enhanced global competition brought about by globalization, including the need for the rapid adoption of new technologies (primarily related to production and communication) and corporate restructuring. The adoption of these improvements is especially important for agricultural and extractive industries who have witnessed dramatic declines in profits in recent decades. This decline has forced many communities and individual industries to diversify their operations. For agriculture, this has meant an increase in off-farm occupations, and on-farm diversification (Evans et al. 2002). For communities, this has meant diversifying into industries based on their particular assets, including natural amenities (Whitender and McGranahan 2003; Deller et al. 2001). Agricultural restructuring has also resulted in a decrease in non-agricultural sectors that have additional consequences for rural communities (White 2008; Rathge and Highman

1998). Consequences include a loss of community attachment and sense of place through the closure of community facilities, including schools, churches, and post-offices, that in turn have fragmented rural residents' sense of identity, independence, and community interaction (Woods 2005).

Simultaneous with restructuring of agriculture have been shifts in other primary industries, such as fisheries, mining operations, and timber production, which have all seen declines in recent decades. According to Woods (2005), these declines are driven by three primary factors: exhaustion of the natural resources themselves, decline in consumer demand and the forces of global competition, and increasing focus on sustainable resource use. There also has been a general increase in the importance of the manufacturing industry in rural areas in the form of absolute increase in the 1940s-1960s, and comparative (to urban) increases in the 1970s-1990s. North (1998) and Woods (2005) have suggested that the catalyst for this shift is based on five hypotheses; the constrained location hypothesis, which suggests that as urban space become more limited, industry seeks rural locations for expansion; the production cost hypothesis, based on the spatial variation in wages and land values; the filter-down hypothesis where, as products move through their life cycle, the resources provided by urban settings may no longer be needed; the capital restructuring hypothesis, based on the assumption that advances in technology and mobility have reduced the need for highly skilled labor; and the residential preference hypothesis, which suggests that industries move to rural areas due to the perception of the rural idyll.

The structure of rural social and demographic characteristics has also been transformed through restructuring and uneven development, with lasting impacts on community cohesion and dynamics (Woods 2005). Demographically, rural areas have experienced a mixture of boom and bust cycles, and those cycles have been spatially heterogeneous. From the steady decline in rural populations from the turn of the 20th Century to the counter-urbanization trends beginning in the 1960s, shifting population bases, both in sheer numbers and composition, have fundamentally changed in rural areas (Woods 2005). This is largely the result of the restructuring of agriculture, which has decreased the number of employees needed (White 2008; Rathge and Highman 1998). Changes in the service industry through counter-urbanization and restructuring of the

labor market have also resulted in a decomposition of class structure (toward a middle class in some instances). This change in class composition has been facilitated by an increase in service-related managerial employment; job-related in-migration; an increased need for teachers, doctors, and government officials; the mobility afforded through improved transportation and telecommunication technologies; and a search for the rural idyll (Woods 2005).

Although often overlooked when compared to urban settings, the increase in poverty as a result of restructuring, class structure dynamics, and uneven development related to the service industry and amenity-driven migration, is widespread in rural regions (Tickamyer 2006). Further, the decline in rural populations has also had a dramatic impact on the quality of housing in rural areas, and the availability of affordable housing opportunities (Barcus 2003). Social services, such as medical services and employment centers, are also increasingly inaccessible for many rural residents (Woods 2005). Further, the out-migration of younger populations has ramifications for rural areas' ability to grow in the future (Rathge and Highman 1998).

Lastly, as amenity migrants move into rural areas, not only do they transpose their preconceived notion of the rural idyll, including the good, natural, sustainable, all-American life (Lapping 1997), but they also transpose their own values, beliefs and attitudes, which may be at odds with those of long-time rural residents. Traditional rural residents tend to view the land and nature resources as a source for production, as opposed to new migrants who often view it as a place of (scenery) consumption, primarily through recreation and tourism (Lapping, Daniels, and Keller 1989). Further, new migrants to rural areas often desire services and amenities that were present in their former urban locations. This results in calls for additional or improved municipal infrastructure such as roads, waste treatment facilities, water treatment plants, and open spaces such as parks and recreation areas. Infrastructure improvements require communities to keep pace with public services and often results in increased taxes and higher property values (Lapping, Daniels, and Keller 1989).

The types of resources (natural, cultural, and human), their uses, community dependence upon resources, and the implications of dependency vary spatially and temporally. As individuals and societies, we are dependent upon resources for our

livelihoods, particularly in the form of material goods and services. For people directly involved in the extraction of resources, this dependence is even further amplified. As societal values and uses of resources shift through time, the livelihoods of resource dependent communities are directly impacted. During times of high resource valuation and use, resource dependent communities thrive and often expand, while during times of low valuation and use, they struggle to survive (Krannich and Luloff 1991). In general, it has been shown that resource dependent communities have a higher preponderance of poverty and unemployment rates, low median home incomes, and higher occurrences of social pathologies, including alcoholism and divorce (Stedman, Parkins, and Beckley 2005).

In order to cope with social changes in extractive industries, Marshall et al. (2007) suggest that the theory of social resilience offers a variety of approaches. The first dimension of resilience ('perception of risk in approaching change'), suggests that those with transferable skills in other trades are more capable of coping with unexpected changes. The second dimension of resilience ('ability to plan, learn and reorganize'), suggests that newcomers to extractive industries, and those who are able to plan, gain education, and reorganize, are in better positions and more willing to shift to other industries. According to the third dimension of resilience ('perception of the ability to cope with change'), those who perceive themselves as being financially and domestically stable are more likely to succeed in dealing with change, and finally, the fourth dimension of resilience ('level of interest in adapting to change'), is based on the assumption that resource dependent employees must be willing to adapt to changes, and those with fewer social and economic constraints are often in a better position to do so.

In recent decades, formerly extraction-based communities have attempted to diversify economically through tourism and recreation based industries. Although tourism is not often regarded as a resource extraction industry in the traditional sense, the commodification of the natural environment in conjunction with the social and cultural environment, in many communities, has resulted in a transferral of dependence from one resource to another (Lapping, Daniels, and Keller 1989). Hall and Page (2002) suggest that the tourism industry as a whole has numerous positive and negative implications for destination societies, economies, and environments. Economically, tourism leads to

increased expenditures in the community that in most cases lead to additional employment opportunities, as well as increased standard of living (Reeder and Brown 2005). However, it also leads to increased local inflation, including increased property and home values, as well as monetary leakages through outside influences. Socially, tourism may lead to increased values and traditions, pride and spirit ; however, it may also lead to the commercialization of traditional activities, the loss of sense of place, and overall decrease in social cohesion . Finally, tourism has the potential to improve the natural environment through capital expenditures such as restoration projects and the development of new facilities, but it may also lead to environmental damage through increased resource usage, changes in natural processes, and the fragmentation and displacement of flora and fauna (Hall and Page 2002). However, efforts can mitigate the negative impacts of tourism, including efforts towards sustainable tourism that focus on being sensitive to the environment, and having a social awareness of impacts on local traditions. An example is sustainable tourism, which aims to provide economic opportunities and an enhanced quality of life for local populations, while simultaneously protecting the cultural and natural heritage of tourist destinations (McCool, Moisey, and Nickerson 2001).

Environmental Sociology: Perceptions, Attitudes, Values, and Behavior

Of primary concern to the multi-disciplinary field of sustainability science is the interconnectedness of the environment, economics and society (Kates 2000). Sociology is well suited to study these complex interactions, as it is able to examine differing scales of social organization, as well as the commonalities and differences among scales (Laska 1993). By focusing on questions of inequality, culture, power, and politics, the field of sociology is able to view sustainability, and environmental studies, differently than most related fields (King and McCarthy 2005). Several of the conceptual dimensions of environmental sociology research are applicable to sustainability studies, particularly environmental attitudes, the environmental movement, social impact analysis, and risk assessment (Laska 1993). An appreciation for the relationship between society and the environment has not traditionally been prevalent in the discipline, and a fundamental shift in paradigms in the field was necessary to bring this change about.

The Rise of Environmental Sociology

Foster (2005) suggested that the events leading up to World War II, and the technological and scientific advancements thereafter, sparked what he terms, a "new ecological stage" for planet earth. This stage brought with it, for the first time, technological and economic practices that rivaled ecological cycles, and related increased ecological peril. Prior to the 1970s, sociologists gave little attention to the relationship between humans and their natural environment. This was largely the result of ongoing sentiment that discussions of the environment led to interpretations of environmental determinism. With the proliferation of the environmental movement in 1970s public discourse, largely because of perspectives such as Foster's "new ecological stage," the environment was brought center stage for a number of disciplines. As environmental concerns continued to permeate society, non-sociologists were increasingly interested in the interaction between societies and the natural environment, as well as the ways in which societal decisions affected the environment (Laska 1993).

Three sociological traditions would eventually coalesce to form the subdiscipline of environmental sociology. First, was a growing movement in the field in the 1970s that focused on parks and leisure, public lands, their policies and management, as well as land use planning. This research became collectively known as natural resource sociology. Second, traditional rural community studies of the 1950s and 1960s began to shift toward communities that were natural resource dependent, including industries such as logging, fisheries, and mineral and energy extraction (Buttel 1987). Finally, human ecology also added vitality to environmental sociology by focusing on the human species, its relation to the environment (both constructed and natural), and the environmental influence of the species (Buttel 1987).

A greater understanding of the complexity and interconnectedness of these three traditions spurred some in the field to begin to look more critically at the current philosophies of the field, particularly the Human Exceptionalism Paradigm (HEP). In addition, Allen Schnaiberg's (2002) notion of the "treadmill of production," would further the discourse on human-environment interactions, which combined with HEP, brought about a transition towards environmental sociology. Specifically, the new field of study began to focus on the social considerations of the environment, and on

environmental issues themselves. This led researchers to focus on two categories of environmental phenomena. First, was the everyday (or ordinary) practices of society, which resulted in what Buttel (1996) termed "sub-structurally-environmental" practices, or those that were unrecognized by institutions or societies. Second, those phenomena that were recognized by institutions and societies, and subsequently acted upon through social patterns and/or behavior such as the environmental movement.

Environmental Orientation

Buttel (1987) suggested that there are three major methods by which sociologists ascertain environmental orientation, all of which have considerable applicability to research about social situations in the GYE. First, social-structural research attempts to understand the differences between attitudes and beliefs of different segments of society. This method is particularly useful when attempting to differentiate attitudes and beliefs of decision makers and stakeholders. Second, social-psychological research focuses on the cognitive structure and attitude-behavior similarities of environmental orientations, with a particular emphasis on norm-activation theory. Norm-activation theory states that societal norms are only activated when society becomes aware of the consequences of its actions. This research approach has considerable application in sustainability studies, especially those that look at bottom-up, grass roots-based approaches. Finally, applied research focuses on the relation between societal behavior, attitudes, incentives, and public programs. This method is important to decision makers in the GYE, as it provides alternatives for the promotion of sustainability initiatives.

Political Ecology

Environmental change reflects, and has the potential to modify, political processes at various scales (Bryant 1991). The field of political ecology allows for the analysis of politics and power structures, their relationship to society and the natural environment, and the ramifications that may transpire as sources of power and conditions change (Bryant 1991). Paulson, Gezon and Watts (2003) suggested that the field is shaped by its ability to relate social relations and environmental concerns that may not be proximate to one another. This is of particular concern to the GYE, where extra-local institutional policies and procedures, especially those of the National Park Service and the US Forest

Service, can have dramatic effects on both the natural environment and local economies. Bryant (1991) identified three interrelated areas of research that are applicable to human-environment studies in the GYE. First is the examination of the overall impact of state policies on environmental conditions. It is critical to understand the power dynamics in individual communities to ascertain where influences originate, and what outcomes they have produced in the past. The second focuses on the spatial and temporal nature of state policies, and public response to those changes. In particular, it is crucial to determine if policies and responses are uniform spatially and temporally, and if not, how differences influence perceptions and actions. The last research area assesses the implications on environmental change and its relation to socio-economic inequalities. In the GYE it is important to examine how socio-economic differences between traditional resource dependent communities differ from those who rely on amenity migration and the recreation and tourism industry for vitality, as these differences may further inform perceptions and subsequent actions.

Perceptions, Attitudes, Beliefs, and Values

Perceptions are an aspect of human behavior that is culturally influenced and based on the complex combination of past individual experiences (Segall et al. 1968). Perceptions allow humans to organize and interpret information about the world around them based on the senses; they contribute to our aesthetic sense and provide critical survival tools (Pomerantz 2006). For some geographers, perceptions are more akin to attitudes about a subject, as opposed to how a subject is perceived by the physical senses (Tuan 1979). As Heberlain (unpublished manuscript) suggested, attitudes are related to values, range from general to specific, and are based on an emotional dimension (e.g., 'feelings') and a cognitive dimension (e.g., facts). Values are a type of attitude that is central to an individual's personal belief system. Environmental perceptions and attitudes have been of interest to scholars and policymakers for decades. Formal assessment of public perceptions and attitudes of environmental issues began in the 1970s (Bord et al. 1998). For scientists, the benefit of these assessments was that they provided the ability to determine public response to environmental initiatives: responses had the ability to exacerbate or reduce environmental impacts. For policymakers, public

assessment provided the opportunity to determine the policies or initiatives that held public support (Adelle and Whitana 2008; Bord et al. 1998).

Three primary research paradigms drive modern environmental attitude studies in sociology, those focused on socio-economic variables that result in environmental protection, those that focus on the cognitive basis for environmental orientation and attitude-behavior congruence, and those that evaluate policies intended to influence behavior (Buttel 1987).

It could be argued that environmental perception studies began in the field of geography in 1925, when Carl Sauer began to investigate the impact of humans on the environment (English 1969), and with Gilbert White's (1945) paper on natural hazards. As Saarinen (1969) suggested, geographers are particularly well suited to study environmental perceptions because of their extensive focus on human-land relationships, their ability to investigate and interpret relationships in real world contexts, and their ability to work at a number of scales (local to global). Perception studies matured in the 1950s and 1960s, when behavioral geographers began to recognize that human activities were a product of their interaction with the natural world and that their goals toward it were based on beliefs, attitudes, and preferences (Rushton 1979). Kirk (1952) suggested that the discipline of geography should be separated into two major divisions, phenomenal environment and behavioral environment. The phenomenal environment consisted of facts about the physical world, including the environments that humans had altered. The behavioral environment consisted of the patterns, structures, and acquired values of phenomenal facts in a cultural context (Woods 1970). In addition, Kirk suggested that the examination of human behavior in relation to the environment is critical because it is the basis for human decision making (Grossman 1977).

Other geographers have expanded upon Kirk's work to classify the study of perceptions. Downs (1967), suggested the study of perceptions could be separated into three classes: first, the nature of the perceived world (analysis of structure); second, the study of the perceived world that impact decisions (analysis of evaluation); and third, the study of how objects are perceived in relation to each other (analysis of preference). Goodey (1968) identified three research foci, environmental perceptions, extra-environment perceptions, and preferential perceptions, while Bordessa (1969) recognized

four overlapping research areas, environmental perceptions, attitudes and responses to the environment, environmental space preferences, and environmental perception and behavior. In addition, Wright (1974) suggested that a new field of geography could be established, geosophy. Geosophy would be concerned with man's sense of space on the surface of the earth (Woods 1970).

Today geographic approaches to environmental perceptions consists of a number of related areas, including natural hazard studies, mental maps, ethnoscience, recreation studies, humanistic studies, and phenomenological perspectives, all of which attempt to understand better the relationship between the environment, our perceptions of it, and our decisions and behavior toward the environment (Grossman, 1977). Additionally, in their 2002 paper, "The big questions in geography," Cutter et al. suggested that a better understanding of how perceptions of the physical environment impact social and environmental processes is needed.

In addition to geography and environmental sociology, environmental psychology has also focused on the factors that influence environmental attitude and perceptions (Brody et al. 2004). Brody et al. (2004) suggested that while socio-demographic studies have dominated the field of environmental psychology in the past, recent attention has turned toward the relationships between location, place, and space and environmental perceptions. Yi Fu Tuan's (1979) seminal text *Topophilia* suggested that research on environmental attitudes or perceptions could be classified as falling into one of four categories: 1) how humans perceive and structure their world, 2) environmental evaluations, 3) the history of environmental ideas, and 4) the meaning and history of the environment. The idea that humans maintained a bond between themselves and a place or setting was termed topophilia, a concept known today as attachment to place. In addition, Tuan (2003) suggested that because perceptions are based on life experiences and imagination, no two people will perceive a given subject or landscape the same, further complicating perception studies.

Attachment to place has been defined as the emotional, functional, and cognitive bond that develops between an individual or group and their natural environment (Halpenny 2006; Gustavo and Manor 1998). An individual's attachment to place is predicated upon their sense of place, comprised of their belief, understanding, and

feelings toward a place (Jorgenson and Stedman 2001). Sense of place and attachment to place are important in understanding environmental perceptions and attitudes as they have the ability to facilitate or hinder involvement in social and political processes and environmentally responsible behavior (Gustavo and Manor 1998). The willingness of individuals to participate in social and environmental decision-making provides an opportunity to determine "the responsibility people wish to accept for the environment and the capacity of people to contribute to a sustainable management of the environment" (Volker 1997).

In relation to a transition toward sustainability, research on the perceptions of economic and societal dimensions of sustainability is limited, while research on the environmental dimension is more robust. Specifically, environmental studies focus on "the intrinsic value of nature, global environmental concerns, the trade-offs between environmental protection and economic growth, government policies, and individual and household policies" (Leiserowitz et al. 2006). In order to achieve a sustainability transition, changes in values, attitudes, and behaviors are needed. However, two barriers toward sustainable behavior exist. First, at the individual level, a lack of time, money, and knowledge often result in the inability to translate attitudes and values into action. Second, structural barriers such as laws, regulations, and societal norms limit action (Leiserowitz et al. 2006). In a study of Lancashire, England, Macnaghten et al. (1995) found that while many residents identified positively with the values and priorities of sustainability, there was concern that local and national governments acted as a barrier toward sustainability as they operated in their own self-interest, which marginalized locals. As the authors suggested, "people are continually concerned about their relationship with actors and institutions such as those of government, and that their expression of hope or despair, willingness to act or not, trust or mistrust, are inseparable from this continuing negotiations of such relationships." In this regard, it was suggested that public participation in the transition toward sustainability and decision-making processes was critical, especially at the local level (Macnaghten and Jacobs 1997), where disempowerment was perceived as being the greatest barrier (Macnaghten et al. 1995).

In the context of the Greater Yellowstone Ecosystem, perceptions, attitudes, beliefs, and behaviors vary largely as a result of dependence on natural resources (Jobes

1991; Patten 1991; Power 1991; Rasker et al. 1992, Reading et al. 1994). In 1994, Reading et al. conducted surveys of 308 residents of the GYE. Results suggested that while the vast majority of respondents agreed that ecosystem management and coordination of management agencies was beneficial and reduced cumulative impacts on the region, they also felt it would result in greater governmental control of the region, and was an attempt to control development in lower elevation areas. Further, they believed that such coordination and management would have detrimental impacts on local economies and political processes. In order to effectively develop policies that would balance environmental preservation, tourism, and natural resource extraction, it was suggested that decision makers must understand better the values, attitudes, and knowledge of local residents.

Contributions of this Study

This study contributes to the discourse on human-environment interactions and perceptions of sustainability in several ways. First, unlike previous research, this study includes both the economic and societal dimensions of sustainability, and how they relate and interact with environmental dimensions. Second, based on the inclusion of economic and social dimensions, this study will provide a clearer understanding of what local residents hope to sustain, and what they wish to develop. Third, this study will determine what institutions are most likely to control and drive change toward (or away from) a sustainability transition. Fourth, this study will help to improve understanding of the challenges that rural and amenity-based communities face on their transition toward sustainability. Fifth, this study will provide stakeholders the opportunity to participate, although informally, in the decision making process, which will increase awareness for, and vested interest in, sustainability. Sixth, this study will differ from previous work in that it will go beyond traditional socio-economic analysis of the perceptions, attitudes, beliefs, and values in relation to a sustainability transition, and include location, place, and space attributes that facilitate or hinder sustainability. Lastly, the temporal scale of this study is broader than previous studies, and in conjunction with a mixed methods

approach, will provide stakeholders and decision makers with a more in-depth analysis of past, current, and future trends in relation to a sustainability transition.

Chapter Two Summary

The environmental impacts associated with fulfilling human needs since the Industrial Revolution have resulted in a substantial degradation of the Earth's natural environment. The concept of sustainability has emerged to offer insights into the long-term implications of human-induced environmental degradation, with the recognition that societal goals, including economic objectives, must be reconciled with the natural limits of the environment. One of the fundamental issues regarding sustainability today is the inability of researchers, institutions, and agencies to agree upon a universal definition for the concept as a result of the numerous objectives, contexts, goals, and scales of perspective. In addition, because the concept of sustainability is both normative and subjective, solutions tend to be applicable for specific locales, but not the whole of society. To meet sustainability objectives, the National Academy of Sciences' Board on Sustainable Development suggested that society must begin to move away from actions that degrade the planet, and move toward those that sustain and restore it, or what they termed a transition toward sustainability. Although residents of rural areas are a minority in the US, most of the country's land area is rural, and it is in rural areas where the majority of human-environment interactions occur. As a result, the effective management and conservation of rural areas is of primary concern to the nation on its transition toward sustainability.

Sustainability science has emerged as an integrative research paradigm with hopes to better understand the interaction between the dynamic natural world and the viewpoints and behavior of society, with the ultimate goal of moving society(ies) toward sustainability. Societal perceptions and attitudes have been of interest to scholars in the fields of geography, sociology, and psychology for decades, and while research on the perceptions of environmental dimensions of sustainability is robust, those focused on societal and economic dimensions are limited. Because of the complexity of sustainability issues, the perceptions of individuals and communities in relation to their vulnerability and resiliency to change, and the driving forces behind those changes are

essential. Lastly, because interactions between human and environmental systems transpire across a variety of scales, from local to global, an understanding of local perceptions of sustainability-related issues are critical as they may facilitate effective decisions and policy-making. This study contributes to the discourse on coupled human and natural systems and sustainability science through its inclusion of both economic and societal dimensions of sustainability and their relationship with environmental dimensions, an understanding of local priorities of sustainability goals, the institutions and agencies most likely to control and drive change, and the challenges associated with human-environment interactions in a fragile ecosystem.

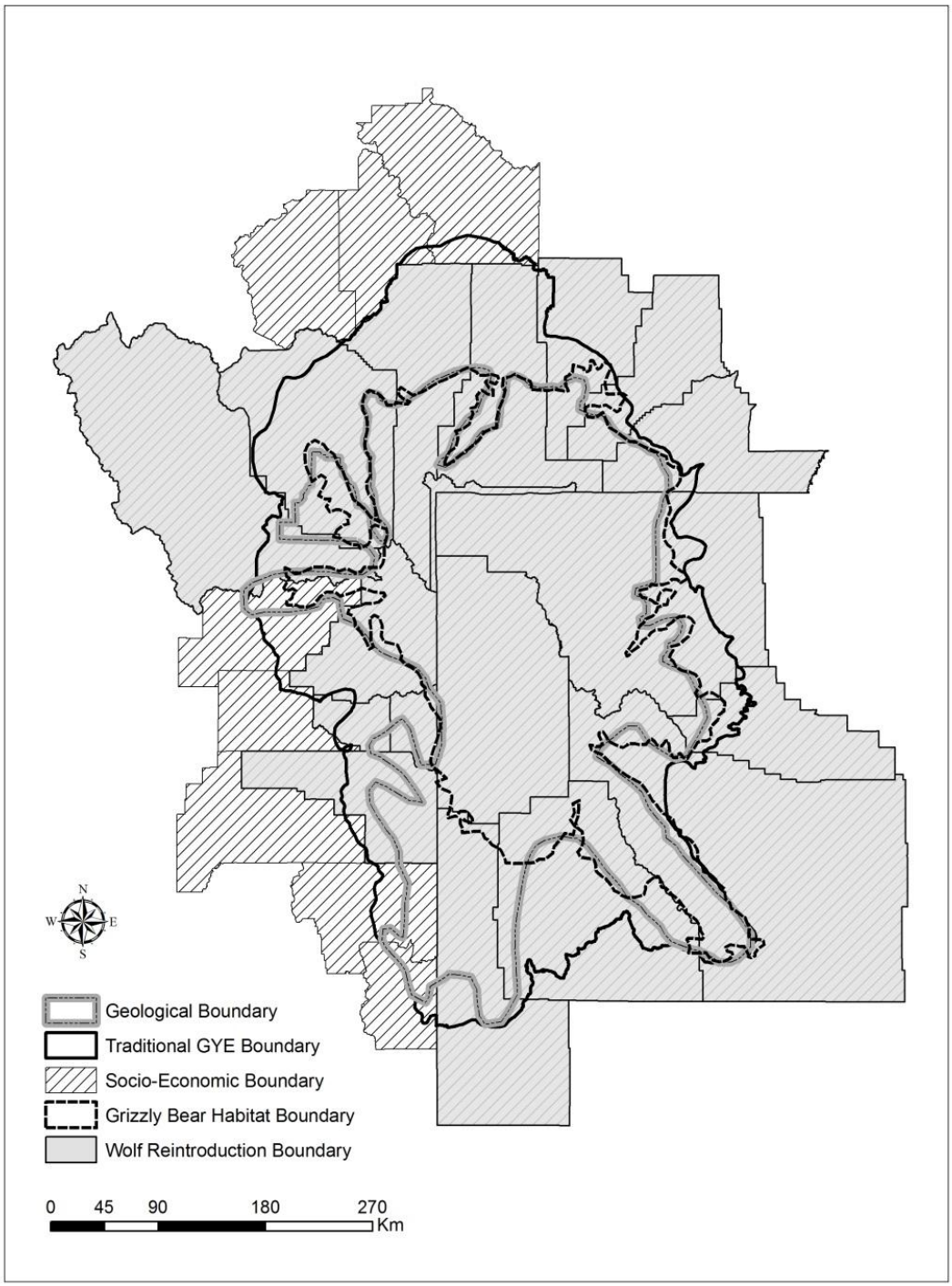
Chapter 3 - The Greater Yellowstone Ecosystem

"The GYE has always meant more to us, as a nation, than the sum of its parts would suggest, and it's ecological, aesthetic, and cultural importance cannot be overstated."
- Lynch et al., 2008

Defining the boundary of any ecosystem is a difficult task, and in most cases will only be an approximation. For management focused on ecosystem characteristics, the ecosystem area must be reduced to include tangible boundaries, have clearly defined elements, and be small enough for humans to believe they can influence ecosystem processes (Camenzind 1985). From a broad environmental prospective, the GYE is defined by its geology, climate, physiography, and the plant and animal communities that inhabit it (Clark et al. 1991).

However, the GYE is often defined or identified by its users based on the aspects they most use or value (Figure 3-1). There are those who view it as a storehouse of raw materials to be exploited for economic growth and employment opportunities. To others it is a vast recreational playground waiting to be explored, or it is a spiritual place, a hallowed ground (Lynch et al. 2008). The GYE is also defined based on the discipline or area of interest of researchers. To the wildlife biologist, the Greater Yellowstone Ecosystem is defined by the habitat of the grizzly bear (*Ursus arctos*) or the 17 counties that constitute the gray wolf (*Canis lupus irremotus*) recovery zone (Duffield et al. 2006). To the geologist, it consists of the 24 conterminous mountain ranges that surround YNP (Pierce et al. 2007). To those who study the socio-economic character of the region, the GYE is defined by the 20-25 counties that surround Yellowstone and Grand Teton National Parks (Gude et al. 2007). Beyond these definitions, nearly 30 local, state, and federal agencies charged with managing the region have their own definitions of what constitutes the GYE. Thus, the GYE is a theoretical, vernacular, and conceptual region, defined by numerous individuals, groups, decision makers, and stakeholders.

Figure 3-1 Greater Yellowstone Ecosystem Boundaries (data sources: BSI 2011; Gude et al. 2007; Pierce et al. 2007; Duffield et al. 1996)



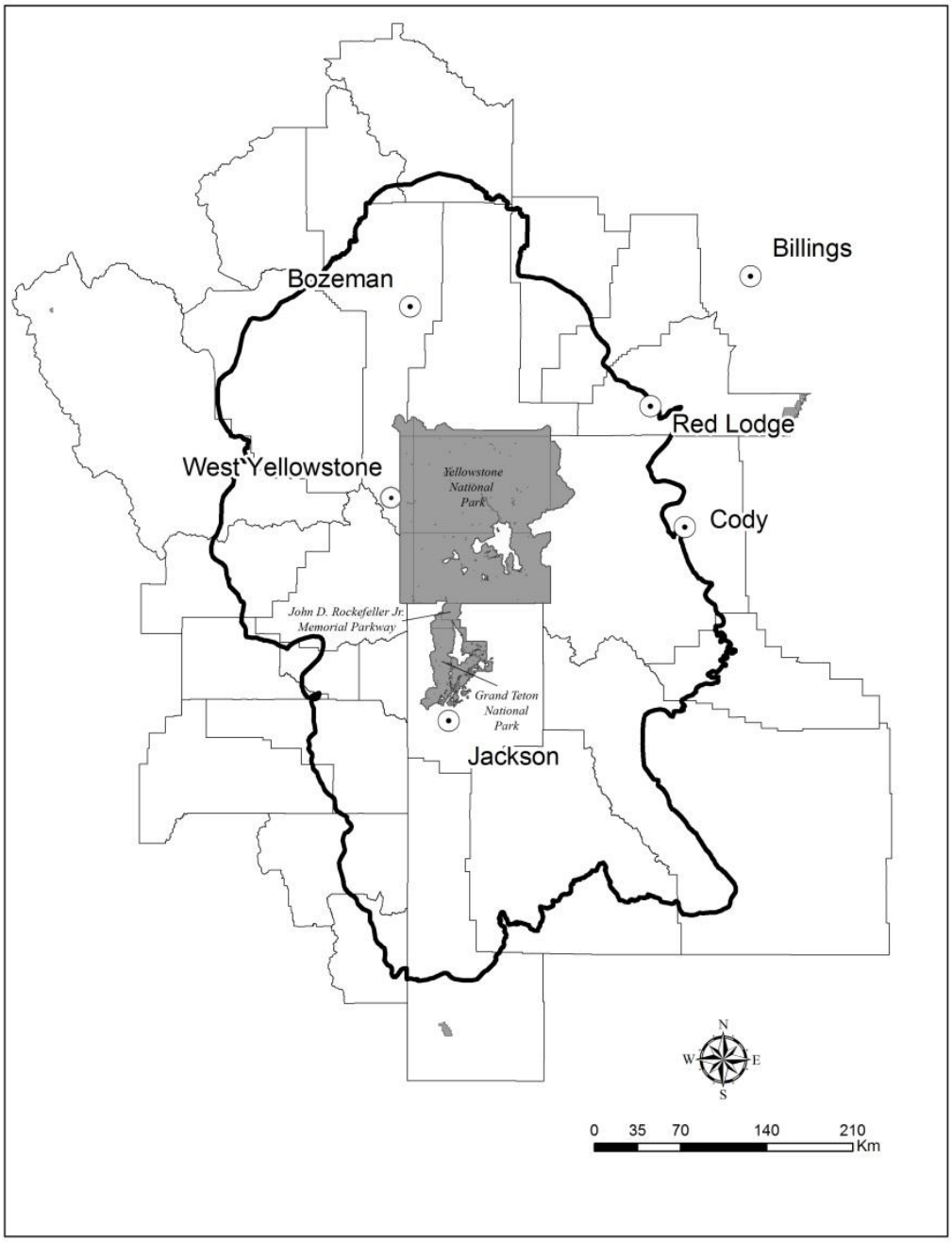
Today it is commonly acknowledged that the GYE spans portions of three states (Montana, Wyoming, and Idaho) and covers over 20 million acres. Included in the region are 2.5 million acres managed by the National Park Service (Yellowstone and Grand-Teton national parks), 11 million acres split among six National, nearly 100,000 acres of the National Wildlife Refuge system, 1.5 million acres managed by state and tribal agencies, and 5 million acres of private land (Figure 3-2). It is a source region for three of the continent's largest river systems (the Missouri-Mississippi, Snake-Colombia, and Green-Colorado), and is home to one of earth's most abundant geothermal energy supplies (Goldstein 1992). Gateway communities, settlements that are adjacent to public lands, have particularly close linkages to the use and management of federal and state lands in the region, and are thus important to understanding better coupled and complex human-environment systems.

Management of the Greater Yellowstone Ecosystem

As Lynch and others (2008) have suggested, it is difficult to overstate the importance of the Greater Yellowstone Ecosystem to the world, or to the United States. For nearly 140 years, Yellowstone National Park and its surroundings have been a symbol of the American West. It reflects a myriad of conflicts over the conservation or preservation of natural resources, their multitude of uses and users, the agencies charged with managing them, and the rights of property owners.

With over 30 federal, tribal, state, and local agencies, thousands of private businesses and landowners, over 175 non-government organizations, and more than 16 million recreational users annually, the GYE has proved to be an incredibly difficult region to manage comprehensively. The varying policies, procedures, goals, and beliefs of decision makers and stakeholders, which often do not adequately reflect the ecological unity and importance of the region, have made it difficult to create comprehensive and integrated management of the ecosystem's lands and resources (Clark et al. 1991). Recognition of the GYE was hoped to facilitate the conservation and sustainability of the Yellowstone

Figure 3-2 Traditional Greater Yellowstone Ecosystem Boundaries (data source: BSI 2011)



region, and allow land managers to maintain existing biodiversity, restore extinct or threatened biodiversity, and integrate long-term sustainable economic viability into this framework. Numerous obstacles still exist, however, including; the mandates and missions of federal land managers, most notably the National Park and U.S. Forest

Service, ambiguous legal support, and ruthless political and legal actions which often result in land managers being constrained by litigation from environmental and economic interests (Goldstein 1992). As Keiter (1993) suggested, ecosystem management in the GYE is interpreted through a complex array of institutions; thus, the issues facing the region are better understood when one considers the mandates and missions of the various management agencies.

Federal Agencies

The National Park Service (NPS) is part of the Department of Interior, and manages Yellowstone and Grand Teton national parks, and the John D. Rockefeller Memorial Parkway (Table 3-1). Yellowstone National Park was established on March 01, 1872, when President Ulysses S Grant singed into a law a bill (S. 392) that would set apart a "certain tract of land lying near the head-waters of the Yellowstone River as a public park." Nathaniel P. Langford, the first superintendent of the newly established park had no salary, no funding to manage the park, and very little authority. In addition, there were external threats such as game poachers, railroads, and entrepreneurs who were hoping to cash in on the parks resources (Haines 1996). Over the ensuing decades, other threats would emerge including those from within the park itself including endangered large carnivores such as grizzly bears and the Northern Rocky Mountain gray wolf, wildland fire policies, and wildlife diseases such as brucellosis and whirling disease (Clark and Minta 1994). Each of these threats would require the National Park Service to consider new management strategies and the revision of those from the past.

The idea of expanding YNP south toward the Teton Range and Jackson Hole had been discussed as early as 1872, and formal legislation to do so was introduced in 1918, by Wyoming Senator Frank Mondell, although it was quickly blocked by interests in Idaho. With the backing of local residents, financial and political support from John D. Rockefeller, and an endorsement from Horace Albright, superintendent of Yellowstone National Park, President Coolidge signed an executive order whereby 39,000ha, including the Teton Range, would be set aside as Grand Teton National Park (Daughery 1999). In 1972, the US Forest Service transferred approximately 10,000ha to the

National Park Service, creating the John D. Rockefeller Memorial Parkway, and for the first time connected Yellowstone and Grand Teton national parks (Daughery 1999).

The National Park Service was established in 1916 through the National Park Service Organic Act (Clark et al. 1991). The Organic Act states that,

> the service thus established shall promote and regulate the use of the Federal areas known as national parks, monuments, and reservations hereinafter specified by such means and measures as conform to the fundamental purpose of the said parks, monuments, and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations (National Park Service Organic Act (16 U.S.C.)).

As Clark and Minta (1994) suggested, "the GYE is a national 'test case' of how these two competing issues will be resolved. The overall question of how to insure the region's natural values, while at the same time accommodating human uses, is a complex problem involving scientific, philosophical, and economic issues."

In 1881, Dr. Franklin B. Hough, was appointed Chief of the newly established Department of Agriculture Division of Forestry. Although congressional approval of the Division of Forestry was temporary in nature, it was given permanent status in 1886; it provided funding to study all aspects of the nation's forests, including their consumption, means of preservation, and supply into the future (Williams 2005). In 1891, Congress debated several homesteading laws, including the Timber-Culture Act of 1873. The Timber-Culture Act provided an additional 160 acres of land to homesteaders, provided they plant trees on at least one quarter of the land. The primary objective of the Timber-Culture Act was to increase tree cover in settled areas for fuel and building supplies (McIntosh 1975). A rider was attached to the Timber-Culture Act that would fundamentally change forestry and the nation's forests. Section 24 of the Act stated that the President had the authority to "set apart and reserve…any part of public land…as public reservation." This provision, henceforth known as the "Creative Act," allowed President Harrison to set aside the country's first forest, the Yellowstone Park Timberland Reserve (501,000ha) immediately adjacent to the newly established Yellowstone National Park (Williams 2005). The Creative Act was strengthened in 1897,

when President McKinley signed the Pettigrew Amendment, later known as the "Organic Act," that required proper management and protection of Forest Reserves. By the end of his term, President Harrison had established 15 forest reserves, covering 5.2 million ha, while President Grover Cleveland added two additional reserves (809,000 ha). In 1897, management of forest reserves was initiated by Hough's, Division of Forestry; however, in 1905, power was transferred from the Department of Interior to the Department of Agriculture and the newly created Forest Service (Williams 2005).

The six national forests that exist in the Greater Yellowstone Ecosystem today (Table 3-1) (Figure 3-3) are the legacy of 24 separate forest reserves or national forests that have been established, transferred, consolidated, or dissolved since the establishment of the Yellowstone Park Timberland Reserve in 1891. In 1902, the name of the Yellowstone Park Timberland Reserve was changed to the Yellowstone Timberland Reserve to avoid public confusion with Yellowstone National Park. In addition to the name change, the reserve was separated into four separate divisions (Shoshone, Wind River, Absaroka, and Teton), with the Shoshone Division eventually becoming the nation's first national forest (USFS 2012). The Gallatin Forest Reserve was established by Presidential proclamation (McKinley) in 1899, and was named after former Secretary of the Treasury, Albert Gallatin. The reserve was originally interspersed with railroad grants (one-square mile inholdings), although by 1993 nearly all had been in-filled through land swaps with private and corporate land owners including the Plum Creek and Big Sky Timber Companies (Draffan 2012). The Otter Forest Reserve was established in 1907, and renamed the Custer National Forest in 1908. The three remaining national forests are consolidations of public lands from the late twentieth century, although all were established in the late nineteenth and early twentieth centuries. The Bridger-Teton National Forest was established in 1973, with the consolidation of the Bridger (est. 1911) and Teton (est. 1897) national forests; the Beaverhead-Deerlodge National Forest was established in 1996, with the consolidation of the Beaverhead (est. 1908) and Deerlodge (est. 1908) national forest; while the Caribou (est. 1907) and Targhee (est. 1908) national forests were consolidated in 2000 to form the Caribou-Targhee National Forest (Davis 1983).

Figure 3-3 U.S. Forest Service Lands (data source: BSI 2011)

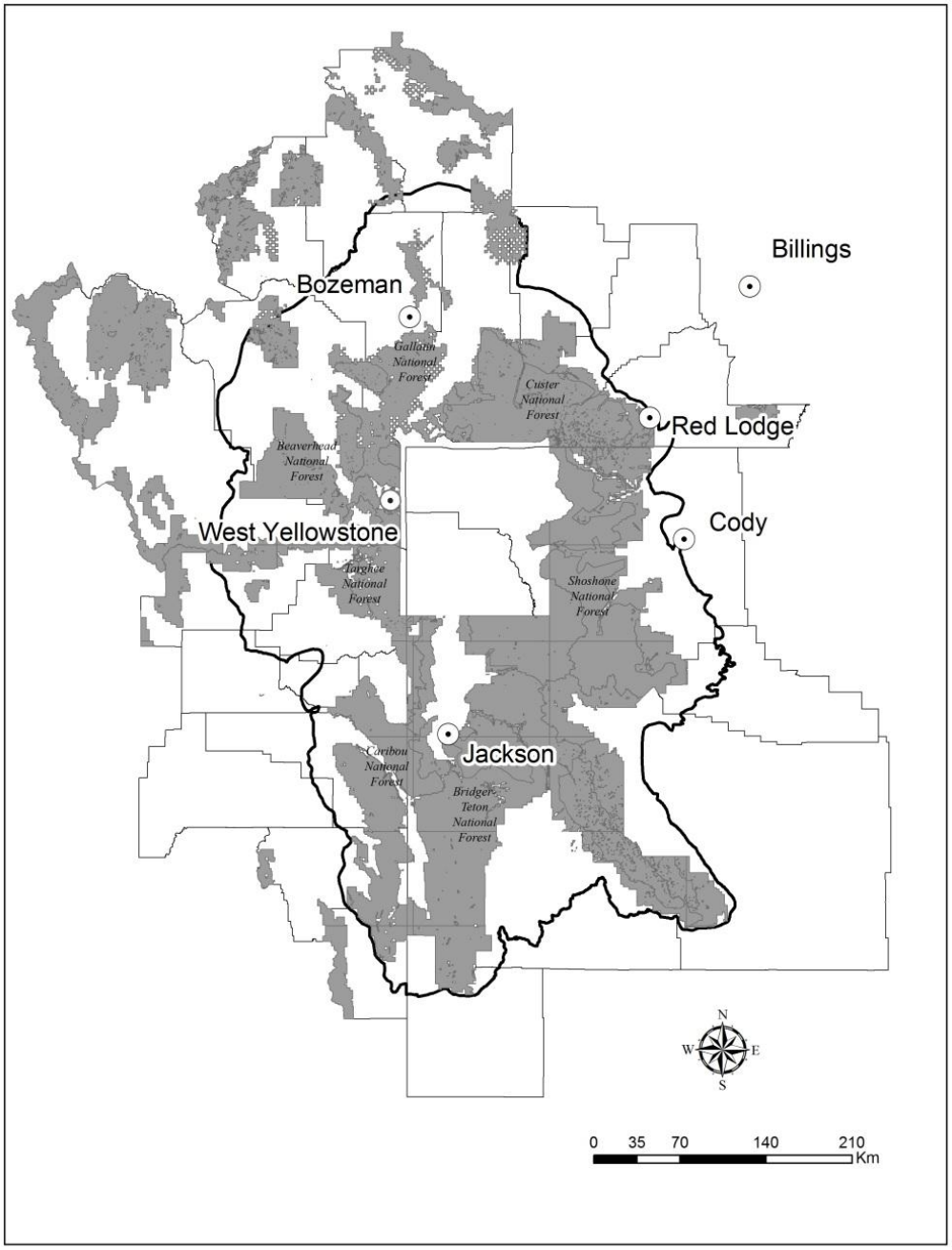


Table 3-1 Federal Agencies and Lands (source: GYCC 1990; Keiter 1993; Clark and Minta 1994)

Department	Agency	Named Land Area	Area (ha)
US Department of the Interior	National Park Service		**1,029,910**
		Yellowstone National Park	2,219,803
		Grand Teton National Park	306,865
		John D. Rockefeller Parkway	27,777
	Bureau of Land Management		**630,134**
	US Fish and Wildlife		**44,599**
		National Elk Refuge	10,117
		Red Rock Lakes	26,632
		Gray's Lake	7,852
	Bureau of Indian Affairs		**356,123**
US Department of Agriculture	US Forest Service		**3,945,624**
		Bridger-Teton NF	1,109,162
		Beaverhead NF	172,720
		Caribou NF	254,244
		Custer NF	209,425
		Gallatin NF	702,292
		Shoshone NF	899,980
		Targhee NF	597,802
State Agencies			**361,865**
	State of Idaho		115,192
	State of Montana		124,539
	State of Wyoming		122,134
Private			**1,828,783**
Total			**8,197,038**

The Forest Service's mission is to "sustain the health, diversity, and productivity of the Nation's forests and grasslands to meet the needs of present and future generations" (USFS 2011). It is guided by a multiple-use policy focused on outdoor recreation, grazing allotments, timber, water resources, and wildlife and fisheries; it also must deal with mining and minerals issues (Keiter 1993). The Organic Administration Act of 1897, the Multiple Use-Sustained Yield Act of 1960 (MUSY), the Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA), and the National Forest

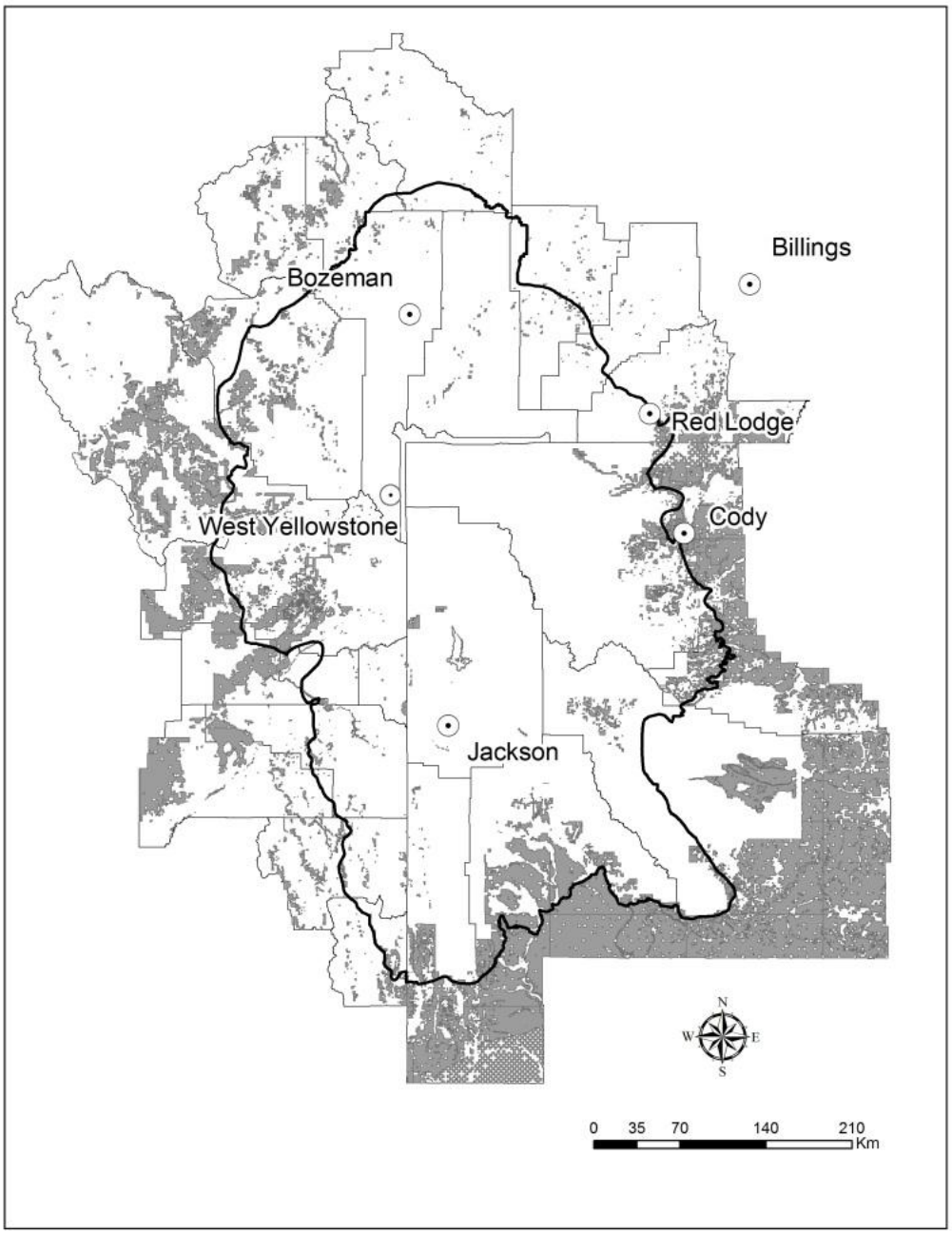
Management Act of 1976 (NFMA) are some of the important laws guiding USFS management decisions (Clark et al. 1991).

The Organic Act of 1897 was established to improve and protect the nation's forests, secure favorable water flows, and develop a continuous supply of timber (USFS 2011). MUSY stated that national forests were to be established and administered for outdoor recreation, range, timber, watershed, and wildlife purposes. The Act also directed that renewable surface resources should be developed for multiple use and sustained yield, and that consideration should be given to the relative value of the natural resources, but not necessarily the combination of uses that might yield the highest profit. Multiple use in this context meant that resources should be utilized so that they meet the needs of the American people, without impairment to the productivity of the land (U.S.C. 1960). The RPA authorized the Forest Service to develop long-term planning, including resource assessments every five years, and Forest Service plans every 10 years. The goal of the act was to ensure future supplies of natural resources in forests and the maintenance of those forests to provide a healthy environment (U.S.C 1974).

The Department of Interior's Bureau of Land Management (BLM)(Figure 3-4) (Table 3-1), is guided by a multiple-use mandate established through the Federal Land and Policy and Management Act of 1976 (FLPMA) (Clark et al. 1991). Similar to the USFS, legislation requires the BLM to "manage public land resources for a variety of uses, such as energy development, livestock grazing, recreation, and timber harvesting, while protecting a wide array of natural, cultural, and historical resources" (BLM 2011).

The U.S. Fish and Wildlife Service (USFWS) is another Department of the Interior agency. Established in 1871, the agency's authority is derived from the 1956 Fish and Wildlife Act, and the 1966 National Wildlife Refuge Systems Administration Act. The agency is also the lead administrator of the Endangered Species Act of 1973, which is designed to protect imperiled species from extinction (Clark et al. 1991). In the GYE, the USFWS oversees the management of the National Elk Refuge (117 ha) in Teton County, Wyoming, the Red Rock Lakes National Wildlife Refuge (632 ha) in the Centennial Valley of southwestern Montana, and the Grays Lake National Wildlife Refuge (850 ha) in southeastern Idaho (Table 3-1) (Keiter 1993).

Figure 3-4 Bureau of Land Management Lands (data source: BSI 2011)



Fish and game departments in Montana, Idaho, and Wyoming (Table 3-1) operate under the user-pay, user-benefit model. This model suggests that when hunters and anglers acquire fishing and hunting equipment they are contributing towards the improvement of fish and wildlife habitat and sustainable species populations through the Federal Aid in Wildlife Restoration Act of 1937, more commonly known as the Pittman-

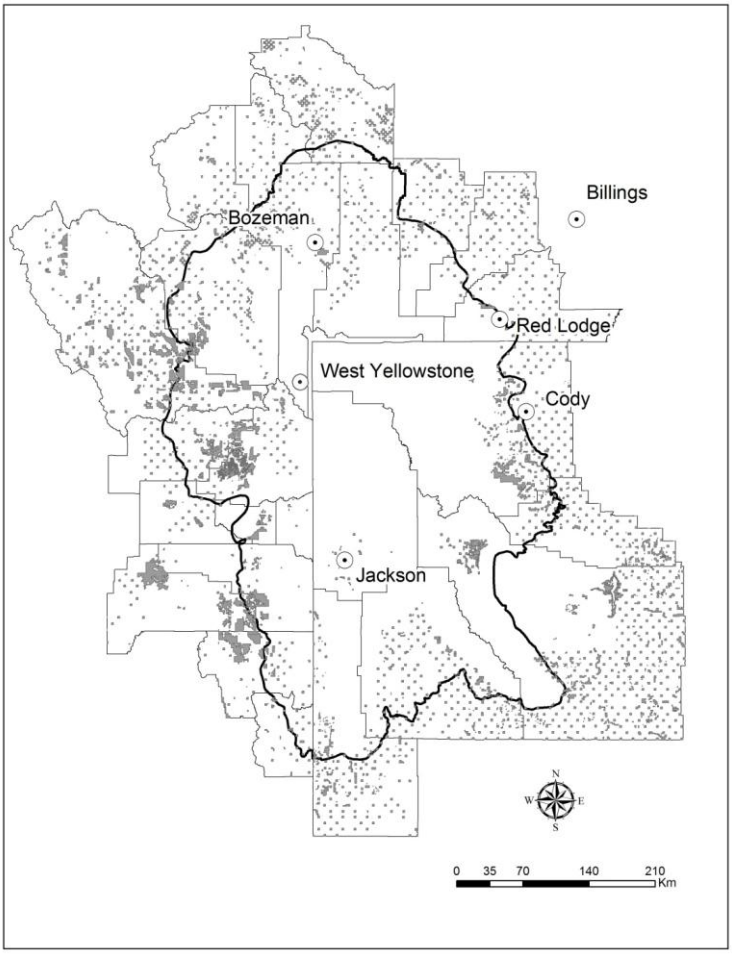
Robertson Act, and the Federal Aid in Sport Fish Restoration Act of 1950, also known as the Dingle-Johnson Act. The Pittman-Robertson Act is an 11 percent excise tax placed on hunting provisions including guns and ammunition, while the Dingle-Johnson Act is a 10 percent excise tax placed on fishing provisions such as reels, rods, and lures. State wildlife agencies may apply for reimbursements of up to 75 percent of costs accrued. Hunters and anglers further contribute to the conservation initiatives by purchasing licenses and permits, which provide additional funding to state wildlife agencies (Bergstrom 2008).

Although each state's fish and game department operates under different mission statements, commonalities, most notably the sustainability of fish and wildlife populations for future generations, connect these organizations. The Idaho Department of Fish and Game is charged with preserving, protecting, perpetuating, and managing all wildlife, including wild animals, wild birds, and fishing, in the state of Idaho (IDFG 2011). The Wyoming Game and Fish Department was established in the 1890s to protect wildlife from over harvesting (WGFD 2011). The Montana Department of Fish, Wildlife and Parks was established in 1901 to reduce wildlife exploitation related to the mining camps of southwestern Montana (Bergstrom 2008). The agency's mission today states, "Montana Fish, Wildlife & Parks, through its employees and citizen commission, provides for the stewardship of the fish, wildlife, parks, and recreational resources of Montana, while contributing to the quality of life for present and future generations" (MFWP 2011)(Figure 3-5).

Greater Yellowstone Coordinating Committee

Efforts have been made in the past to coordinate the numerous agencies towards the implementation of ecosystem-wide management. In the end, however, the power of interest groups, particularly extractive industries and the threat of prolonged litigation resulted in only limited modification of paradigms or policies. In the 1980s, the U.S. Congress focused its attention on the GYE, citing a lack of coordination between the region's management agencies (Clark et al. 1991). To provide greater coordination between the NPS and the USFS, the Greater Yellowstone Coordinating Committee (GYCC) was formed. The goal of the committee was to acknowledge and reduce

Figure 3-5 State Lands (data source: BSI 2011)



disparities in management policies between the NPS and USGS, and work collectively on their shared resources. To guide coordinated management, the GYCC produced *Vision for the Future*, which envisioned a "landscape where natural processes are operating with little hindrance on a grand scale…a combination of ecological processes operating with little restraint or human moderation." Upon publication, extractive industries and associated interests groups coordinated efforts to slow or halt the implementation of the document, as it was perceived as a threat to their economic well-being. With the help of local congressional delegates they were able to force the GYCC to revise its original draft, with the result being a *Vision for the Future* that acknowledged only a need for better coordination between agencies, without the previous provisions of maintaining a functional ecosystem (Keiter 1993).

Non-Government Organizations

Due to the significance of the GYE, and perceived inadequacies in its natural resource protection, numerous non-governmental organizations (NGOs) have developed in the region. Although these groups have been successful in protecting wildlife and wildlands, they have failed to provide adequate protection from development in ecologically sensitive areas and gateway communities (Glick and Freese 2004). *The Greater Yellowstone Conservation Directory* was established to provide users with access to environmentally aware conservation groups in the GYE. A cursory examination of the group's website revealed over 175 separate NGOs in the region (GYCD 2011). GYE non-governmental organizations range from ecosystem-wide environmental groups such as the Greater Yellowstone Coalition, to those promoting specific geographic areas (e.g., Jackson Hole Conservation Alliance), public lands (Montana Wilderness Association), private lands (Gallatin Valley Land Trust), and groups of species (Trout Unlimited)(Glick and Freese 2004).

The Greater Yellowstone Coalition, one of the region's most influential organizations, was established in 1983 to provide coordination and common goals toward sustainable resource management in the ecosystem. Although it has strived to limit development activities including logging, road building, and mineral and energy extraction, it also produced two guiding documents for the region. The first, *Greater Yellowstone Tomorrow,* was published in 1989. Its goal was to develop a future vision for the GYE based on ecosystem management, with a focus on human impacts on the environment and long-term protection of natural resources (Clark et al. 1991). The second document, *Sustaining Greater Yellowstone: A Blueprint for Success,* was published in 1994. It focused on five practical problems that the authors suggested undermined the future of communities that call the GYE home. First, that the decision makers and stakeholders lack a common understanding of the ecological and social problems of the region. Second, that values and policies in the region's management agencies differ. Third, uncoordinated management practices result in a devaluation of ecosystem services. Fourth, that data monitoring techniques and capabilities are lacking; and fifth, that antiquated tax structures and economic policies discourage effective and sustainable economic activities (Harting and Glick 1994).

With respect to general public perceptions of the GYE, its importance and use depend largely on individual goal, beliefs, and behaviors. One long-held belief is that ecosystem boundaries and ecosystem management, and thus the Greater Yellowstone Ecosystem, are an extension of federal authority (Keiter 1993). Although many residents and business owners may recognize the relationship between economic welfare of local communities and the natural environment, they perceive the ecosystem concept as giving priority to natural processes over community needs and economic vitality. The challenge is to guide decision makers and stakeholders towards policies that protect ecosystem services while ensuring economic opportunity (Keiter 1993). As Freemuth and McGreggor-Cawley (1998) suggested, while the federal lands of the GYE are owned by the American public, they are also locations where communities have developed. Thus, management decisions are "as much about defining the character of local communities, as they are about defining land use practices."

Natural Features of the Greater Yellowstone Ecosystem

Terrestrial Vegetation

It has been suggested that prior to 12,000 years BP, vast portions of the GYE saw infrequent fire activity and were dominated by tundra vegetation (Huerta, Whitlock, and Yale 2008). Roughly 11,000 years BP, fire episodes increased as a result of increasing temperatures due to higher insolation during the summer months, with a corresponding shift from tundra vegetation to conifer parklands. Between 11,000 and 7,600 years BP, high fire activity continued, but closed pine forests expanded due to increased winter precipitation. Over the past 4,000 years, warm and dry conditions, coupled with ever-increasing fire episodes, resulted in a decrease in many pine species and the landscape we see today.

Vegetation in the region varies based on elevation, substrate, and available moisture during the growing season. Steppe vegetation exists below 1700 m and in regions of nutrient laden calcareous glacial till. Species include big sagebrush (*Artemisia tridentata*), rabbitbrush (*Chrysothamnus nauseosus*), and Idaho fescue (*Festuca idahoensis*). A Montane conifer forest exists on rhyolitic soils between 1700 and 3000 m, with species such as limber pine *(Pinus flexilis*), and Rocky Mountain Juniper

(*Juniperus scopulorum*), present up to an elevation of 1900 m. Douglas fir (*Pseudotsuga menziesii*), and lodgepole pine (*P. contorta*) exist up to 2400 m, while Engelmann spruce (*Picea engelmannii*), subalpine fir (*Abeis bifolia*), and whitebark pine (.*s albicaulis*) extend to 3000 m. Lastly, alpine tundra vegetation is confined to areas above 3000 m in elevation (Huerta, Whitlock, and Yale 2008; Despain 1990). While vegetation varies based on elevation and substrate, the GYE is also distinct in that it is home to flora from five separate regions (Camenzind 1985) (Table 3-2).

Disturbance Regimes

Natural communities are dynamic and spatially heterogeneous partly as a result of physical and biological disturbances (Sousa 1984). The two most prevalent disturbance regimes in the GYE are forest pathogens (biological) and forest fires (physical).

The most pervasive agents of disturbance in North American forests, including the GYE, are insects and pathogens. They affect an area fifty times larger, and are associated with an economic impact five times greater, than forest fires (Logan et al. 2003). Current interest in the large-scale dynamics of stress and mortality on forests has resulted in a better understanding of forest community dynamics and the ability to predict changes in high-altitude environments (Hatala et al. 2010).

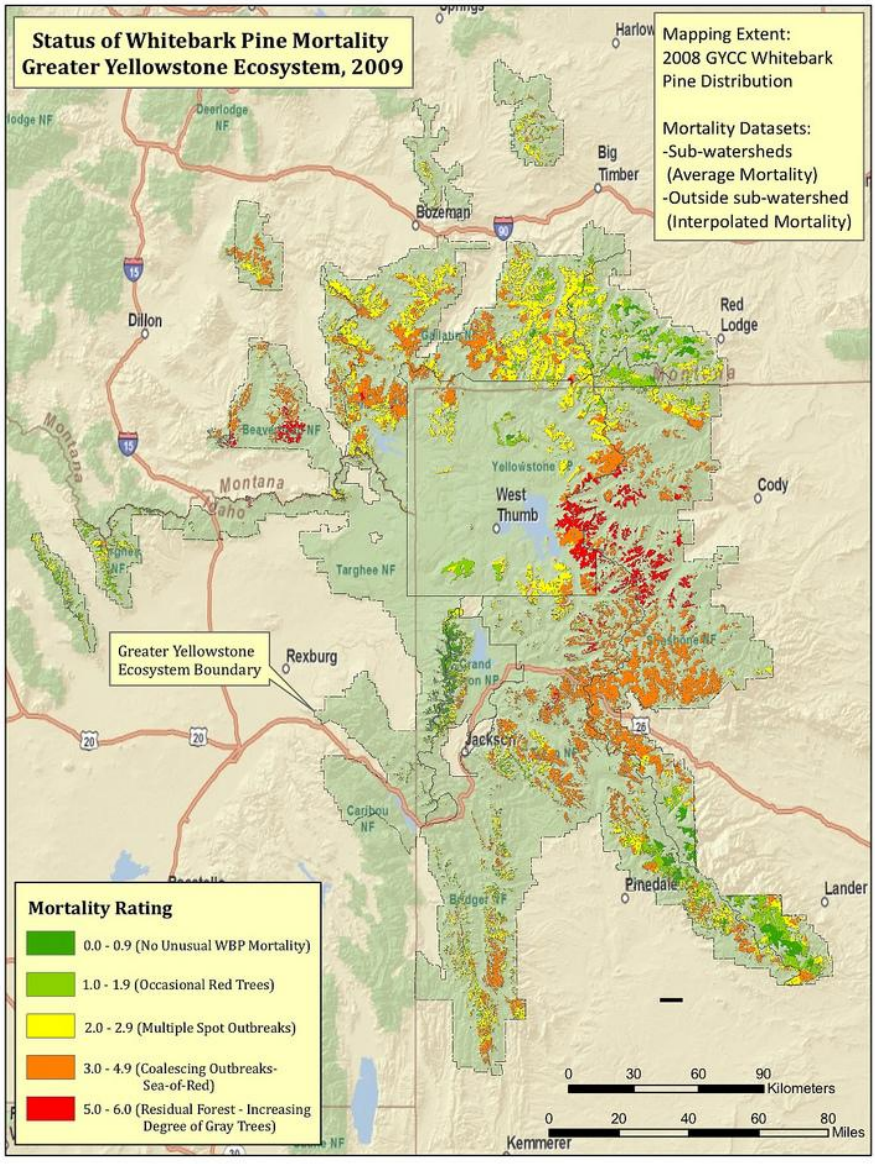
Pathogens and pests in GYE forests, particularly whitebark pine (Figure 3-6) and lodgepole pine, are of critical concern to decision makers and stakeholders in the region. The results are also readily witnessed by the over 16 million visitors to the region each year in the form of unhealthy or dying (red or gray, as opposed to green) conifer stands. Although episodic outbreaks of pathogens and pests are common, current outbreaks are occurring in habitats where they had not previously occurred or were previously limited in spatial extent.

Two of the most importance causes of forest mortality and stress in the GYE are blister rust (*Cronartium ribicola*) and mountain pine beetle (*Dendroctonous ponderosae*). Blister rust is an invasive fungal pathogen that is particularly difficult to control or predict because its spores are wind dispersed. Recovery of forests impacts by blister rust is difficult, although not impossible, as the pathogen kills mature trees within 15 to 20 years.

Table 3-2 Vegetation by Region (source: Camenzind 1985)

Region	Common Name	Species Name
Southern Rocky Mountain	Engelmann Spruce	*Picea engelmannii*
	Douglas Fir	*Pseudotsuga menziesii*
	Limber Pine	*Pinus flexilis*
	Rocky Mountain Juniper	*Juniperus scopulorum*
	Colorado Blue Spruce	*Picea pungens*
	Narrowleaf Cottonwood	*Populus angustifolia*
	Green Gentian	*Frasera speciosa*
	Parry's Primrose	*Primula parryi*
Pacific Northwest	Beargrass	*Xerophyllum tenax*
	False Huckleberry	*Menziesia ferruginea*
	Shootingstar	*Dodecatheon meadia*
	Sitka Alder	*Alnus viridis*
Great Basin	Sagebrush	*Artemisia spp.*
	Antelope Bitterbrush	*Purshia tridentata*
	Winterfat	*Krascheninnikovia lanata*
	Mountain Mahogany	*Cercocarpus montanus*
	Balsamroot	*Balsamorhiza deltoidea*
Northern Rocky Mountain	Lodgepole Pine	*Pinus contorta*
	Subalpine Fir	*abies lasiocarpa*
	Whitebark Pine	*Pinus albicaulis*
	Western Mountain Ash	*Sorbus scopulina*
	Scouler Willow	*Salix scouleriana*
Boreal North American	White Spruce	*Picea glauca*
	Prostrate Juniper	*Juniperus prostrata*
	Balsam Poplar	*Populus balsamifera*
	Quaking Aspen	*Populus tremuloides*
	One-flowered Wintergreen	*Moneses uniflora*

Figure 3-6 Whitebark Pine Mortality (Source: GYCC, 2011)



In contrast, mountain pine beetle is a native pest that can reside in nearly all five-needled, and some two-needled pine species. Recovery from infestations is rare, as the beetles tend to kill mature trees in less than three years (Hatala et al. 2002). The primary catalyst for the increased and widespread outbreaks of mountain pine beetle in the region is warming temperatures. Because pine beetles are a freeze-intolerant species, warmer

summer temperatures allow the beetle's entire life cycle to be completed in a single year. Warmer winter temperatures are also allowing increased over-winter survival of the species (Hatala et al. 2010).

Whitebark pine is a keystone species as it plays an essential role in micro-climates, and because it is considered a critical food source for a number of species including Clark's nutcracker (*Nucifraga columbiana*), red squirrel (*Tamiasciurus hudsonicusto*), and the grizzly bear. The species also plays a critical role in the distribution of snow in high-elevation areas, and subsequently the intensity of spring run-off. Outbreaks of mountain pine beetle in whitebark pine stands have resulted in mortality rates of cone-bearing trees in excess of 95 percent in many areas because they must kill their host to reproduce successfully (Hatala et al. 2010). Because the species has a slow growth rate, achieving cone-bearing age in a minimum of 50 years, and decreased decomposition rates at high altitude, the impacts of mountain pine beetle infestations on whitebark pine stands is dramatic and long-term. The cone-bearing age of lodgepole pine as opposed to whitebark pine is relatively short. Serotonous and non-serotonous wind-dispersed seeds are generated in as little as five to ten years in lodgepole pine, with serotonous cones maintaining their seeds for extended periods. This, in addition to effective chemical defenses that repel pine beetle attacks, allows the lodgepole pine to be less susceptible to large-scale spatial and temporal mortality rates (Logan et al. 2010).

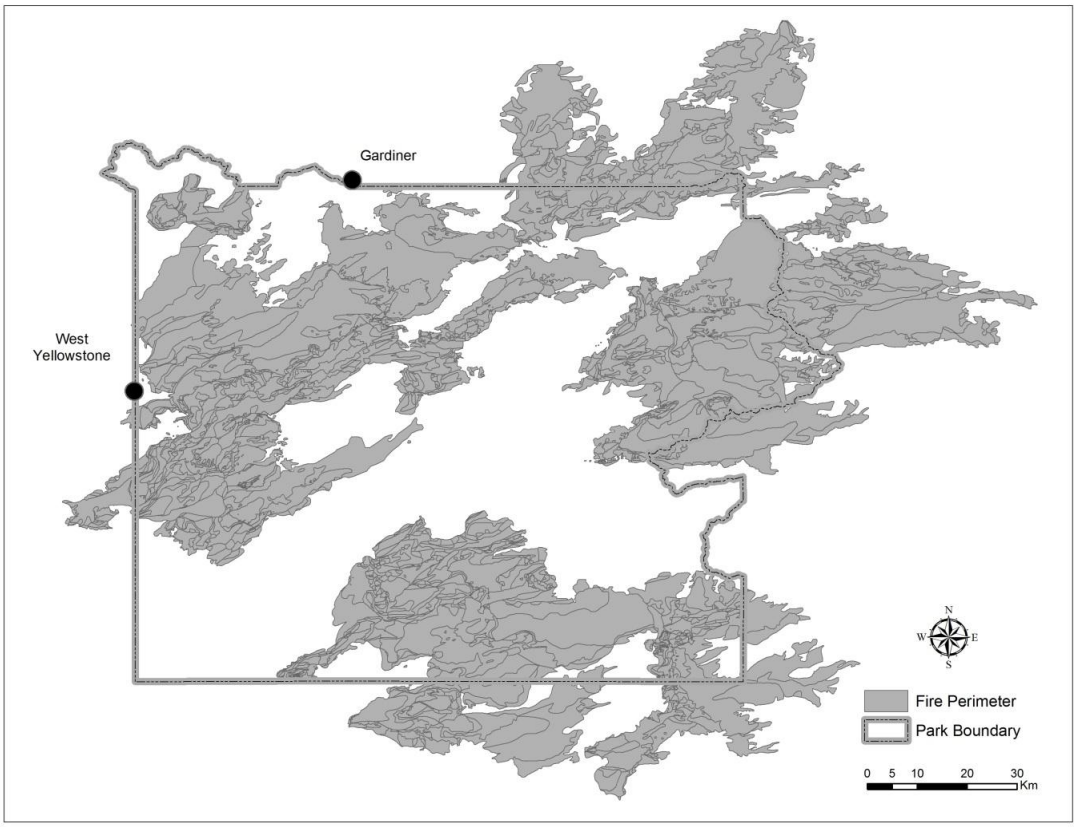
The impacts of forest pathogens and pests like blister rust and mountain pine beetle are expressed not only through potential decreases in ecosystem services provided by coniferous forests in the GYE, but are readily recognized on the landscape by recreationists. How the loss of aesthetic appeal to the natural environment will be manifested in economic terms is poorly understood. If the wildfires that spread across Yellowstone National Park in 1988 are any indication, the general public will view the massive losses of coniferous stands as a curiosity; however, the question remains for how long? The fires that destroyed portions of YNP did so in a matter of months, and vegetative regrowth was nearly instantaneous. It is doubtful that lodgepole and whitebark pine forest stands infected by pathogens and pests will be as fortunate considering the dynamic and complex life cycles and reproduction rates of species.

Forest Fires

The intensities, frequencies, and extents of wildfires are controlled by six complex and coupled characteristics (Sousa 1984). First, the frequency and seasonality of ignition sources determine whether ignition will occur, the intensity of the fire, and the fire's spatial extent. Second, the moisture content of the fuel (living or dead vegetation) determines whether it will burn. Third, the rate of fuel accumulation is determined by the conditions and characteristics of the site and the vegetation, most importantly the rate of decomposition, which is, in turn determined by climatological factors and recent weather conditions. Fourth, the structural character of fuel sources determines fire intensity. Fuels that are widely distributed result in relatively low intensity surface fires, while those that densely situated burn more intensely and often result in crown fires. Fifth, the mosaic of the landscape also influences the areal extent of fires and the frequency in which adjoining areas are burned. Lastly, local weather conditions, including precipitation, air temperature, humidity, and wind speed and direction, determine the rate and extent of wildland fires (Sousa 1984). All six of these factors are critical to wildfires in the GYE, and each to varying degrees influenced the dramatic fires in the region in 1988.

While GYE has been witness to other large-scale forest fires in the past, including the 1910 fire that burned 3.25 million acres, the fires during the summer of 1988 (Figure 3-7) were distinctive for a number of reasons (Christensen et al. 1989). First, the 1988 fires were the largest and most intense ever recorded in GYE. Second, was the unparalleled media coverage of the fires, and the large public attention that was focused on the Yellowstone Region and its land managers. Third, was the large financial cost of the fires. Fourth, the fires proved to be a timely test of recent changes in management philosophies, programs, and policies of land managers. The fires also provided valuable insights for ecologists because the spatial extent and heterogeneity of the fires provided scientists the ability to address landscape-scale questions for the first time. Lastly, because of the long history of research and data acquisition in the region, the fires allowed researchers to make comparisons between pre and post-fire terrestrial and aquatic systems (Christensen et al. 1989).

Figure 3-7 Greater Yellowstone Fires of 1988 (data source: BSI 2011)



Historically, nearly all fires in the GYE, and most importantly in Yellowstone National Park, were suppressed by human intervention. Human intervention began in 1886, when the U.S. Cavalry was charged with extinguishing a fire near Mammoth Hot Springs. Early efforts were primarily focused on major roads, trails, and developments, but by the end of World War II new fire suppression methods and technologies allowed land managers to monitor and control fires in the most remote reaches of the region (Romme and Despain 1989). In recognition of the ecological importance of fire (Turner, Romme, and Tinker 2003), and based on past experience and historical data, the National Park Service modified its fire suppression program based on recommendations from the Leopold Report in 1968 (Christensen et al. 1989). The "Let Burn" and natural regulation management policies initiated in the late 1960s remain today with limited controlled burns, but it has been suggested that the suppression of fires prior to the 1970s was one of

the primary catalysts for the 1988 fires. Other compounding factors include the weather conditions of 1988 and the buildup of dead wood materials to serve as fuel, given that much of the forest area had remained unburned since the 1700s (Romme and Dispain 1989).

As Christensen et al. (1989) suggested, the fires that burned throughout the GYE during the summer of 1988 "followed a typical scenario for the region: prolonged drought, a rash of ignition from dry lightning storms and human sources, a steady increase in fire size and intensity through July, and a near-fire storm climate in late august and early September." Precipitation amounts were above average for April (155 percent), and May (181 percent), which resulted in an increased fuel load. By June, which only saw 20 percent of average annual precipitation, over 20 fires had been started by both human and natural causes. On July 15, over 3,237 ha had already been consumed by fire, and by July 21, that number increased to6,880 ha. This prompted management officials to begin to suppress all existing and new fires as drought conditions persisted. Ultimately, 1988 would become the driest year in the recorded history of the region. The dry conditions were combined with a series of dry cold fronts that passed through the region in July, August, and September, with winds reaching 97 km/h, and pushing fires at a rate of 16 km per day. On September 26, 1988, the fires extended to cover a region of 526,091 ha. Cooler temperatures and snow on November 18, 1998 finally extinguished the fires for the season, but not before 11 percent (570,000ha) of the GYE, and 45 percent (400,000ha) of YNP had been consumed. In the end, the fires had cost over $100 million to fight, with over 9,000 firefighters from across the country hand digging 1,368 km of fires lines, while bulldozers had dug an additional 220 km. Although virtually all forest age and fuel categories were burned during the fires, only 55 structures in the park and in gateway communities, which had been the target of most of the firefighting efforts, were lost. Surveys indicated fewer than 375 native large ungulates (elk, deer, moose, black bear, and bison) had been directly lost due to the fires, although over 11 percent of the region's northern winter range had been consumed (Schullery 1989; Christensen et al. 1989). The fires also created a "spatially complex mosaic of burned and unburned" areas, with burned areas reestablishing

themselves rapidly with extensive stands of lodgepole pines (Turner, Romme, and Tinker 2003).

While the fires of 1988 were unprecedented in their scale and intensity, the history of forest fires in the U.S. West suggests that such fires were the norm and not the exception. Recent research has also suggested that climate change will have dramatic impacts on the intensity, extent, and frequency of fires throughout the region. Since 1982, longer and warmer summers have resulted in an increase in the duration and intensity of wildfire seasons in the western United States. Overall, the length of the fire season has grown by as many as 80 days, while the duration of individual fires has increased from 7.5 to 37.1 days (Running 2006). These increases have been attributed to a ~0.9° C increase in spring and summer temperatures, and a 1-4 week earlier spring snowmelt. Because wildfires contribute as much as 40 percent of the total carbon dioxide output of fossil fuel consumption each year (Running 2006), decision makers and land managers have begun to incorporate wildfire dynamics into future climate change scenarios, as well as mitigation and adaptation strategies for fires. Although the federal government has been hesitant to correlate wildfire dynamics with global climate change, it is felt that fuel reductions are a step in the right direction to mitigate future large-scale wildfires such as the 1988 fires in Yellowstone National Park (Running 2006). One such project is the U.S. Department of Agriculture's "Healthy Forests" program, which removes dead and dying fuel loads from western forests.

The potential impacts of future climate change on the distribution of major tree taxa in the GYE is also a major concern for land managers. Bartlein, Whitlock and Shafter (1997) used a downscaled global circulation model in conjunction with an equilibrium vegetation model to determine the impacts of climate change on tree species in the region. Projections suggest increases in mean January and July temperatures, and January precipitation, as well as decreases in July precipitation (mild winters warm-dry summers), creating conditions similar to those currently found in northwestern Montana and northern Idaho. Analysis of vegetation distribution and dynamics suggest that elevational and directional changes in species distribution is likely, and more complex than previous studies indicate (Romme 1991). Shifts in the distribution of tree taxa in the region may have dramatic effects on the timber industry and communities dependent

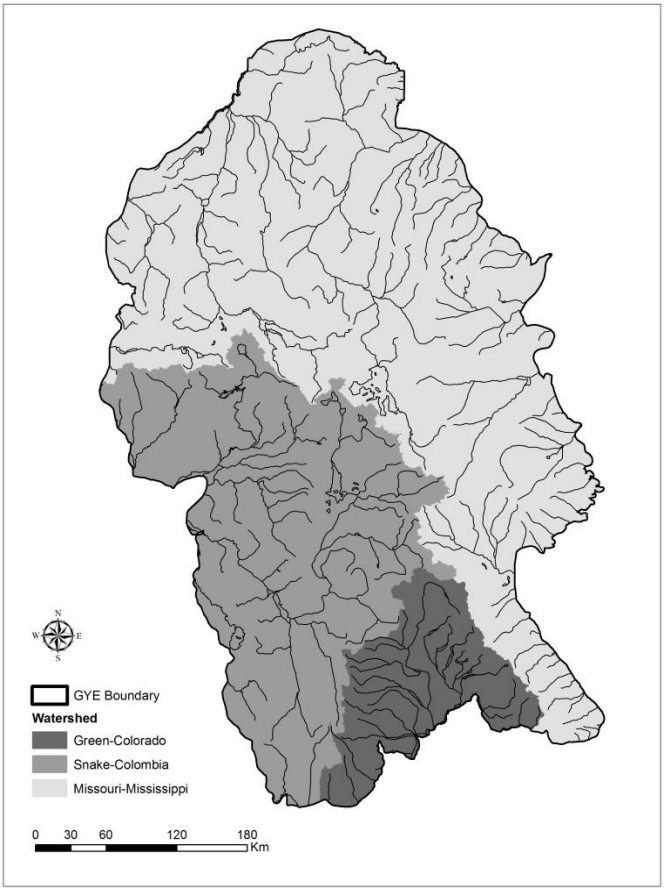
upon the industry for survival, as well as on biodiversity, primary productivity, wildlife habitat, and migratory corridors.

Westerling et al. (2011) considered how "the occurrence, size, and spatial location of large fires" would respond to climate change using statistical models. Their findings suggest that, while years without substantial fires have been historically common, they will become rare as the frequency and extent of fires increase due to climate change. They also suggested that while the Intermountain West historically has been characterized by cool temperatures and snow-dominated precipitation that supports forest growth, future climate change (i.e., 0.5°C above the 1961-1990 average) will result in the GYE reaching a critical tipping point that will transform regional fire regimes by the middle of the twenty-first century. This will result in the current conifer dominated forests being replaced with non-forest vegetation due to reduced fire frequency and intervals, and thus a reduction in regeneration of fire dependent tree species. It is predicted that these changes will have dramatic impacts on the flora, fauna, and ecosystem services of the region, including aesthetic appeal, hydrology, and the carbon storage availability.

Hydrology

It has been estimated that GYE water sources discharge approximately 12.5 million acre feet of water each year (GYC 1994). The region contains the headwaters of three of North America's largest river systems, the Missouri-Mississippi, Snake-Colombia, and Green-Colorado (Goldstein 1992)(Figure 3-8). The Missouri-Mississippi tributaries include the Wind, North and South Forks of the Shoshone, Clark Fork of the Yellowstone, Lamar, Yellowstone, Gallatin, Madison, and the Rock rivers. The Snake-Colombia watershed includes the Henry's Fork of the Snake, Snake, Grey's, Salt, Gros Ventre, and Hoback Rivers. The Green-Colorado watershed begins in the Wind River

Figure 3-8 Greater Yellowstone Watersheds (data source: BSI 2011)



Mountain Range, and eventually drains into the Colorado River in Utah (Marston and Anderson 1991). As Bevenger et al., (2006) suggest, not only are the region's waterways important for fish, wildlife, and recreational opportunities near their headwaters, but they are important to downstream users who rely on the waterways for clean, abundant flows for recreational, agricultural, and industrial uses, making them the most valuable resource of the GYE. The protection of the region's waterways is not only critical to the economic health of local communities, and the environment as a whole, but also because they are the cornerstone of the complex geothermal processes that make the region unique (GYSLC 2011).

The surface waters of the GYE are protected under the Clean Water Act of 1972 (CWA) through management initiatives at the state, tribal, and federal level. The goal of

the CWA is to "restore and maintain chemical, physical, and biological integrity of the nation's waters so that they can support the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water" by reducing the discharge of pollutants into waterways, facilitating municipal water treatment processes, and managing runoff (EPA 2011).

The allocation of water resources is dictated by the prior appropriation doctrine, states that "the first individual or entity to put water to use has priority over others who might later wish to use it." Water rights are based on "beneficial use" of the resource, which has traditionally been defined as irrigation, industrial processes, and municipal uses, although this has been modified in recent decades to consider in-stream (or natural flow) use as potentially beneficial as well. Although the prior appropriations doctrine applies to the allocation of water rights to state and individual users, the Winters Doctrine determines rights for federal and tribal lands. In this case, water rights are not allocated based on first use, but rather the establishment of the federal land. As such water rights associated with the Winters Doctrine take precedence over prior appropriation rights (GYC 1994).

Wildlife

The Greater Yellowstone Ecosystem is home to the largest concentration of mammals in the lower 48 states, with over 60 distinct species. Wildlife species use the region's mountain environments for migratory corridors and summer ranges, while lower elevation waterways and riparian zones are used for primary winter range (MFWP 2005a). The region is home to at least eight ungulate species, including bison (*Bison bison*), Rocky Mountain elk (*Cervus Canadensis*), mule deer (*Odocoilues hemionus*), white-tailed deer (*Odocoileus virginiannus*), pronghorn (*Antilocapra Americana*), Shiras moose (*Alces alces shirasi*), and big horn sheep (*Ovis Canadensis*). The region is also home to seven large predators, including the black bear (*Ursus americanus*), Canadian lynx (*Lynx Canadensis*), mountain lion (*Puma concolor*), coyote (*Canis latrans*), wolverines (*Gulo gulo*), gray wolf (*Canis lupus*), and grizzly bear (*Ursus arctos*). Key bird and small mammal species include the bald eagle (*Haliaeetus leucocephalus*), osprey (*Pandion haliaetus*), peregrine falcon (*Falco peregrinus*), great gray owl (*Strix*

nebulosa), whooping crane (*Grus Americana*), trumpeter swan (*Cygnus buccinator*), blackfooted ferret (*Mustela nigripes*), fisher (*Martes pennanti*), river otter (*Lontra Canadensis*), and pine marten (*Martes martes*)(Camezind 1985).

Big game species are economically important to the GYE region. Between 1991 and 2006, big game hunters directly spent $813 per visit and nearly $3,000 per species harvested on average, with a total of over $70 million spent annually in southwestern Montana alone. This results in a total economic impact (direct, indirect, and induced effects) of over $100 million annually. Between 1991 and 2006, big game hunters in southwestern Montana also created over 1300 employment opportunities, with the largest beneficiaries being retail trade (652 jobs), transportation and warehousing (202 jobs), and accommodations and food services (195 jobs)(Bergstrom 2008).

Due to cooler temperatures, the region contains only a limited number of amphibian and reptile species. Species include the Blotched Tiger salamander (*Ambystoma tigrinum*), Boreal toad (*Bufo boreas boreas*), Boreal chorus frog (*Pseudacris maculate*), and the Columbia spotted frog (*Rana luteiventris*), bullsnake (*Pituophis catenifer sayi*), prairie rattlesnake (*Crotalis viridis*), rubber boa (*Charina bottae*), sagebrush lizard (*Sceloporus graciosus*), valley garter snake (*Thamnophis sirtalis*), and the wandering garter snake (*Thamnophis elegans*). While no amphibian or reptile species in the region are currently listed on the threatened or endangered species list, there have been recent population declines attributed to drought, disease, predation, habitat loss, and the introduction of non-native species.

Over 300 species of birds are known to inhabit the region, with nearly half considered regular breeders in the GYE. The broad array of habitat types and variations in elevation result in a relatively high level of diversity. Birds are considered a bioindicator of climate change, due to their sensitivity and rapid responses to changes in seasonal climates. Species of special concern due to their possible sensitivity to climate change include the common loon (*Gavia immer*), peregrine falcon, Harlequin duck (*Histrionicus histrionicus*), trumpeter swan, osprey, and the bald eagle (YNP 2011).

Fisheries

The Greater Yellowstone Ecosystem is home to at least 13 native fish including three subspecies of cutthroat trout (Western cutthroat [*Oncorhynchus. clarki lewiii]*, *Yellowstone cutthroat [O. clarki bouvieri]*, and Snake River cutthroat [*O. clarki behnkei]*, fluvial arctic grayling (*Thymallus arcticus*), and mountain whitefish (*Prosopium williamsoni*). Beginning in the late nineteenth and early twentieth centuries numerous non-native species were including rainbow trout (*O. mykiss*), brown trout (*Salmo trutta*), brook trout (*Salvelinus fontinalis)*, and lake trout (*Salvenlinus namaycush*). Early park managers began stocking waters with non-native species to curb over-consumption by recreationalists and to ensure that all waters in the park contained fishable species for tourists. In 1889 and 1890, brook trout were stocked in the Upper Firehole River, rainbow trout in the upper Gibbon River, and brown and lake trout in Lewis and Shoshone Lakes. Although stocking ceased in 1956, when managers recognized the negative impacts non-native species were having on the ecosystem, by that time over 300 million fish had been released into the waters of Yellowstone National Park and surrounding areas, and over 800 million eggs from native trout were collected and shipped throughout the U.S. (YNP 2011).

Today, numerous threats exist for native fish species in the GYE including the displacement of native species by non-natives, the hybridization of Yellowstone and Westslope cutthroat trout with non-native rainbow trout, and, perhaps most significantly, the predation of Yellowstone cutthroat by non-native lake trout (Koel et al. 2006). Further, whirling disease was also introduced into the region in the 1990s, and infection rates are as high as 90 percent in some watersheds. Lastly, persistent drought in the region over the past decade or more has resulted in increased water temperatures, decreased peak stream flows, and the alteration of stream networks, all of which have resulted in population declines. The cumulative impacts of such threats have been detrimental to the species, and while programs such as the Lake Trout Removal Project initiated by the NPS is beginning to see results, a clearer understanding of the complexity and connections between these processes is needed (Koel et al. 2006).

Physiography

The Greater Yellowstone Ecosystem ranges in elevation between 1300 m and 4000 m, and is comprised of primarily north-south trending mountain ranges situated at the northern end of the Central Rocky Mountains, with the continental divide virtually bisecting the entire region. At the center of the GYE is the 6500 km^2 Yellowstone Plateau that includes nearly all of Yellowstone National Park and extends westward toward the town of Island Park, Idaho, and the Snake River Plain. The plateau ranges between 3,000 and 4,000 m in elevation and was created over a period of two million years through volcanic, and more recently, glacial, activity. Because of volcanic activity in the past, the region is largely composed of rhyolite, basalt, and extensive ash-flow sheets (Christiansen 2001). Today, geologic processes such as faulting, uplift, and volcanism are associated with the Yellowstone hotspot, a northeastward trending thermal plume that rises to the Earth's mantle from below the North American tectonic plate. While the thermal plume arrived below today's Yellowstone National Park approximately 2 million years ago, its progression began approximately 16 million years ago near the modern borders of Nevada and Oregon (Pierce et al. 2007). Today, sub-surface volcanic processes (Yellowstone thermal plume) have resulted in more than 200 geysers and 10,000 thermal features in YNP, the largest concentration on the planet (GYC 1994). In addition, (Davey et al. 2006) suggested that the Greater Yellowstone Ecosystem is particularly sensitive climatic indices such as El Nino Southern Oscillation, and the Pacific Decadal Oscillation especially in relation to winter precipitation. Wetter winter conditions are typically associated with negative phases of the PDO and/or La Nina conditions, while driers conditions are associated with positive phases of the PDO and/or El Nino conditions.

Climate in the GYE varies based on aspect, slope, and elevation, but is generally characterized by cold winters and cool summers. Topography is the primary determinant of climatic conditions through their interaction with large-scale air masses. Temperatures range annually from near 20°C in Bighorn Canyon National Recreation Area to nearly 0°C in mountainous regions (Davey et al. 2006). Precipitation patterns vary seasonally, with a winter peak at higher elevations in the western portions of the GYE, and a late spring peak in the eastern portion of the region. Mid and late summer months are

typically characterized by dry conditions due to the influence of the New Mexico and Arizona monsoon. Precipitation rates range from less than 20 cm in mountain valleys, to over 200 cm above 3000 m, with the majority falling in the form of snow (Davey et al. 2006). The variations in precipitation patterns elevationally result in a moisture surplus in the mountainous regions and a moisture deficit in lower elevation valleys, especially in the east (GYC 1994).

To the north of the Yellowstone Plateau are eight major mountain ranges including the Beartooth, Absaroka, Crazy, Bridger, Gallatin, Pyror, and Madison, and five major rivers including the Yellowstone, Boulder, Shields, Gallatin, and Madison and their associated valleys. Intermountain valleys such as the Gallatin Valley near Bozeman receive on average 33cm of precipitation per year, while the mountainous regions of the Absaroka Range receives over 200cm annually (NRCS 1996). The Gallatin Valley is typical of the lower elevation valleys of the northern portion of the GYE. It ranges in elevation from 1300 m to 1500 m, and boasts a growing season between 108 and 130 days, with moderate average annual temperatures and low precipitation rates (49 cm/year)(Aspinall 2004). Mountain ranges in the northern region consist of glaciated peaks and valleys with granite rock overlain by sedimentary rocks such as sandstone, shale, and limestone. Cretaceous and Tertiary volcanism are also present, especially in the Absaroka and Gallatin Ranges where granite, diorite, schist, and gneiss dominate. Climate in the mountainous areas to the north vary elevationally, but temperatures typically average between -5°C and 16°C, with precipitation rates averaging 20o cm annually (NRCS 1981).

To the east and southeast of the Yellowstone Plateau lie the Wind River Range (4023 m), Shoshone National Forest, and two major waterways, the Popo Agie and Wind Rivers. Shoshone National Forest was the first federally protected forest in the US under the Yellowstone Timberland Reserve in 1891. Topography is characterized by uplifted mountain blocks and intermountain basins, with elevations ranging from 1555 m to over 4000 m. The Wind River Mountains are defined by exposed granite, gneiss, and schist, with narrow crests and deeply glaciated gorges and valleys. Precipitation varies annually from 35cm to 264cm dependent on elevation, while temperatures averages range from -5°C in winter to 19°C in summer (NRCS 1981).

To the south and southwest of the Yellowstone Plateau are at least four major mountain ranges including the Gros Ventre, Snake River, Teton, and Salt River. These ranges are part of both the Basin and Range physiographic province, and the Rocky Mountain over-trust belt with elevations ranging from 1765 m along the Bear River, to nearly 4200 m atop Grand Teton peak in Grand Teton National Park (NRCS 1982). The Rocky Mountain Overthrust Belt is a band of sedimentary rocks, primarily marine shales, that have experienced intensive folding and thrust faulting and has resulted in extensive oil and gas reservoirs (Harbour 1980). Valleys consist of Tertiary and Quaterniary-aged sediments, while mountain slopes consist of volcanic tuff, sedimentary sandstone, limestone, siltstone, and conglomerate. In addition, the primary hydrologic feature is the Snake River that drains into the Columbia River Basin (NRCS 2010). Temperatures range from 17°C during the summer months, to -7°C in the winter, with some colder temperatures recorded at higher elevations. Intermountain valleys receive on avarege 70 cm of precipitation, while mountainous regions such as the Tetons receive over 200 cm annually (NRCS 1982; NRCS 2010). Because of the Snake River Plain, the Teton Range has relatively few topographic barriers along its windward (western) side. As such, moisture-laden air masses from the south and southwest are able to deposit large amounts of precipitation on the windward side. In contrast, the leeward side of the Teton Range receives on average only 50 cm of precipitation annually (Davey et al. 2006).

To the west of the Yellowstone Plateau are twelve separate mountain ranges including the Bitterroot, Henry's Lake, Big Hole, Snake River, Beaverhead, Caribou, the Lehmi Range, Pioneer, Gravelly, Saphire, Snowcrest, and the Centennial. Topography varies from alluvial outwash plains along the Snake River (1554m), to the Diamond Peak (3718m) that is dominated by overthrust structures and extrusive flows of igneous rock (Bowerman et al. 1999). In addition, the Henry's Fork of the Snake River originates in the Targhee National Forest, and in conjunction with its tributaries the Falls and Teton Rivers, forms the headwaters of the Colombia River Basin. Precipitation ranges from 28cm in the foothills to 190cm on mountain summits, while temperatures vary elevationally, but average between -1° to 4°C annually, with temperatures reaching as high as 40°C in lower elevation areas, and as low as -50°C in mountainous regions (NRCS 2007).

Land Use and Land Cover Change

Land use and land cover changes are so pervasive that they have significantly altered key aspects of earth system functioning, and the rate, magnitude, and spatial extent of such changes are unprecedented in human history (Lambin et al. 2001). The spatial extent (footprint) of anthropocentric action is poorly understood, even with increased attention over the past decade. Human footprint is defined as the extent of human induced impacts and actions on natural environments. Leu et al. (2008) studied the human footprint in the western United States between 1990 and 2000, and found that areas with the smallest spatial extent of anthropocentric impact represented 48 percent of total land area, while those with the highest impacts represented 7 percent. However, they also found that due to increased urbanization, the least effected lands might not be sufficient to conserve biodiversity throughout the region. Because knowledge of the effects of exurban development in relation to its density, configuration, and the perceptions and behaviors of humans are poorly understood, greater emphasis and understanding must be placed on these ideas, especially as they relate to urban/exurban and rural/exurban boundaries (Hansen et al., 2005).

Today, some eight percent of the earth's land area is designated as protected (Hansen and Defries 2007). It was believed that by protecting natural environments from human influences that ecological processes and ecosystem services could be maintained. Because protected areas are critical to conserving biodiversity, and land use is critical to providing food and fiber for human consumption, the challenge for land mangers is maintaining ecological functionality while simultaneously reducing restrictions on human use of the land. To effectively manage protected areas to meet biodiversity, production, and ecosystem services maintenance goals, there must be clear definitions of management objectives and the identification of biodiversity characteristics, an understanding of the relationship between the area being protected and its surrounding natural environment, and the socio-economic characteristics and potential conflicts that might exist among resources uses/users both inside and outside of protected areas (DeFries et al. 2007). Due to changes in climate, disturbance regime changes, and the introduction of exotic and non-native species, many protected areas are not sustaining the

services or species they were originally established to protect (Hansen and DeFries 2007).

Since Yellowstone National Park's establishment in 1872, the lands surrounding the park have witnessed a continuing degradation of wildlife habitat, water quality, agricultural lands, and their overall aesthetic appeal (Harting and Glick 1994), as a result of increased grazing, agricultural, and residential development activities being focused on areas of high primary productivity (Hansen et al. 1998). This degradation is the result of traditional economic reliance on the region's abundant natural resources, and in more recent times, the high pressure associated with amenity-driven in-migration, recreational activities, and tourism. While the land use and land cover changes in the region may not be readily visible to the casual observer, there is no question that anthropocentric influences on the landscape are accelerating. Specifically, Parmenter et al. (2003) found that between 1975 and 1995, the largest land cover changes (in total percentage) occurred in rock and soil, urban, burned area, conifer forest, deciduous forest, and mixed conifer forest land use classes. Rocks and soil increased by 971 km^2 (17.85 percent), urban areas increased by 171 km^2 (349 percent), burned area increased by 1,543 km^2 (4,968 percent), conifer forest decreased by over 6,000 km^2 (28,344 percent), woody deciduous forests decreased by 1,941 km^2 (46 percent), and mixed conifer forests increased 5,155 km^2 (91 percent). These changes have implications for the GYE due to the coupled and complex relationships between the natural environment and human drivers of change.

Patten (1991) suggested that, in order to evaluate human impacts in the Greater Yellowstone Ecosystem, the original goals of each system (ecological, economic etc.) must be re-evaluated to determine if their original intent remains adequate. If existing goals are not adequate, they may need to be changed or modified and re-implemented. Before any reimplementation is achieved, however, the current state of each individual system must be compared to the management goals for that system, as well as in relation to all other systems. While a sustainable economic and environmental ecosystem is possible, cooperation and coordination amongst landowners and land managers in the GYE is imperative. It is likely that some lands in the region must be sacrificed to certain degrees to accommodate economic initiatives, and the determination of these lands must be determined prior to the reimplementation of system goals. Ecologists have suggested

two approaches to achieving sustainable ecological and economic objectives in the region. The first approach is the replacement of current ecological patterns and processes to those dominant prior to human settlement, and the second is through a better understanding of the interaction between ecosystems and human land use, especially the ability to manage these systems across public and private boundaries (Hansen et al. 1998).

Jones et al. (2009) suggest that three land use drivers were responsible with having the most detrimental impacts on the resources of the Greater Yellowstone: the extraction of natural resources, agricultural enterprises, and residential development. Specific consequences of these drivers include the reduction in the effective size of the ecosystem, the elimination of critical habitat, the modification of ecological flows, the direct disturbance of the ecosystem itself, and the expansion of human-adapted species.

Hard Rock Mineral Mining

The same year that Yellowstone National Park was established as the world's first national park, 1872, the General Mining Law (GML) was passed by Congress (and has yet to be amended). The GML was designed to promote mining of hardrock minerals, including silver, gold, iron, nickel, and copper, on public lands (BLM 2011). Mineral load claims are established through a $100 holding fee, and proof of an investment of at least $500 on the claim. Once minerals are found, the miner may patent the claim at a rate of between $2.50 and $5 per acre. Two of the most controversial aspects of the GML is that is does not require the miner to pay royalties for the sale of minerals on federal lands, and that miners are not required to post bonds for the mitigation of environmental degradation (McClure and Schneider 2001).

Beginning in the 1850s, gold miners began to prospect the hills, valleys, and waterways of the GYE region, and by 1860, Cooke City, Montana, in the New World Mining District, was established and thriving. Coal mines were developed in the late 1800s and early 1900s, and today minerals including gold, nickel, chromium, talc, travertine, platinum, silver, copper, and lead are extracted from nearly 4,000 mines (with 8,000 inactive) in the region (GYCC 1990). The historic mining operations in the New

World Mining District have compromised the region's waterways including Soda Butte Creek, a world-renowned fly-fishing destination, in Yellowstone National Park (Nimmo et al. 1998). Tailings from gold, silver, and copper mines have resulted in the deposition of heavy metals along a 28 km corridor of the waterway. Agricultural soil samples taken along the creek show moderately acidic pH levels that have negatively affected plant biomass, density, and diversity (Stoughton and Marcus 2000). Native ungulate populations including elk have also been negatively impacted by mining operations. Kuck, Hompland, and Merrill (1985) found that, not only did cow/calf pairs abandon their traditional calf-rearing areas near mining operations, but calves also moved greater distances and used larger areas for forage when compared to undisturbed areas. Other environmental impacts associated with mining operations include acid mine drainage, erosion and sedimentation of local waterways, the release of cyanide and other chemicals, fugitive dust emissions, habitat modification, and surface and groundwater contamination (Ecosystem Restoration 2011). Soil and rock overburden produced from the mining process often contain pyrite, a sulfide mineral, which releases iron and sulfate when exposed to oxygen and water, producing an acidic solution. Further, chemicals such as cyanide, oil, petroleum, solvents, acids, and reagents are often used in the refining of minerals, which have the potential to affect regional water and soil supplies, aquatic organisms, wildlife, and humans (Ecosystem Restoration 2011).

The mining of phosphate in the region has become one of the largest environmental concerns in recent decades. Phosphate mining began in 1906 near Montpelier, Idaho, and today over 40 percent of the phosphate mined in the United States is extracted from four states, Montana, Idaho, Wyoming, and Utah (Lemly 1999). In southeastern Idaho alone, 31 phosphate mines are currently in production or development, including two which are superfund sites (Smoky Canyon Mine and Dry Valley Mine). Seventeen open pit phosphate mines that are currently out of production are also listed as superfund sites by the Environmental Protection Agency. In addition to the environmental issues related to superfund sites, in 2002 the Idaho Department of Environmental Quality listed over 60 miles of streams adjacent to existing or dormant phosphate operations as being contaminated by selenium, with that number rising to 151 miles in 2008. This included Monsanto's South Rasmussen Ridge Mine where the

company has been in violation of the Clean Water Act for the better part of decade for discharging selenium into the West Fork of Sheep Creek (GYC 2011). The release of selenium into regional waterways has also affected populations of native Yellowstone cutthroat trout, livestock grazing on pastures bordering streams, and elk populations, which have forced Forest employees and Fish and Game officials to issue consumption advisories for ungulates and for fish species (GYC 2011; Lemly 1999). Although not directly located in the Greater Yellowstone Ecosystem, the largest superfund site in the country, the Upper Clark Fork Basin Superfund Site, is located on the northwestern fringe of the GYE. Extending 225 km from the Berkeley Pit in Butte, Montana, the 200 million cubic meters of tailings produced by the Anaconda Company mine are contaminated with 9,000 metric tons of arsenic, over 18,000 metric tons of lead, 80,000 metric tons of copper, and over 40,000 metric tons of zinc, as well as high concentrations of cadmium and silver (Watkins 2011).

Oil and Gas Extraction

Although hardrock mining is governed by the General Mining Law of 1872, oil and gas leasing, exploration, and development are managed through the Mineral Leasing Act of 1920 and the Federal Onshore Oil and Gas Leasing Reform Act of 1987 (BLM 2011). Both Acts allow for the competitive leasing (auctioning) of up to 2,560 acres per lease of federal lands for a period of 10 years. The highest bidder is required to pay $1.50 per acre per year for the first five years, and $2.00 per acre per year thereafter. Unlike the GML, oil and gas lease holders must provide a $10,000 environmental protection bond, as well as pay a 12.5 percent royalty on extracted products (BLM 2011).

The oil and gas industry saw relatively high levels of production well in the 1980s, but the 1990s witnessed significant declines. However, recent rises in oil, gas, and mineral prices have resulted in a resurgence of activity in the region, including platinum and palladium operations in Sweetgrass County, Montana, and phosphate operations in Caribou County, Idaho (Swanson 2007). By 1994, over 80 percent of forested lands in the GYE had active or pending oil and gas exploration and drilling leases, including lands adjacent to four of the five entrances to Yellowstone National Park, as well as along a 48 km corridor on the Park's northwestern boundary (GYC

1994). Today, the primary focus of gas and oil exploration in the GYE is along the Wyoming, Idaho border, with the most extensive operations occurring in the Bridger-Teton and Shoshone National Forests (GYCC 1990). In Wyoming, over 50,000 coal bed methane gas wells have been authorized on federal lands at a density of 1 well per 6-13 ha acres, with an additional 18,000 wells in Montana (Walker 2007). Five counties in the GYE (Sweetwater and Carbon, Montana, and Sublette, Lincoln, and Uinta, Wyoming), combined, produced nearly 14 million barrels of oil and nearly 1 million cubic feet of natural gas annually by 1998, with southwestern Wyoming producing over 10 million barrels of oil each year from over 2,000 wells (Sawyer et al. 2002). The production of oil and gas in Wyoming had a total economic impact of nearly $20 billion in 2007. The industry provided for over 20,000 jobs with $1.4 billion in total labor earnings ($54,608 in earnings per employee), and $2.9 billion in taxes to the state (Bender et al. 2007). Although the oil and gas industries have produced substantial employment opportunities, stimulating local and state economies, they have also come under increasingly stringent scrutiny for their environmental impacts, including those on wildlife and aesthetic values and the region's vast network of geothermal features (Glick 1996). Wildlife are directly impacted through the modification of critical habitat and winter ranges (Holloran et al. 2010). Four species that have been shown to be particularly susceptible to habitat modifications are elk, mule deer, pronghorn antelope, and sage-grouse (*Centroceruc urophasianus*) (Lyon and Anderson 2003; Sawyer et al. 2009; Sawyer et al. 2002; Van Dyke and Klein 1996). Oil and gas operations have also been shown to negatively affect air quality standards. In particular, air quality standards in three wilderness management areas in the Wind River Mountain Range (Bridger, Fitzpatrick, Popo Agie) have been exceeded by the nearly 3,000 wells (8,700 proposed) in the Upper Green River Basin of Wyoming (Story et al. 2006).

Anthropogenic perturbations via the extraction of natural resources are particularly harmful to ecosystems, and are one of the primary challenges facing the GYE (Patten 1991). As Swanson (2007) suggested, the sustainability of local and regional economies that are dependent on oil, gas, and mineral extraction industries requires land managers, extractive industry representatives, and local communities to ensure that

current and future development be conducted in ways that protect environmental resources.

Hydrothermal Energy

As fossil fuel reserves decline, demand for energy increases, and the environmental implications of energy-related resource extraction amplifies, the provisioning of alternative energy sources has become one the largest challenges in both the developed and developing world (Duffield and Sass 2003). One potential source of alternative energy is geothermal. Geothermal electricity, generally known as geothermal power, is produced when high-temperature groundwater, heated by energy diffusing from radioactive decay in the Earth's interior, is used to drive turbines. Appropriate conditions are most often located near lithospheric plate boundary zones or hot spot regions, including the Greater Yellowstone Ecosystem. Geothermal (electric) power production facilities are generally built adjacent to locations where water heated from the Earth's interior reaches the surface, or subsurface reservoirs may be drilled into (Steingisser and Marcus 2009).

Although geothermal energy accounts for less than one percent of the power produced in the United States, technological innovations have increased production significantly in recent decades. Today, over 10,000 megawatts are produced annually by approximately 20 geothermal reservoirs within the United States, with an additional 1300 sites producing direct-use energy for homes and recreational purposes (Duffield and Sass 2003). Proponents of geothermal exploration, development, and production suggest that not only is geothermal energy readily available and renewable, but that geothermal energy produces approximately one percent of the sulfur dioxide and nitrous oxide, and five percent of the carbon dioxide, compared to coal-fired plants of similar size. Opponents suggest that geothermal may not be a renewable energy source because the amount of water, steam, and heat produced by a hydrothermal system has the potential to be withdrawn at rates that exceed replenishment rates. In addition, concern exists over the disposal of waste water from the production process (Duffield and Sass 2003).

Of the nearly 40 locations around the globe where geysers and hot springs exist that may readily produce geothermal energy, nine are located in Yellowstone National

Park (nine geyser basins and 11,000 thermal features), with two additional areas immediately adjacent to the park (Steingisser and Marcus 2009). The Island Park Known Geothermal Resource Area (KGRA) is located 20 km west of YNP in the Targhee National Forest, while the Corwin Springs KGRA is located less than 13 km from Mammoth Hot Springs, a primary tourist destination at the north entrance to Yellowstone National Park (Barrick 2010). Development of the Island Park and Corwin Springs KGRAs are a fundamental concern to park resource managers because the hydrologic connections between the KGRAs and the geyser and thermal features of the park are poorly understood (Steingisser and Marcus 2009).

The Geothermal Steam Act of 1970 opened public lands to geothermal leasing, and while over 200 applications were initially filed for exploration and development in the Island Park KGRA, none were approved due to the limited knowledge of their impacts on Yellowstone National Park. Based on these concerns, amendments to the Geothermal Steam Act prohibited development in the Island Park KGRA in 1984; however, 25,000 acres of state and private lands, including the Corwin Springs KGRA were opened for development (Steingisser and Marcus 2009).

In April 1986, the Church Universal and Triumphant, a private land owner in the Corwin Springs KGRA, drilled a 140 m well across the Yellowstone River from the La Duke Hot Spring. After only 13 hours of pumping in September of that same year, officials at La Duke observed a significant reduction in flow rates at the hot spring and pumping was halted (Sorey et al., 1991). This prompted further amendments to the Geothermal Steam Act including provisions that allowed the Secretary of the Interior the power to decline leasing applications if it was believed to be "reasonably likely to result in a significant adverse effect on significant thermal features within a unit of the NPS." It also prohibited further development on the Corwin Spring KGRA until further research could be conducted. Results from studies by the US Geological Survey and the National Park Service indicated a potential connection between the Corwin Spring KGRA and Mammoth Hot Springs. This prompted the Old Faithful Protection Act bill in 1994 that would have prohibited geothermal development within 15 miles of YNP. Although the bill eventually failed to pass, the State of Montana and the National Park Service established the Montana–National Park Service Water Compact that restricted hot and

cold groundwater withdrawals adjacent to Yellowstone and Glacier National Parks, and the Big Hole Battlefield National Monument. In additional, the State of Idaho granted the National Park Service all reserved water rights adjacent to the park, although geothermal exploration was not specifically addressed in the agreement, while State of Wyoming retains its water rights (Steingisser and Marcus 2009).

As Barrick (2010) suggested, the thermal features in Yellowstone National Park remain at risk from geothermal development outside the park boundary due outdated regulations such as the Geothermal Steam Ac, and the unwillingness to grant Yellowstone National Park complete water rights access in the states of Wyoming and Idaho. In addition, as technological innovations reduce the cost of geothermal development and demand for alternative energy increases, the pressure placed on geothermal features on public and private lands will only increase without adequate policies at the local, state, and federal levels.

Timber Harvesting

Traditional natural resource extraction industries, although declining in recent decades, continue to have important implications for environmental and ecosystem services, demographic characteristics, and economic conditions in the GYE. A dramatic indication of the continuing presence of extractive industries in the region is the stark contrast between the western border of Yellowstone National Park, which is protected from timber harvesting, and the Targhee National Forest, where over one billion board feet of timber has been harvested since the 1960s (Glick 1995). The timber operations in Targhee National Forest and other national forests in the region have resulted in the construction of over 7,000 miles of roads on federal lands (Hartin and Glick 1994). Road construction on federal lands has resulted in the depletion and fragmentation of wildlife habitat, cover, and critical migratory corridors, particularly in relation to mature elk, as well as the increased sedimentation and erosion of streams and rivers (Leal 1990). Sedimentation of streams and rivers as a result of timber harvesting, road construction, and grazing on federal lands has resulted in a decline in overall water quality, a decrease in aquatic insects and plant life, and increased water temperatures, all of which result in a decrease in the region's prized trout populations, recreational opportunities in local

communities (Dana 1990), and related economic opportunities for communities in the GYE.

Agriculture and Ranching

Ranches, while iconic in societal terms due to their open spaces, perceptions of agriculture, and cultural personification, are in reality marginal places that are often defined by their marginality of site and situation (Starrs 2003). Agricultural endeavors developed simultaneously with the initial settlement of the greater Yellowstone region. Today, traditional row crop agriculture, most notably spring and winter wheat, seed potato, and sugar beets, as well as ranching, dominate land use practices on private lands, with 57 percent of private lands in range usage, 20 percent in crop production, and 7 percent in pasturelands (GYC 1994). These private lands are typically located in lower elevation valleys and riparian zones, which place significant pressures on the natural environment, including critical wildlife habitat and migratory corridors (Hansen et al. 2002). These pressures are compounded by the fact that increasing land values in the region are facilitating a transition from traditional land use practices to amenity and recreational practices (Riebsame, Gosnell and Theobald 1996). To illustrate the conversion of traditional agricultural lands to other uses, nearly 12 percent of the total land area in the GYE (11,158 km^2) was agricultural in 1975. By 1995, that number was down to 10.8 percent (10,208 km^2), representing nearly a 9 percent decline in agricultural lands. Losses were attributed to two primary factors: acceptance of upland grain fields in the CRP, and urban and rural residential development, which saw a 348 percent increase during the same period (Parmenter et al. 2003).

Since the early 1990s, the ranching landscape of the GYE has become dominated by amenity and investment ownership. Between 1990 and 2001, nearly a quarter of all ranchlands in the GYE changed hands, with only one-quarter of those lands being retained for traditional ranching activities. The remainder was purchased by amenity buyers, part-time ranchers, developers, investors or corporations (Brunson and Huntsinger 2008; Gosnell et al. 2006). These changes are a product of the willingness of amenity migrants to pay more for the aesthetic value of the land than traditional ranchers can pay to produce goods and services. Further, because of current tax laws, land values

are set at the highest potential value of the land, in this case residential real estate, and not the value that represents traditional uses when properties are inherited. Because of this, ranchland heirs are often unable to pay the inheritance tax and are forced to sell the land outright, or sell a portion of the land to pay the tax (Bennett and McGinnis 2008). Gosnell and Travis (2005) suggested that the current transition in ranch ownership is not a new phenomenon. For example, during the depression and droughts of the 1930s smaller ranches were consolidated into larger operations. As opposed to the 1930s when ranches remained focused on livestock and agricultural production, the current transition toward amenity and investment properties results in the termination of traditional land use practices and a shift to hobby ranches with limited production or to subdivision development. Two examples of the transition toward more amenity properties can be found in Sublette County, Wyoming, and Carbon County, Montana.

Sublette County is known for its mountain vistas, large valley bottoms, and sagebrush rangelands. Although the county was originally settled for its agricultural potential, the energy development boom of the 1970s prompted many ranchers to sell their property. In the 1990s and early 2000s, land speculation and sales in adjacent Teton County prompted the sale of even more ranches in the county. Because over 90 percent of the ranches in the county exceeded 400 acres, the sale of rangelands for energy development and later amenity properties changed the county's character. Between 1990 and 2001, a total of 58,091 ha, or 45 percent of the agricultural lands in the county changed hands (Gosnell and Travis 2005). Sixty percent of the lands sold transferred to amenity migrants and 11 percent transferred to developers, with nearly 70 percent of all land sales being conducted with out of state purchasers. In Carbon County, 26 percent of properties were purchased by investors, 23 percent were purchased by amenity migrants, and 30 percent were purchased by energy corporations, although 21 percent remained in traditional ranches. Similar to Sublette County, nearly 80 percent of all land purchases were conducted by non-locals (Gosnell and Travis 2005).

This transition away from traditional agricultural and ranching ownership may result in conflicts for land managers in relation to landscape and ecosystem conservation, as well as a decline in social networks and community cohesion since amenity migrants are often only in residence for small portions of the year (Gosnell et al. 2006). Bennett

and McGinnis (2008) have suggested that changes in land ownership toward amenity migrants and second home owners have created a positive feedback loop that leads to "non-linear growth in amenity ownership." They suggested that this feedback loop is driven by four processes. First, because of the social and cultural nature of ranching and agriculture, each additional amenity migrant weakens support for the ranching community, which causes a decline in agricultural ways of life. This is further compounded by demographic shifts taking place in rural areas, primarily aging agriculturalists, and the lack of desire of younger generations to perpetuate the agricultural culture. Second, amenity and second home owners have land management values that differ from agriculturalists and may result in changes in land usage. Third, declines in agricultural activities have subsequent impacts on agricultural communities and economies through the reduction in supporting infrastructure such as supply stores, banks, and labor pools. Fourth, as more land is taken out of traditional agricultural operations and replaced with amenity properties, the pressure to transform even more land increases.

Traditional land use practices that were thought of as incompatible with conservation goals, including monocrop agriculture, and predator control have been replaced by restricted public access, large-scale residences and subdivisions, and shifting water consumption practices including stream diversion for recreational or aesthetic purposes. However, amenity and investment landowners may be more likely to place their properties in conservation easements and other land conservation programs, as they are more likely to have the financial abilities to do so. This may result in greater long-term ecosystem sustainability through perpetual conservation practices. Those lands without adequate protection, however, will continue to be an area of focus for land managers, conservation organizations, and developers alike, some of whose land-use priorities may be in conflict with biodiversity sustainability (Gosnell et al. 2006).

Wuerthner (1994) suggested that although suburban and exurban development may be a threat to ecosystem integrity in the GYE, agriculture – both livestock production and farming – has the largest impact on Western ecosystems. One of the largest impacts is associated with livestock production, which is considered the single greatest source of non-point pollution in the region. In addition, agricultural operations

that produce forage crops for the region's livestock industry are the greatest consumers of surface and sub-surface water resources (Reisner and Bate 1990; Wuerthner 1994), depleting the resource for downstream users, both municipal and recreational. Native plant communities are also supplanted by crops for livestock forage, which not only reduce the carrying capacity for native ungulates and other herbivores, but also destroy native soils through the introduction of pesticides (Wuerthner 1994), when these chemicals are used.

An example of the detrimental impacts that agricultural and ranching endeavors have on the landscape was put forth by Hansen, Wyckoff, and Banfield (1995) when they examined the relationships between livestock production and coniferous forests in the Madison Valley of southwestern Montana. Settlement of the Madison Valley, which forms a portion of the western boundary of the GYE, began in the 1860s when gold was discovered in nearby Alder Gulch. To feed the growing mining camps ranchers relied on grazing forage on their own property and in the adjacent mountains. As demand for beef, and later sheep, increased, the impact of livestock production on the landscape increased as well. Specifically, livestock trampled and compacted soils and subsequently hindered the establishment of coniferous seedlings, resulting in an upward shift of the lower coniferous forest boundary. It has also been suggested that a further consequence of livestock production is the competition between livestock and native ungulates for scarce resources. To mitigate the potential impacts of livestock operations in southwestern Montana, the federal government began to regulate grazing practices through grazing districts and an annual permit system on USFS lands.

Exurbanization and Development

As Travis (2007) suggested, the American West is in the midst of a transition that began in the 1970s and 1980s with the rise of coal and natural gas extraction. The energy boom gave way to a service-based economy based on low-skilled service jobs, tourism, and high-tech and professional industries as the result of declining commodities prices and a globalized economy, which saw countries with inexpensive labor and abundant natural resources out-competing natural resource extractors in the US West. With the

transition to a service-based economy, the West also saw a marked shift in local economies, socio-cultural characteristics, and demographics (Smith and Krannich 2000).

The population of the US Rocky Mountain West has grown at three times the national rate since the 1980s (Baron, Theobald, and Fagre 2000). Between 1970 and 1999, the Greater Yellowstone Ecosystem experienced a 58 percent increase in population, with a corresponding increase of 350 percent in exurban housing densities in rural areas (Gude et al. 2005), with some county populations growing by as much as 275 percent (Hansen et al. 2002). Rates of growth in the GYE differed between counties that contained protected lands and those that did not, with Lorah and Southwick (2003) suggesting that the myth that the protection of federal lands eventually leads to declines in employment opportunities, income and population was just that, a myth. Instead, the authors suggested that those counties with protected lands are growing at relatively rapid rates compared to those without protected lands, and that economic vitality and demographic growth is associated with the protection of the natural environment. Population in counties with protected lands grew 11.7 times faster than those without, employment grew 10.6 times faster, and income grew 2.75 times as fast.

Demographic changes in the region have directly influenced, and have often driven, land values and real estate demand. Burger and Carpenter (2010) detailed the dramatic impacts of fluctuating real estate markets in the Intermountain West between 1980 and the present. The authors suggested that five distinct periods of development existed during this time, each with local, regional, national, and global drivers. The first period began with dual recessions of 1980 and 1982, and did not end until the recession of 1990-1991. During this time rural land values dropped significantly, especially in Montana where land values declined by over 60 percent, largely as a result of declines in commodity prices (which the state was heavily dependent upon at the time). Intermittent growth during this time resulted in some speculative rural subdivision as a result of property review exemptions offered at the state level. While other states throughout the Rocky Mountain West enacted legislation in support of conservation easements, the northern Rockies, including Montana, Idaho, and Wyoming, were slow to respond. The mid-1990s to 2000 marked the next phase in real estate evolution in the region, a period that Burger and Carpenter termed “Dot-com wealth and A River Runs through It.”

During this period land values began to recover as out of state buyers began to invest in rural properties. It was during this time that Jackson Hole became a premiere real estate destination, and some of the region's exclusive gated communities, such as the Yellowstone Club near Big Sky, Montana, were established. In contrast to the gated communities of Big Sky and Jackson Hole, conservation development also began to appear on the landscape, driven by the potential tax benefits afforded through conservation easements. The third period began with the September 11, 2001, attacks, compounded by the technology stock crash and numerous corporate accounting scandals. To counter the lack of confidence many investors felt during this time, they began to invest heavily in real estate, a traditionally secure long-term investment strategy. Investment in real estate spurred a home ownership boom across the country, which was further fueled by low interest rates, debt securitization, and relaxed underwriting practices. As home prices began to rise as a result of this reinvestment, the financial and real estate industries began to promote second home ownership as a retirement and wealth building strategy. Lastly, smaller regional centers like Bozeman were praised in national publications for their natural and cultural amenities and outdoor recreation opportunities, which further stimulated land speculation and development. The housing markets in many Intermountain West towns reached their peaks in 2005 and 2006, and soon afterward, sales volumes dropped significantly as the early stages of the credit crisis began forcing land developers to slow or halt new projects. Although the northern Rockies escaped the worst impacts of the economic slowdown initially, by 2008 large ranch sales had declined by over 70 percent in western Montana, and residential home sales were declining at a rate of 25-35 percent per year. This was dramatically illustrated in Teton County, Wyoming, where nearly 7,000 residential lots of the 9,194 total in the county were vacant by 2008.

The tremendous growth the GYE has experienced in recent decades is the product of both enabling and shaping forces. Enabling forces are a direct result of local, state, and national government programs, such as innovations in technology, government subsidies, and public investment, which all promote growth. Shaping forces, both political and physical, also promote growth. Political forces include land use planning and growth policies at municipal and county levels, or the lack thereof, while physical

forces include the region's unique topography and climate which attracts migrants looking for a "beautiful, safe, and somewhat remote place" (Travis 2007). Other enabling forces behind the growth include increases in the number of retiring baby-boomers and their associated non-labor income, quality of life migrants, an expansion of the service-based industry, rising real estate values, and an increasing demand for tourism and recreation-based services (Johnson 2001).

Rasker (1993) suggested that it is the region's natural amenities that have been the catalyst for its growing population and economy, and that the challenge for local decision-makers is the sustainability of these amenities. However, as regional economies changed through increases in industry and non-labor income, specifically retirement accounts, those with the financial ability began to move further into the suburban and mountain periphery. In some cases in-migrants have settled on the edge of public lands, which places further burdens on the environment and, consequently, decision-makers (Hansen et al. 2002; Clendenning, Field, and Kapp 2005; Hansen and DeFries 2007).

County and municipal leaders often believe that amenity migration is the cure for ailing rural economies, as it is perceived that residential development will raise more taxes per acre of land than traditional agriculture. However, the financial contribution that residential development makes to county and local tax bases is often overshadowed by increased demands placed on services and infrastructure including roads, public health and safety, and education among many others (Sonoran Institute 2006). In addition to increased demands on municipal services, the rapid growth the GYE has witnessed in recent decades has also placed more stress on the natural environment.

Exurban development (approximately 6-25 homes/km), is the fastest growing form of land use in the US in Urban Fringe Development (UFD) areas, defined as those immediately adjacent to urban areas (Hansen et al. 2005). Primary changes associated with such development include shifts from wildlands to exurban, and from exurban and agricultural to suburban. All such changes have had considerable influence on native and non-native flora and fauna, specifically a decrease in species richness and abundance. Exurban development in rural areas is also seen as being detrimental to biodiversity. This is of critical importance in areas at the boundaries of public lands. Specific alterations from exurban development in rural areas include habitat fragmentation,

modified disturbance regimes, particularly fires and flooding, changes to nutrient cycling, and alteration of biotic interactions (Hansen et al. 2005).

Human induced land use and land cover changes, including rural residential development, are being focused on areas of the GYE with high primary productivity (Hansen, Gallant, and Rotella 1998). While built area has increased 348 percent since 1975, conifer forests, which dominate the region especially at higher elevations, have seen a 17 percent decrease in total land area. Further, hardwood stands, especially those in riparian zones that act as important wildlife habitat, have decreased 46 percent; and traditional agricultural activities have declined 9 percent, largely as the result of exurban development and subdivisions. Recent migrants to the region have also tended to concentrate in areas dominated by high biodiversity, particularly low-elevation valleys and riparian zones. As a result, habitat decline and fragmentation, as well as the loss of critical habitat corridors, are common throughout the region (Hansen et al. 2002).

In the 32 percent of the GYE that is privately owned, land conversions are increasing rapidly. Since the 1980s, Gude et al. (2007) found that exurban growth has occurred disproportionally in areas occupied by grizzly bears, bird biodiversity hot spots, and riparian areas. The authors conducted five alternative land use scenarios ('status quo,' 'low growth,' 'boom,' 'moderate growth management,' and 'aggressive growth management') to determine their impacts on the biodiversity. Results suggest that development has occurred disproportionately in riparian and biodiversity hotspots, and that most habitats will be impacted to some extent in the future regardless of management initiatives. Further, only the aggressive growth management scenario was deemed to be sufficient to protect "at risk" habitats. In this scenario, future growth is specifically directed away from areas of high biodiversity. It is suggested that what is needed most in the region is collaboration between decision makers and the general public, county-wide zoning (which does not currently exist in most counties), and incentives to encourage appropriate levels of growth, such as streamlined development processes.

One of the fundamental issues relating to residential development in the GYE is a lack of unified or consistent planning and zoning policies at the county level. Although a number of counties do have planning processes in place, most often county planners act only in an advisory role, with final oversight and approval through county commissions,

and thus a lack of local oversight at the municipal level (Johnson 2001). It was not until 1973 that the state of Montana required subdivision regulations at the county level (Schmidt 1978), and it was not until 1993 that Gallatin County, one of the fastest growing counties in the state, approved a countywide zoning plan. Prior to 1993, properties that were subdivided into parcels in excess of 20 acres were exempt from review at the local level (Johnson 2001). Today in Montana, subdivisions are regulated through two legal designations, which differ in size and number of parcels developed, and degrees of regulation. Major subdivisions, those lands with six or more parcels under 160 acres, are more heavily regulated, with specific design standards including road width, water and sewer service, and viewshed protection. Minor subdivisions contain five or fewer parcels under 160 acres in size and have similar but less stringent design standards than those of major subdivisions (Compas 2007).

A 2007 study by Compas that analyzed the impacts of planning and zoning policies on exurban development in Gallatin County found that while minor subdivisions accounted for the smallest number of parcels developed, they consumed the most land, and were increasingly located further from major growth centers. In contrast, major subdivisions became more clustered, consumed less land, contained more open space, and were located closer to growth centers. These results suggest that although some GYE counties have actively pursued planning and zoning policies in recent decades, current policies may not be adequate to mitigate the impacts of residential development in rural areas of the region. Although growth and the subsequent consequences to biodiversity are inevitable due to amenity migration, redirecting development toward existing cities rather than limiting future development holds the greatest prospect for biodiversity sustainability.

Tourism

Tourism began soon after the establishment of Yellowstone National Park in 1872. The first recorded account of a tourist in the region occurred in 1877, when Chief Joseph took tourists hostage in the park boundaries as he fled Colonel Nelson Miles. The tourists were eventually released unharmed, but the event signaled the beginning of the tourist fascination with the area. While tourism would benefit from technological

advances such as the advent of the automobile, it would not be until the 1960s and 1970s that the region would see a substantial change in tourism-related migration. Spurred by the recent success of winter resorts such as Sun Valley in Idaho and Aspen in Colorado, the Jackson Hole Ski and Summer Resort was opened in 1965, and Big Sky Resort was opened by NBC News anchorman Chet Huntley in 1973 (Johnson 2004). It is estimated that over 16 million tourists visit public lands in the GYE annually, with over 90 percent visiting between the months of April and December. Tourism visits are not only temporally confined to specific times of the year, but they also vary considerably in their recreational activity and the location of that activity. The vast majority of tourists visit for one of five reasons: viewing natural features and scenery, wildlife viewing, general relaxation, hiking or walking, and driving for pleasure on the region's vast network of scenic roads (Figure 3-9). Tourists from the GYE region itself, or from nearby states, typically visit national forests, and often are return visitors. Visitors to national parks, on the other hand, tend to be drawn both nationally and internationally, with over half of national park visitors visiting the region for the first time. Yellowstone National Park is the most visited location in the region, accounting for over 20 percent of all visits (3.5 million visitors per year) (Figure 3-10). This is followed by Caribou-Targhee National Forest (16 percent), Bridger-Teton National Forest (16 percent), and Grand Teton National Park (15 percent of all visitors) (GYCC 2006).

Tourism and recreation-related activities are the primary driver of local economies, especially in gateway communities such as West Yellowstone, Gardiner, and Red Lodge, Montana (Johnson et al. 2003). However, the economic impact of tourism on the region is difficult to assess because the standardized industrial classification (SIC) system, a standard matrix for gauging economic importance, does not recognize tourism as a discrete industry. Further, each state and community collects different economic and tourism-related data, making comparisons and analysis difficult (Johnson 2011). However, economists are able to approximate valuation of tourist-related expenditures by implementing input-output models and other methods. The objective of an input-output model is to measure multipliers in an economy (Wallace et al. 1991). Bergstrom et al. (1990) defined a multiplier as the ratio of the direct, indirect, and induced effects on an economy to the direct effects, and can be used as an effective method by which to assess

Figure 3-9 Greater Yellowstone Ecosystem Recreation (source: GYCC 2006)

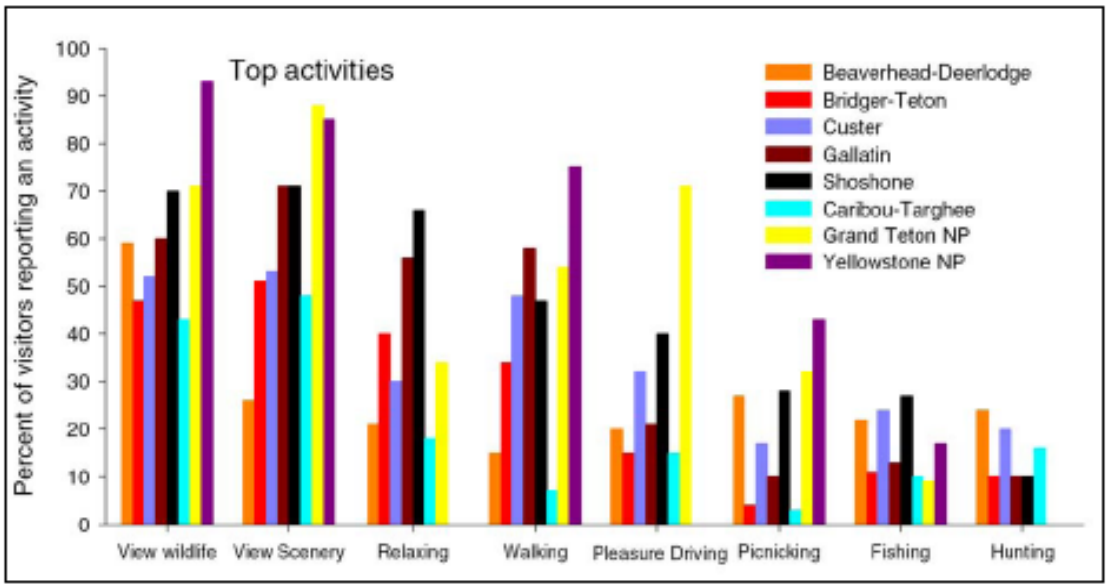
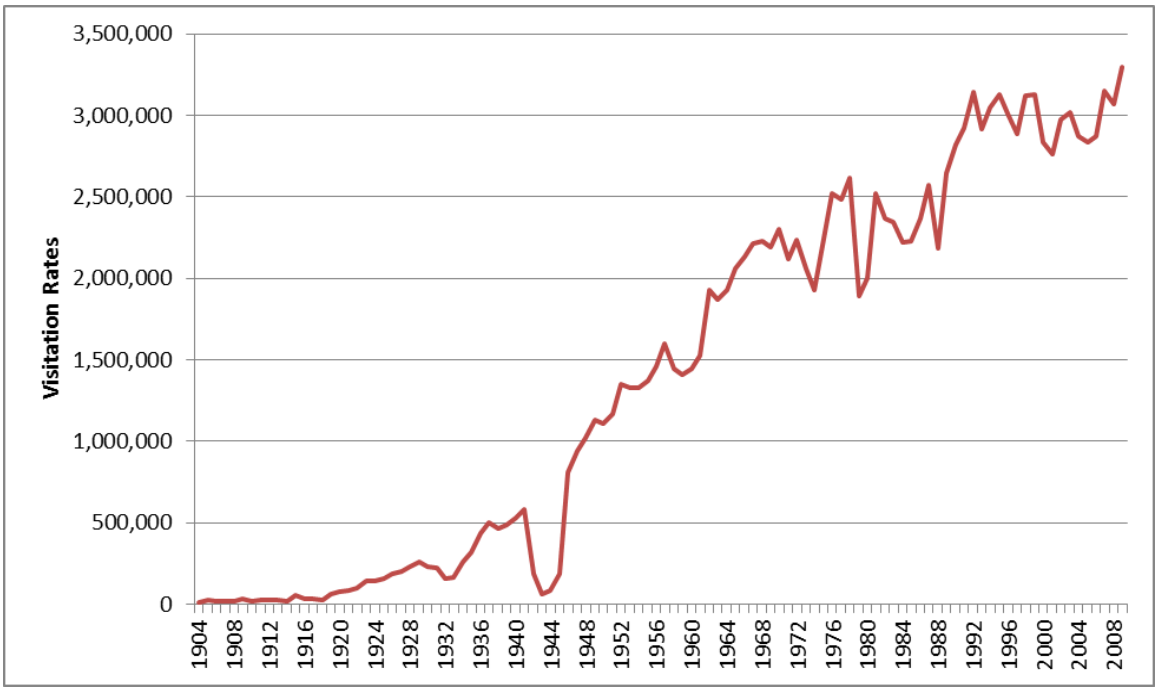


Figure 3-10 Yellowstone National Park Annual Visitation Rates (source: NPS PUSO 2011)



the effects that recreational spending has on other sectors of an economy (Zhou et al. 1997). Direct effects are defined, for example, as the income and employment generated by consumer purchases at local businesses. Indirect effects occur, for example, when businesses use their revenues to purchase goods and services, and induced effects result, for example, when households (employees) purchase consumer goods and services with their wages (Johnson and Moore 1993; Koontz and Loomis 2005; Eiswerth et al. 2005). These models are capable of calculating the total economic impact of an industry by combining the direct, indirect, and induced effects that industry has on local economies.

In 1998, the 3.8 million nonresident visitors to the region spent more than $1.5 billion in direct tourist-related expenditures in Montana, with over $300 million in Gallatin County alone. Visitor expenditures were typically focused on retail sales (24 percent of expenditures), gas and oil (22 percent), food and beverages (18 percent), and lodging (17 percent)(McMahon 2000). In 2001, nonresident tourists spent nearly $40 million dollars in Carbon County, with over $12 million in food-related expenditures (Nickerson et al. 2004). By 2006, visitors to the region had a total economic impact of nearly $350 million, and created 5,808 tourist-related employment opportunities (Stynes 2008). While the state of Montana may rank 42nd in relation to tourist-related expenditures, it ranked seventh in expenditures per capita, signifying a significant contribution to the states total economy. At a statewide level, non-resident tourist expenditures in Montana had a total economic impact of $4.31 billion, and created nearly 50,000 employment opportunities statewide. These revenues generated over $1 billion total personal income, and brought in $235 million in local and state taxes, and $270 million in federal taxes (Grau and Bruns-Dubois 2008).

Although tourism in the GYE may be economically advantageous, especially to gateway communities, the millions of tourists who visit the region each year also have a direct impact on the natural environment and communities they have come to enjoy. First, tourism and tourism-related migration often results in an economic loss to communities because of the costs in providing public services (McCool et al. 1998). With improvements in technology such as navigational tools, improvements in clothing, and survival gear, the impact of tourists on the environment is correspondingly increasing. Environmental impacts associated with tourism include air and water

pollution through the construction of tourist-related facilities and the disruption of wildlife through recreation activities such as off-road vehicles. Tourists themselves may contribute to over congestion of local and regional highways, and may compete with local residents for popular recreation destinations (McCool et al. 1998). In addition, tourists may introduce exotic species such as zebra mussels, invasive aquatic vegetation, and non-native fish species unintentionally to local water resources. They may also damage soil and watersheds through pioneer trails on steep slopes that may result in scarring, soil erosion, and the loss of vegetation. Unmanaged recreation has negative impacts on not only the landscape, but also on land managers' abilities to meet the goals of protecting biophysical, geologic, and heritage resources (GYCC 2006). One method by which this has been mitigated in Montana is the implementation of a resort or bed tax. In 1985, the town of West Yellowstone initiated a four percent resort tax on all non-essential goods. The revenue generated from this resort tax was used to fund infrastructure improvements to local waterworks, public roads, and recreation trails, with the remainder used for tourism promotion (Johnson 2004). In addition, the Travelers for Open Land organization was recently established through a partnership of Travel Montana, the Montana Innkeepers Association, the Montana Community Foundation, and the Montana Association of Land Trusts. The goal of the organization is to provide a means by which tourists can protect the GYE . This is accomplished through a donation of $1 or $2 by tourists for each lodging guest that will go directly towards grants for open-land conservation (Person 2009a).

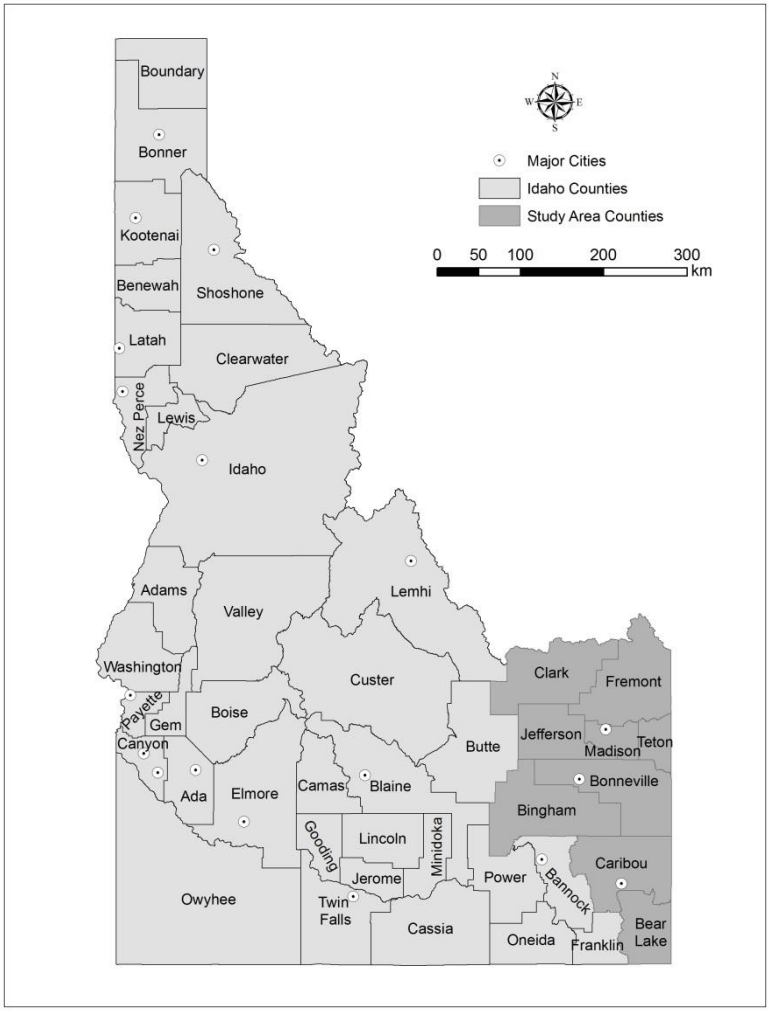
Socio-Economic Characteristics

Gude et al. (2007) suggested that socio-economic analysis of the Greater Yellowstone Ecosystem should include at least the 20-25 counties that are in or adjacent to the traditionally defined boundary of the GYE (Figure 3-2). Each of these counties varies in their socio-economic characteristics, as well as their dependence on tourism and recreational-based industries. Although this study does not specifically focus on the socio-economic character of all 25 counties, an examination of their characteristics is important to understanding better the region as a whole.

Idaho County-Level Socio-Economic Profiles

Counties in Idaho (Figure 3-11) on average cover nearly 350,000 ha (Table 3-3), with populations ranging from 984 in Clark County, to 96,238 in Bonneville County. Bonneville County's high population is largely attributed to its inclusion in the Idaho Falls Metropolitan Area, while the vast majority of Clark County's population lives in the town of Dubois (647) (IDL 2011). Madison County is increasingly recognized as a second home, tourist, and recreational destination (Madison County 2011), and although its median income is the lowest of all study area counties in Idaho, its median home value ($162,800), the second highest in the region, reflects its importance as an amenity destination. Teton County, Idaho, has the both the highest median income ($23,577) and the highest median home value ($289,900) (IDL 2011). Originally the location of Indian tribal councils and the trapper rendezvous known as Pierre's Hole, Teton County is often recognized as the bed room community to Jackson, Wyoming. In addition to increases in service related employment opportunities across the Teton Pass in Jackson, the county is increasingly drawing amenity-seeking second homeowners of its own, especially in the communities of Driggs and Victor (IDL 2011). Other amenity and tourist-driven counties include Bear Lake County, which is known as the "Caribbrean of the Rockies" for its crystal blue waters, Jefferson County with its numerous lakes, rivers, and streams, Caribou County, known for Soda Springs, a natural carbonate spring that erupts every hour, and Fremont County where blue-ribbon trout fishing on the Henry's Fork of the Snake River bring anglers from around the globe (IDL 2011). Agricultural is also a dominant industrial sector in many counties including Bingham County, which is a major potato processing and shipping center, Franklin County, and Clark County. In addition, natural resource extraction is also important to counties such as Bonneville County where the proposed multi-billion dollar AREVA uranium enrichment plant is projects to increase both population numbers and employment opportunities (IDL 2011), and Clark County, which is home to the largest opal mining operation in the country near the town of Spencer (Clark County 2011).

Figure 3-11 Idaho GYE Counties (data source: BSI 2011)



Montana County-Level Socio-Economic Profiles

Counties in Montana (Figure 3-12) on average cover over 317,000 ha (Table 3-4), with populations ranging from 1,628 in Meagher County, to 86,532 in Gallatin County. Gallatin County's high population is largely attributed to Montana State University and the region's only medical center, Deaconess Hospital (Merrill and Jacobson 1997). Agriculture has traditionally played a dominant role in the lives of Carbon County residents, and while the total number of residents who consider agricultural-based

Table 3-3 Idaho County Socio-Economic Profile

State	County	Land Area (ha)	Population (2009)	Median Income ($)	Median Home Value ($)
Idaho	Bear Lake	271,689	5,859	19,478	136,500
	Bingham	549,077	43,635	18,601	120,000
	Bonneville	492,097	96,238	23,198	144,500
	Caribou	465,679	6,888	20,368	111,300
	Clark	457,132	984	14,416	76,300
	Franklin	173,011	12,272	15,450	154,500
	Fremont	490,802	12,357	18,542	116,700
	Jefferson	286,193	22,892	18,349	145,300
	Madison	122,506	37,120	13,050	162,800
	Teton	116,549	8,422	23,577	289,900
	Average	342,474	24,667	$18,503	$145,780

Figure 3-12 Montana GYE Counties (data source: BSI 2011)

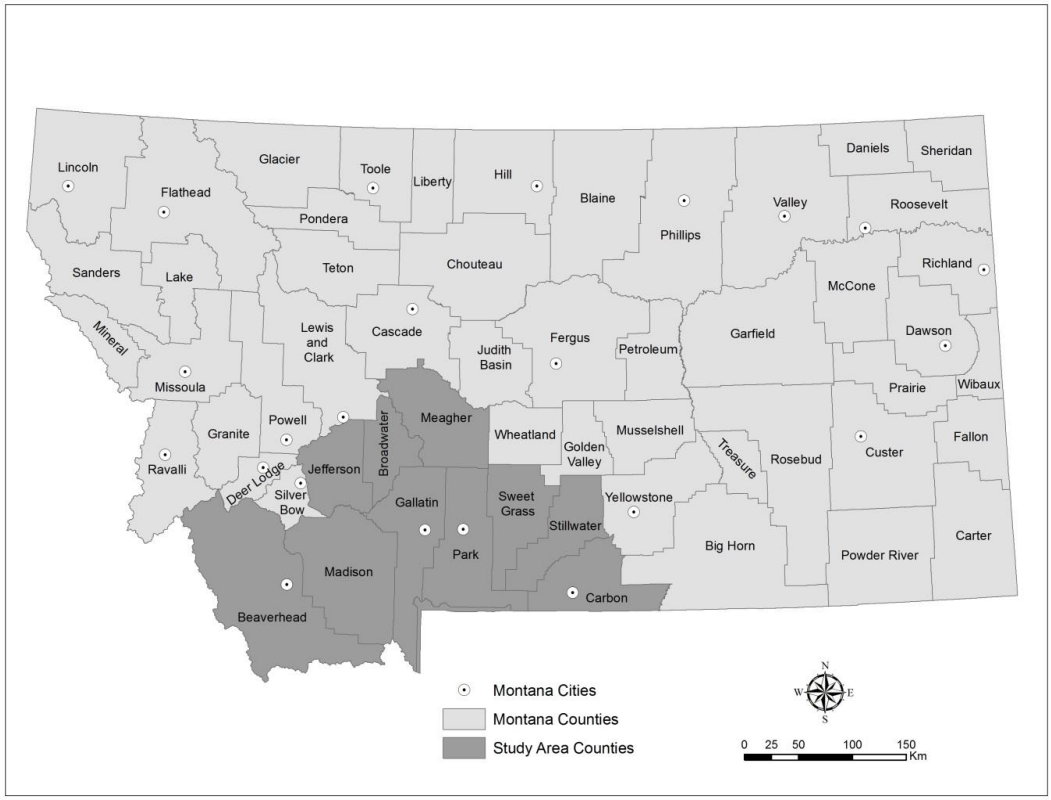


Table 3-4 Montana County Socio-Economic Profile

State	County	Land Area (ha)	Population (2009)	Median Income ($)	Median Home Value ($)
Montana	Beaverhead	144,297	8,887	19,572	149,200
	Broadwater	32,054	4,602	20,490	141,000
	Carbon	534,055	9,756	17,204	189,900
	Gallatin	681,684	86,532	25,921	266,200
	Jefferson	42,291	11,105	24,260	202,800
	Madison	93,283	7,314	22,768	229,600
	Meagher	620,302	1,628	18,866	88,800
	Park	72,882	15,935	23,289	191,200
	Stillwater	467,491	8,573	26,194	161,700
	Sweat Grass	482,255	3,765	20,672	183,000
	Average	317,059	15,810	$21,924	$180,340

industries their primary occupation has decreased by over 25 percent since 2000, the total land area in farming has increased five percent, with a sixty percent increase in farms owned by corporations or cooperative trusts. In addition, while the economy of the Carbon County was traditionally based on the extraction of natural resources, most notably coal, today it is focused on tourism and recreational-based industries (MDLI 2005). The agriculture industry has also held close ties to Gallatin County. Today it is considered the state's top producer of alfalfa hay, and was at one time considered a key source of canning peas nationwide, a tradition celebrated annually with the Sweet Pea Festival in August (MDLI 2005; Merrill and Jacobson 1997). Tourism and recreation-related industries are also important to Montana counties including Broadwater County, where Canyon Ferry Lake, the third largest water body in the state, draws Montanans and non-residents, alike. Outdoor recreation, specifically activities relating to the Madison River and its adjacent public lands are important to Madison County, especially in the town of Ennis, while Jefferson County is known for its radon mines, used for health purposes. Currently only four radon mines are active in the US, all of which are located in the Boulder River valley of Jefferson County (Erickson 2000). Lastly, Park County, which received its name due to its close proximity to Yellowstone National Park, is also

an important tourism and recreation destination, most notably the towns of Livingston, and Gardiner (MDLI 2010). Natural resource extraction is one of the primary industrial sectors in Stillwater and Sweet Grass Counties. One of the largest producers of platinum and palladium in the US, Stillwater Mining Company is located in Stillwater County, while palladium mining is also important in Sweet Grass County (MDLI 2010).

Wyoming County-Level Socio-Economic Profiles

Counties in Wyoming (Figure 3-13) on average cover nearly 1.4 million ha (Table 3-5), with populations ranging from 4,500 in Hot Springs County, to over 37,000 in Fremont County. Economic development in the Hot Springs County has been driven primarily by its abundant natural resources including oil and gas, coal, mineral hot springs, as well as paleontological resources including dinosaur fossils (HSCNRPC 2005). The agricultural industry plays a prominent role in Fremont County due to rich agricultural lands, extensive water development, and summer grazing allotments in the Bridger-Teton National Forest. It is anticipated that mining will play a larger role in the county's economy in the future due to renewed interests in uranium mining in the east central portion of the county (Taylor and Foukle 2008a). Amenity migrants and spillover from Teton County, specifically the town of Jackson, has pulled migrants into Lincoln County due to its mountain vistas, lush vegetation, and seemingly abundant water resources (Taylor and Foulke 2008b). Tourism is big business in Park County, and for good reason. Yellowstone National Park, including Mammoth, Canyon, Fishing Bridge, and Roosevelt Lodge, some of the most visited locations with the park, are located in the county. Although summer tourism has traditionally been the counties driving economic force, winter use of Yellowstone National Park, including snowmobiling, cross-country skiing, and wildlife viewing, is becoming increasingly important. It is estimated that non-resident snowmobile users alone spend more than $100 million annually in the county, creating more than $40 million in personal income and generating 3,000 employment opportunities (Taylor 1999). While the average time in residence in Sublette County for private property owners was greater than 17 years, fifty-four percent had permanent residence outside the county, and twenty-seven percent had held residence outside the state. The significant numbers of second homeowners is largely the result of

Figure 3-13 Wyoming GYE Counties (data source: BSI 2011)

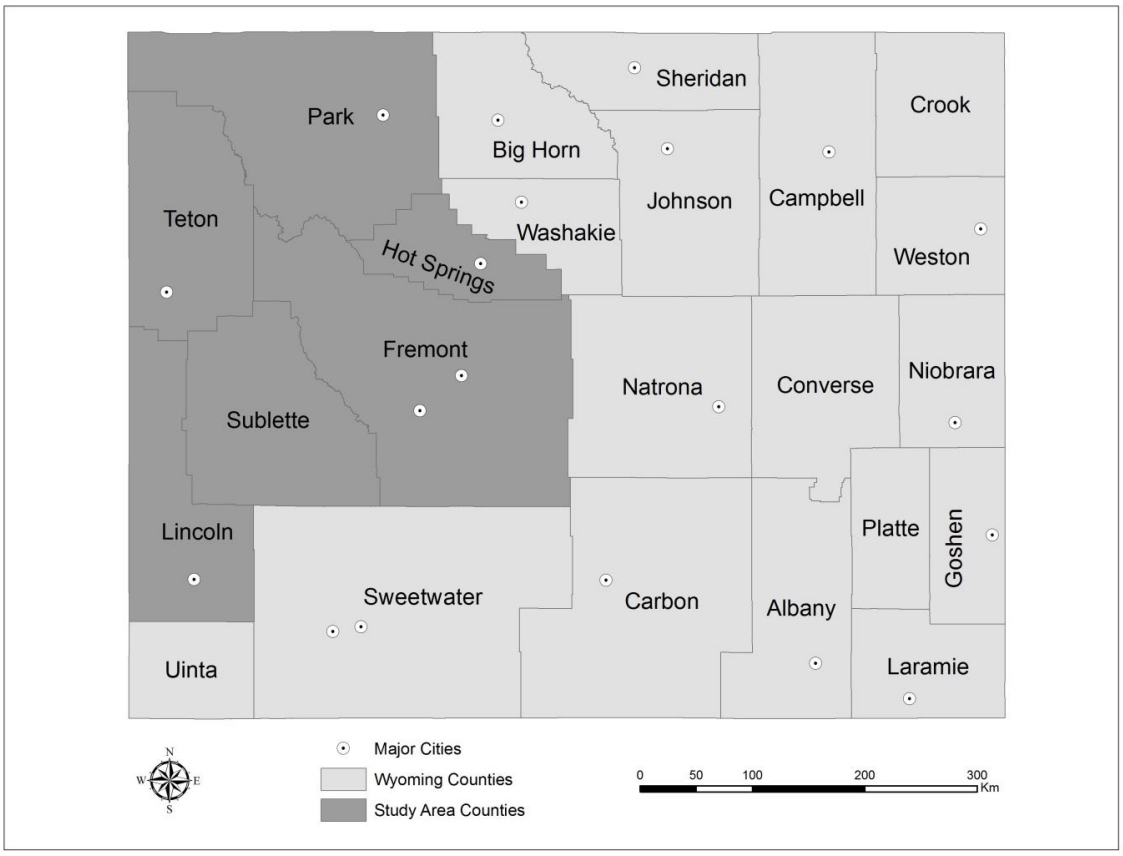


Table 3-5 Wyoming County Socio-Economic Profile

State	County	Land Area (ha)	Population (2009)	Median Income ($)	Median Home Value ($)
Wyoming	Fremont	2,399,882	37,432	23,868	141,600
	Hot Springs	519,551	4,523	26,373	101,300
	Lincoln	1,059,046	16,185	24,699	182,000
	Park	1,804,962	27,193	25,178	171,600
	Sublette	1,278,418	7,801	31,090	243,100
	Teton	1,093,491	20,067	38,588	704,700
	Average	1,359,225	18,867	$28,299	$257,383

amenity-migration with owners seeking a rural lifestyle, low population densities, recreational opportunities, and abundant natural resources (McLeod et al. 1998). Since the 1980s, wealth and natural amenities have driven growth and development in Teton County. This is evidenced by the county having the second highest per capita income in the nation. Migrants are drawn to the county for its proximity to two national parks, and three nearby ski resorts, in addition to cultural amenities such as an international airport, numerous fine dining opportunities, and retail shopping. Although the population boom of the 1980s and 1990s has declined, it is expected that cultural and natural amenities will continue to draw people into the Teton Valley in the future (Taylor and Foulke 2008c).

Conflict in Greater Yellowstone

In addition to the obstacles previously discussed are a number of long-term, highly contentious issues focused on the GYE, which make management increasingly difficult. These include "fire policy, wolf reintroduction, bison management, geothermal protection, oil and gas leasing, timber harvesting practices, hard rock mining proposals, and appropriate levels of tourism and recreation development" (Keiter 1993). Three issues that reveal the complex interrelations between interest groups, government agencies, and individuals—what Kiasatpour and Whitfield (2008) and others before them termed, "wicked problems," or problems with no clear solution and that involve a myriad of stakeholders with differing frames of understanding—are bison management, the reintroduction of the gray wolf, and winter use access to Yellowstone National Park.

Bison

Yellowstone National Park is home to last remaining, free-ranging population of bison in the lower 48 states, although the title of "free-ranging" is the source of much of the contention regarding the species throughout the region. In prehistoric times between three and five million bison ranged from the Pacific Ocean to the Appalachian Mountains (YNP 2010). The original population of bison in Yellowstone National Park consisted of mountain bison (*Bison bison athabascae*). Due to overharvesting, poachers had reduced the herd to two dozen animals; the original population was interbred with the plains bison (*Bison bison bison*) from Montana and Texas in the 1920s, and their offspring were

released into the park. Today the park is home to approximately 3,000 bison, in roughly their original home ranges. During the winter months, the herd migrates toward the Lamar, Pelican, and Mary Mountain subunits of the park, while in the summer they range to the Upper Lamar and Mirror Plateaus, and in the Hayden Valley (Meagher 1973). In 1907, the Buffalo Ranch was established in the Lamar Valley, east of Mammoth Hot Springs. The primary purpose of the ranch was to ensure the survival of the bison herd, although cattle were also raised at the ranch for consumption by park employees (Meagher and Meyer 1994). The park actively managed the herd through the Buffalo Ranch until 1969, when it adopted a "natural regulation" policy, whereby the bison population was allowed to fluctuate naturally based on ecological conditions (Bidwell 2010).

The bacterium *Brucella abortus*, the principal cause of brucellosis, was first discovered serologically in Yellowstone bison in 1917. Brucellosis is a reproductive disease that results in spontaneous abortions (i.e., miscarriage) in both cattle and bison populations. The disease is transmitted when herd members ingest the bacteria that are present on aborted materials such as tissue and contaminated forage (Meagher 1994). Once the disease is introduced into a herd, it spreads rapidly and may cause serious losses, including aborted fetuses, sterility, and decreased milk production for up to two years. While the symptoms may dissipate in a matter of a few years, infected cattle continue to have the possibility of spreading the disease to others (Ragan 2002). Although the disease is most prevalent in cattle and bison, it can also be transmitted to humans through the consumption of infected milk, resulting in 'undulant fever' (Bidwell 2010).

It has been suggested that brucellosis first entered the bison herd at YNP through one of two sources, cattle used for consumption at the Buffalo Ranch or elk from the National Elk Refuge in Wyoming, although it highly probably that elk acquired the disease directly from cattle (Meagher 1994). Disagreement over forage harvested in traditional elk wintering areas spurred the creation of the National Elk Refuge outside of Jackson, Wyoming, in 1912, with the disease first recognized in the elk herd in 1930. One the primary concerns today in relation to the National Elk Refuge stems from the high rate of brucellosis transmission among confined herds of elk, and the inability of

land managers to mitigate contact between elk that forage on the 23 sanctioned elk feeding grounds in Wyoming and cattle (Daniels and Hillman 2002).

The political, social, and economic conflict that surrounds the bison issue stems from the animals annual migration from the snow-covered uplands of the park into lower-elevation valleys during the spring months in search of forage (Bidwell 2010), and the potential for brucellosis transmission between cattle and bison. In response to the growing concern of the human health implications of the disease and the potential economic impacts on the cattle industry, the US Department of Agriculture (USDA) implemented an aggressive eradication program in 1934 (Bidwell 2010; Ragan 2002). Beginning in the 1960s, the park began to test, slaughter, and vaccinate small portions of the bison herd to curb the brucellosis disease. When this tactic failed, they instituted a policy whereby bison that wandered beyond the park boundaries were shot. By the 1970s, the Livestock Conservation Association, US Animal Health Association, the Wyoming Livestock and Sanitary Board, the Wyoming Stockgrowers Association, and the Montana Board of Livestock, all began to pressure to the National Park Service to reinstate their testing and vaccination plan to eradicate the disease. Soon after, the park stopped shooting bison that left the park on orders from the Department of the Interior, and instead left the issue to the State of Montana, where most of the bison migrated. In response, the state of Montana issued hunting licenses for bison that left the park, but this program was quickly discontinued due to protestors and the increasing attention the hunts were receiving in the local, regional, and national media (Nasr 2006).

The biggest concern to ranchers and cattle producers in the region is the Brucellosis Classification system developed by the Animal and Plant Health Inspection Service (APHIS). In order for a state to be classified as brucellosis free, which allows the state to ship cattle products nationally and internationally without quarantine, all cattle and bison herds in the state must have remained brucellosis free for at least 12 months. States where the infection rates are lower than 0.1 percent or where more than one herd of in the state is infected with brucellosis may qualify as Class A status that limits but does not ban interstate exportation of cattle, while those below 1 percent qualify as Class B. Class C states are those that have the highest rate of brucellosis (APHIS 2003). Cattle production is big business in Montana, Idaho, and Wyoming, and loss of brucellosis free

status can have detrimental impacts that reverberate throughout the regional economy. For example, in 1993, there were 5.5 million cattle in the tri-state area, valued at over $11 billion, with 1.1 million cattle at a value of $2.47 billion in the GYE (Hendry 2002).

In 1988, state animal health officials from Montana, Idaho, and Wyoming met to discuss the issue of brucellosis in Jackson, Wyoming. Six years later the Greater Yellowstone Interagency Brucellosis Committee (GYIBC) was formed, for the express purpose of eliminating brucellosis from elk and bison in the region. Little attention was given at the time to cattle, even though the GYIBC had determined that brucellosis was not a natural disease in bison because it had been introduced through cattle (Daniels and Hillman 2002).

Cattle in every state bordering Yellowstone National Park had become infected with brucellosis at some point by the early 1990s, although scientists were unable to declare that infection stemmed from bison. In response, the State of Montana sued the federal government over concerns that current brucellosis policies were crippling the ranching and livestock community in the state. Frustration stemmed from the fact that, while the NPS allowed infected bison to leave the park, the USDA punished ranchers through quarantines if their cattle herds became infected with the disease (Nasr 2006). In 1996, federal and state agencies agreed to form a binding bison management plan which required the NPS to capture bison leaving park boundaries, and for the Montana Department of Livestock to test bison for brucellosis and slaughter those that tested positive. That winter, one of the harshest in recent decades, over 1,100 bison were slaughtered when they left park boundaries (Bidwell 2010). The killing of a third of the park's bison population prompted a disgruntled Native American and a park visitor to form the Buffalo Field Campaign, with the goal of exposing the slaughter of bison to the nation and the world (Nasr 2006).

In 1997, the Brucellosis Emergency Action Plan was developed and implemented. It placed an emphasis on depopulating herds where brucellosis was recently introduced, and strict monitoring and management of infected herds (Ragan 2002). This plan was updated in 2000, through the Interagency Bison Management Plan (IBMP), a collaboration of the NPS, USFS, and State of Montana. The plan was designed to maintain a population of 2,300 free-roaming bison, while reducing the risk of brucellosis

transmission to cattle, thus maintaining Montana's brucellosis-free status. The plan authorized the hazing (herding) of bison that leave the park through any means necessary, including the use of snowmobiles, all-terrain vehicles, and helicopters, and capturing and slaughtering those that do not respond to hazing methods (Bidwell 2010).

It has been suggested that the IBMP may not be the cure-all that federal and state agencies seek, and several management alternative have been suggested (Thorne and Kreeger 2002), each of which has its own limitations and benefits. The first alternative is to do nothing, although this approach has the potential to expose the region's cattle to perpetual risk of brucellosis. The second alternative would be to remove and replace all elk and bison in the GYE, although with over 3,000 bison and an estimated 120,000 elk in the region, this alternative is clearly impractical. A variation of the second alternative would be to test all elk and bison and slaughter those that test positive, although this approach would again be expensive and currently no completely accurate testing method exists. Another alternative is to vaccinate all cattle in the region, although it is argued that this approach would only act as a buffer as the vaccination does not completely shield cattle from the disease. Further, at a cost of approximately $10 per animal, vaccination also may not be economically feasible across the region. Other alternatives include the elimination of elk feeding grounds, the treatment of elk and bison with antibiotics, and vaccination of elk and bison populations.

Nationwide, the brucellosis eradication program has cost taxpayers an estimated $3.5 billion since 1954 (Hendry 2002), with the IBMP costing taxpayers $2.5 million annual in the GYE (Kilpatrick et al. 2009). Many wonder how this cost can be justified, considering that 85 percent of respondents in West Yellowstone and Gardiner, Montana, the two communities most heavily impacted by the bison controversy, are in support of bison, and 70 percent agreed that the bison was the symbol of the American West and should be protected. In addition, over 50 percent of respondents agreed that wildlife, including bison, were the most important economic asset in Montana, and only 30 percent felt that cattle were likely to contract brucellosis from bison (Morris and McBeth 2003). Private property owners and federal representatives are beginning to rethink brucellosis management in the GYE. In 2003, Horse Butte, a peninsula on Hebgen Lake outside West Yellowstone that historically served as a cattle ranch, was sold to private

landowners who opened the property to bison as a winter feeding ground. In 2008, the representatives of the IBMP signed a $3.3 million, 30-year lease with the Church Universal and Triumphant north of Gardiner, providing a much needed bison corridor between YNP and the Gallatin National Forest (Flando 2011c). In April of 2011, the IBMP began the installation of fences and bison guards through Yankee Jim Canyon near Gardiner, to allow bison further safe passage to public lands, while protecting ranch owners from bison impacts (Flando 2011b). In addition, IBMP regulations that required the complete slaughter of any cattle herd infected with brucellosis have been eased, provided that only a small portion of the herd is infected (AP 2011).

The Reintroduction of the Gray Wolf

Federal and state bounty systems and widespread poisoning from the late 1800s until the early 1900s resulted in the near complete extirpation of the gray wolf (*Canis lupus irremotus*) from the continental US by 1925. Between 1914 and 1926, park rangers in Yellowstone National Park shot and killed the last remaining gray wolves in the park as part of its predator control campaign (Askins 1987). Beginning with Aldo Leopold in 1944, and other biologists in 1966, the idea of wolf reintroduction into their natural habitats became more prevalent (Bozeman Chronicle 2010). Acting on biologist recommendations, the Secretary of the Interior listed the Northern Rocky Mountain Gray Wolf on the recently created Endangered Species List in 1973. Two years later, the Northern Rocky Mountain Wolf Recovery Team, comprised of government agents, biologists, and livestock and conservation representatives, was appointed by the US Fish and Wildlife Service (USFWS) to oversee the reintroduction and conservation of the species. On August 3, 1987, the team proposed the Northern Rocky Mountain Wolf Recovery Plan (NRMWRP) that would reintroduce the gray wolf into YNP; it was quickly signed into law (Duffield et al. 2006).

The Wolf Recovery Environmental Impact Statement (EIS), a part of the NRMWRP, and the 170,000 public comments that it contained provide valuable insights into the competing interests of conservationists, livestock producers, and outfitter and guides. These insights and the conflicts they represent are still present in the GYE today. Conservationists argue that not only is the recovery of gray wolves mandated by its

inclusion on the endangered species list, but also that the species is essential to restoring ecological balance in the ecosystem. Livestock producers argue that wolves limit access to grazing leases on federal lands and are predators that threaten their livestock herds, and energy industry official argue that the species' presence on the endangered species list will limit current and future energy development in the region. Lastly, outfitters and guides argue that wolves will have long-term detrimental impacts on hunting. In an effort to address the concerns of ranchers, energy companies, and outfitters, the Wolf Recovery Plan established a specific management zone where the species could be managed through lethal means (Askins 1987). Two other concerns were raised during the EIS public comment period: 1) that the high cost of reintroduction would be place an unnecessary burden on taxpayers, and 2) that reintroduction would negatively impact local economies. However, it also was argued by many that reintroduction would increase visitation rates and have a positive economic impact on the region (Duffield et al. 2006).

In January 1995, 29 wolves from Alberta Canada were captured; 14 were transported to Yellowstone National Park, and 15 were transported to central Idaho. In Idaho, all 15 wolves were immediately released into the wild, while in YNP they were held in acclimatization pens until late March (Fritts et al. 2008). In the seven years following reintroduction of the species, they colonized nearly 9,000 square kilometers in and around YNP. By 2002, over 200 free-ranging gray wolves inhabited the GYE (14 packs/132 wolves in the park, and 14 packs/84 wolves outside the park) (Smith et al. 2003).

In the years since the reintroduction of the gray wolf into the GYE, many of the concerns raised by opponents to the recovery plan have gone unfounded. Hunters, outfitters, and wildlife agencies were concerned that reintroduction would result in decreased hunter opportunities and species richness, a hallmark of the Greater Yellowstone Ecosystem. Garrott et al. (2005) examined two separate wolf packs, one in the Madison River Headwaters Area in YNP, and a second pack in the Lower Madison River Area near Ennis, Montana. In the Madison headwaters area the authors found that high elk kill rates by wolves, combined with high wolf densities and modest elk densities resulted in 20 percent of resident elk being killed. In the Lower Madison area high elk

mortality rates, low wolf densities, and high elk densities resulted in only a four percent kill rate. The authors suggested that the effects of wolf predation on elk, the region's most important game species, differ considerably over relatively small spatial scales, and that land management goals, human-induced wolf mortality, and winter severity have a larger impact on elk population numbers than wolf predation rates. Between 1976 and 1994, prior to wolf reintroduction, hunters harvested on average 1,014 elk annually in the hunting districts nearest to Gardiner, Montana. Between 1995 and 2004, after reintroduction, hunter harvest rates averaged 1,372 elk, further indicating that wolves did not negatively impact hunting opportunities in the GYE (Duffield et al. 2006).

Before the reintroduction of the gray wolf to Yellowstone National Park and the GYE, carrion was plentiful in nearly all seasons with the exception of mild winters, when ungulates had easier access to forage and less restricted mobility. As average monthly snow depths have decreased over the past 50 years, the date of the last snowfall has arrived earlier in the season, and the number of days with a maximum temperature greater than 0°C, have increased, the amount of carrion available has correspondingly decreased. However, the reintroduction of the gray wolf has resulted in an increase of early and late winter carrion availability for scavengers, and thus has mitigated some of the potential impacts of global climate change in the region. Further, the historic impacts of pulsed and seasonal carrion resources have been shown to be less significant with the reintroduction of the wolf. These changes will have dramatic implications for species richness and abundance into the future; wolf reintroduction provides an example where human modification of the environment may prove positive for natural biodiversity maintenance (Wilmers and Getz 2005). In addition to scavenger populations, wolves have also proven beneficial to the preservation of biodiversity in riparian areas of the GYE, including woody plants and trees such as cottonwood (Ripple and Beschta 2003).

Visitation rates and the economic impacts of wolf reintroduction were of concern. Duffield et al. (2006) found that in 2005 over 300,000 visitors saw wolves in YNP and 44 percent of visitors listed wolves as one of the top species they would most like to see, second only to grizzly bears. Further, over 60 percent of visitors to YNP were in favor of wolf reintroduction to the ecosystem, while 15 percent were in opposition. They further estimated that wolf reintroduction contributes an additional $36 million to local

economies annually. Lastly, livestock producers and ranchers were concerned over the potential of wolf predation on livestock. Between 1997 and 2000, wolf predation on livestock (cattle and sheep) averaged $11,300 per year. In 2004 that number rose to $63,818, when wolves in the region numbered 300: predation on livestock was occurring, but not to the extent that operators initially feared (Duffield et al. 2006).

On April 15, 2011, the Obama Administration rescinded the Endangered Species Act protection of the gray wolf in eight states of the Northern Rockies and the Great Lakes region. This has opened the door for wildlife officials in Montana and Idaho to begin to provide public hunting opportunities as a wolf management tool (Brown 2011). In Idaho, no hunting quota will be established, although wolves will be managed to maintain 150 animals and at least 15 breeding pairs. In Montana, a statewide quota will be put in place that will ensure that only 220 out of the 556 wolves present in the state in 2011will be harvested (Flando 2011c; Miller 2011).

Snowmobiles and Winter Access to Yellowstone National Park

Carrying 12 passengers, and primarily used for ambulance and taxi services, the first snowmobile, or snow machine, was built in the 1920s (Kiasatpour and Whitfield 2008). It would take several decades and a World War to provide the needed technology to make the machine viable to the public, but the advent of the snowmobile would forever change the landscape, and some would argue the soundscape, of the Greater Yellowstone Ecosystem. Surges in summer visitation rates from 500,000 in 1940, to more than 1 million in 1948, spurred local business owners and politicians in Cody, Wyoming, to recognize that winter tourism in YNP would provide a year-round economy for the region. Their solution to building a year-round economy was for the NPS to keep the roads of YNP open throughout the year through plowing. The Bureau of Public Roads, today's Federal Highway Commission, in conjunction with YNP, conducted a study on the possibility of plowing YNP, and found that due to poor road standards throughout the park the solution was unfeasible (Yochim 1999).

Meanwhile, local residents, primarily in West Yellowstone, built the first snowplane composed of a two-person cab, metal skis, and an airplane propeller mounted to an engine in the rear. In 1949, 35 visitors were able to experience YNP on motorized

vehicles during the winter months for the first time via a snowplane. Six years later, Harold Young and Bill Nicols of West Yellowstone were granted permission to use their 10 passenger Bombardier Snowcoach in the park, ushering in full-blown winter access to YNP. Also in 1955, local politicians and business owners used the recently established Mission 66 program of the NPS to force YNP to revisit the plowing argument. The Mission 66 program was designed to better serve the needs of the ever-growing visitors to the national park system, and disperse visitation rates throughout the year. The NPS concluded that, unlike in 1948, the plowing of YNP was feasible, but not practical or economically justified. In 1963, the first modern snowmobile, the Polaris Snow Traveler, entered the park for the first time. A thousand passengers visited in this way through the winter. One final attempt to convince the NPS to plow the park occurred in 1964, when six senators representing the states along US Highway 20, forced the park to again revisit the issue. The NPS and YNP concluded that, with road improvements, it was now feasible and practical to keep the park open year-round through plowing, but that it would reduce visitor enjoyment by creating what they called "snow canyons" that reduced visitor visibility. Instead, they chose to allow over-snow vehicles access to the park, and full winter access to YNP was established (Yochim 1999).

As the popularity of winter access grew, visitation rates during the winter months increased to 5,000 visitors by 1967, 30,000 in 1973-1974, and nearly 150,000 by the mid-1990s (Yochim 1999). Yellowstone National Park and the NPS had one last opportunity to suppress the growing desire for winter access to the park in 1972, when President Richard Nixon signed Executive Order 11644 into law. Executive Order 11644 on the Use of Off-road Vehicles on Public Lands stated that "trails may one be located in units of the national park system when off-road vehicle use will not adversely affect their natural, aesthetic, or science values." Parks from across the country were directed to review snowmobile use in their units and determine whether the requirements of the executive order were breached. Nearly every park in the system found that snowmobile use violated the order, including Glacier NP in northern Montana, but Yellowstone and Grand Teton National Parks allowed snowmobile use to continue (Sacklin et al. 2000).

By the 1980s, increased winter visitation with snowmobiles began to raise concerns over air and noise pollution, the impacts of snowmobile use on wildlife, and the

overall degradation of visitor experiences in the park (Kiasatpour and Whitfield 2008). In 1992, these concerns resulted in a Visitor Use Management (VUM) plan to identify goals and desired futures in YNP, based on existing conditions. A particularly severe winter in 1996-1997 resulted in bison from the park following groomed snowmobile trails outside park boundaries, with a third of the herd being slaughtered in accordance with the Interagency Bison Management Plan. The Fund for Animals concluded that snowmobile trails provided the catalyst for the slaughter and subsequently filed a lawsuit against the NPS for violating the Endangered Species Act. The NPS settled out of court and agreed to develop an Environmental Impact Statement (EIS) to address all winter use access alternatives, including the implications of groomed trails on bison. In 1999 and 2000, the NPS submitted its final Record of Decision and EIS, calling for the gradual reduction in snowmobile use in the park and complete elimination by 2003-2004. In the place of snowmobiles, the NPS would only allow cleaner and more environmentally friendly snowcoaches to transport visitors through the park during the winter months. This resulted in a counter-suit against the NPS by the International Snowmobile Manufacturers Association (ISMA). The ISMA contended that the ban on snowmobiles neglected to fully account for the economic implications of the decision for local communities, and that it did not take into consideration the possibility that the industry could improve air and noise quality standards. The NPS again settled out of court and agreed to address both concerns through a supplemental EIS, and the snowmobiling ban was rescinded in March of 2003. The new EIS stipulated that "the NPS would add restrictions to snowmobile use, require snowmobile manufacturers to convert from two to four stroke engines to reduce emissions, and required snowmobilers and snow coach passengers to employ certified guides in the park". This prompted the Fund for Animals and the Greater Yellowstone Coalition to file suit against the Park. They contended that the 2003 EIS failed to recognize the growing body of scientific research against snowmobile use, and as a result violated the Administrative Procedures Act that prohibited decision making that was "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law." Based on the suit, Judge Emmet Sullivan ordered the NPS and YNP to reinstate the snowmobile ban on December 16, 2003. On February 10, 2004, US District Court Judge, Clarence Brimmer of Wyoming issued a temporary

restraining order to delay the Sullivan ruling when he concluded that the ban would bring undue hardship to the regional economy (Dustin and Schneider 2005).

Today, the winter season in YNP lasts from mid-December to mid-March, and the park is opened to wheeled vehicles in mid-April. Although the NPS plows the road from the north entrance to Cooke City, Montana, along Highway 191, and from Moran Junction to Flagg Ranch in Grand Teton National Park (Slackin 2000), the debate on winter access to the parks continues. Snowmobiling use of the park continues to this day, but is limited to 318 snowmobiles and 78 snowcoaches per day, although litigation has forced the NPS to again conduct an environmental impact assessment, with a new EIS to be released prior to the 2011-2012 winter season. As Dustin and Schneider (2005) concluded, the winter use controversy in Yellowstone and Grand Teton National Parks is a political, economic, and cultural debate that pits snowmobile users and local communities against environmentalists and scientists, and public lands managers against local district courts in Wyoming and Washington, DC. As has often been the case in the GYE, the fate of local communities like West Yellowstone, the self-proclaimed "Snowmobile Capital of the World" rests not in their own hands, but rather in the hands of extra-local politicians who do not have a permanent stake in the controversy.

Chapter Three Summary

The Greater Yellowstone Ecosystem covers over 20 million acres and is administered and managed by nearly 30 local, state, and federal agencies. It has been suggested that three land use drivers have been responsible for having the most detrimental impact on the resources of the GYE: the extraction of natural resources (e.g. timber, minerals, oil and natural gas etc.), agricultural enterprises (57 percent of private lands are in rangeland use, 20 percent in crop production, and seven percent in pasturelands), and residential development (the GYE has seen a 58 percent increase in population, and a 350 percent increase in exurban housing densities in rural areas since the 1970s). In addition there are highly contentious policy issues focused on the GYE, including wildland fire policy, the reintroduction of the gray wolf, bison management, geothermal protection, oil and gas leasing, and winter access to Yellowstone National Park. These issues reveal the complex interrelations between interest groups,

government agencies, and individuals, and the myriad stakeholders with diverse frames of understanding within the region. Specific consequences of these drivers include the reduction in the effective size of the ecosystem, the elimination of critical habitat, the modification of ecological flows, the direct disturbance of the ecosystem itself, and the expansion of human-adapted species. The GYE has proved to be an incredibly difficult region to manage comprehensively due to varying policies, procedures, goals, and beliefs of decision makers and stakeholders.

Chapter 4 - The Study Communities

Landscape Evolution in the Greater Yellowstone

Landscapes, both cultural and physical, evolve over time. This evolution is the result of local and extra-local forces, and the landscapes that are formed subsequently influence local and extra-local landscapes, as well. Western landscapes continue to evolve through economic, cultural and environmental processes. From the earliest known inhabitants in the region over 10,000 years ago, through the fur-trapping and prospecting eras, into the government and non-government expeditions, the subsequent Euro-American settlement of the region, and the contemporary landscape we see today, each era and its associated cultural and physical processes have left their marks on the region in profound ways. This is especially true for those portions of the American West that are currently transforming at the greatest rates, including the Rocky Mountain West. It is here that amenity-, recreation-, and tourism-driven migration is accelerating economic, cultural, and environmental processes the fastest. This acceleration is having detrimental impacts on the natural environment, the very attribute that has brought the large numbers of migrants west (Hansen et al. 2002). Researchers (see Shumway and Davis 1996; Shumway and Otterstrom 2001; Hansen et al. 2002; Travis 2007; and Robbins et al. 2009) have begun to refer to changes in economic, cultural, and environmental processes in the Rocky Mountain West since the 1970s collectively as the 'New West', indicating a shift away from traditional natural resource extraction-based industries and economies, and toward service, recreation, and tourism-based economies. A better understanding of the contemporary landscape and the beneficial or exploitive use of it, comes from understanding the sequence of events that have brought us to this point.

Early Inhabitants

Pre-Seventeenth Century

The earliest inhabitants of the lands adjacent to what is known today as the Greater Yellowstone Ecosystem left few visible clues of their presence on the landscape,

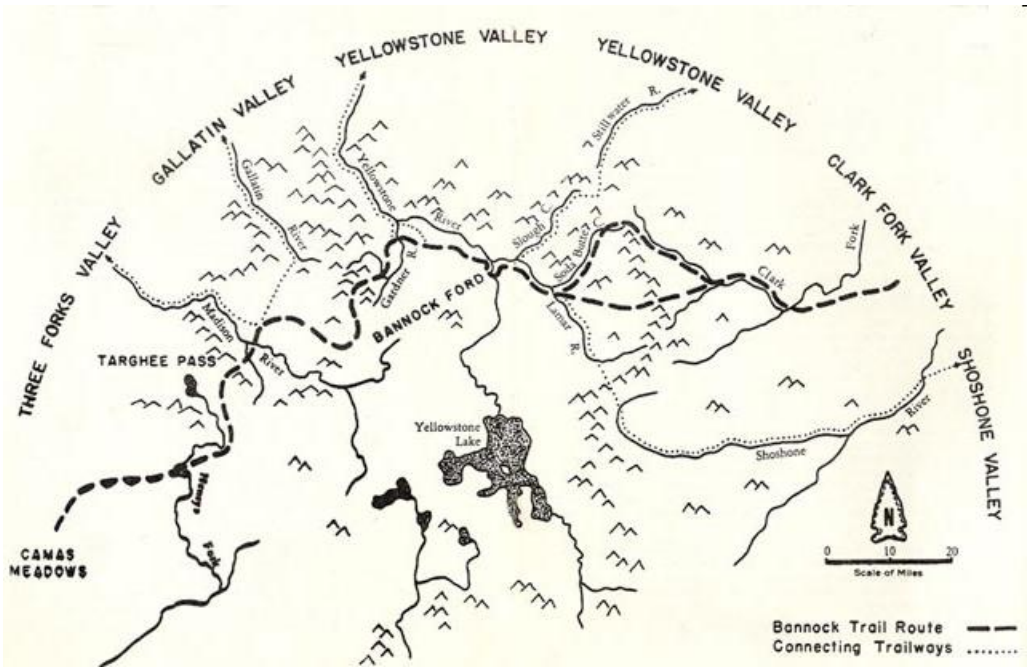
mostly evident through forest structure composition through fires and discarded arrowheads and other subsistence implements. Radiocarbon dating suggests that these nomadic inhabitants arrived nearly 10,000 years BP (Daughery 1999). This time frame corresponds with the retreat of the most recent glacial period, the Pinedale (15,000 to 12,000 years before present), and also suggests that the likely motivating factor for their arrival was the Ice Age or Pleistocene mammals (Haines 1996). Remnant artifacts also suggest that their existence was nomadic in nature, with late spring, summer, and early autumn months spent at higher elevations, and the cooler months of autumn and winter spent in the more moderate valleys (Wright 1984).

As climatic conditions shifted from the cool and moist anathermal conditions to those of warm and drier altithermal conditions, and eventually mediothermal climates much like our own, the flora and fauna that originally drew these hunters into the region shifted as well, increasing in both spatial distribution and diversity (Haines 1996). This shift in distribution and diversity had profound impacts on the native inhabitants of the region. Hunting and nomadic lifestyles eventually gave way to hunter-gatherer practices and a more sedentary way of life, focused more on the communal hunting of bison and other ungulates (Haines 1996). Foraging during this time consisted of the collecting of plants, roots and berries. The development of gathering and preparation techniques allowed for the harvesting and roasting of seeds, particularly in the area now known as Jackson Hole (Sanborn 1978).

As later migrants to the Yellowstone region would also discover, access was difficult through much of the year. Two nomadic traveling routes that did allow access to the region were the 'Corridor Route' (following the Snake River and progressing northward toward the southern border of today's park) and the 'Pacific Creek Route' (following the Yellowstone River south toward today's Yellowstone Lake and continuing southward toward Jackson Hole) (Wright 1984). These routes would eventually form the transportation network that later indigenous peoples, trappers, miners, and explorers used.

The most famous transportation network in the region was the Bannock Trail (Figure 4-1). By 1840, the majority of bison present in the valleys of the Mountain West from the Continental Divide to the Oregon coast were extirpated. Their removal, caused by the combination of traded technologies such as the rifle, the introduction of the horse

Figure 4-1 The Bannock Trail (Trail Tribes 2009)



(Schullery 1997), and extensive hunting, forced the Shoshone, Bannock, and other indigenous nations to travel to the buffalo that were present in the Wyoming and Yellowstone Basins to the east. The trail began at Camas Meadows in Idaho and wandered through the mountains, eventually terminating in the Clarks Fork Valley. In 1878, General Nelson A. Miles defeated the Bannock, as he had the Nez Perce the previous year, and the Bannock Trail was closed for good (Haines 1996). The bison of the Great Plains would soon be near extinction themselves.

Post Seventeenth Century

By the the seventeenth century, the Shoshone held lands that stretched from the Continental Divide east into present-day Wyoming. The Kiowa were present east of the region in the Wyoming Basin, with the Flatheads residing north of Yellowstone Lake, most likely in today's Paradise Valley, Montana. Finally, the Crow Nation held lands east of the Yellowstone River, and are the only Nation to continue to hold at least portions of their original lands today (Haines 1996; Daughery 1999). While these four tribes maintained somewhat permanent residence in the region, other tribes, such as the Bannock, Blackfoot, Gros Ventre, Nez Perce, Ute, and Kalispell, used the area on a

seasonal basis, particularly in for hunting bison and other mammals (Sanborn 1978; Lackett and Hobbs 2008).

Although the Lewis and Clark Expedition encountered "Mountain Shoshone" as early as 1805 in western Montana, the earliest known contact with native tribes in the Yellowstone region occurred in 1825 when fur trapper Osborne Russell encountered the Eastern Shoshone Nation. The Tukudika, or 'Sheep Eaters,' as this tribe is commonly known today, were descendants of the Shoshone who had migrated out of the Great Basin Region in the fifteenth century (Wright 1984) and "retained a specialized mountain culture" (Haines 1996). This group implemented wood structures as opposed to the traditional tipi. Constructed out of willow and aspen with skins stretched across for protection from the elements (wickiups) and hunted game with ramps and pens, herding the animals into a confined space for an easier target and using bows and arrows made from the horns of bighorn sheep (or elk), which are native to the region (Lewis 2008).

In addition to their close physical reliance on the mountainous landscape, they also held close cultural and spiritual ties as well. They believed in a strict hierarchical system to both the physical and spiritual worlds. The physical world consisted of Sky People, with Ground People and Water People below. The spiritual world, on the other hand, consisted of the sun at the pinnacle followed closely by lightning, and the rattlesnake at the bottom. The strongest of all spirits were located in mountain environments, particularly those of the Yellowstone region, including the Absaroka and Wind River Mountain Ranges (Lewis 2008). This close attachment, both physically and spiritually, to the mountains, was even manifested in the names given to particular mountains or mountain ranges. The reference to Grand Teton as "Elder Brother" signifies not only the close relationship to the peak in physical terms, but also references a spiritual connection: it was the location where young tribesmen traveled for guidance through vision quests (Wright 1984).

The Fur Trade

Today's legacy of the mountain men and fur trappers is as complex as it is ironic. Some in the east venerated their wild and carefree life, romanticizing individuals living off the land and forming one of the many great myths that have informed our contemporary perceptions of the West To be certain, they were free and they did indeed

live off the land, but theirs was a hard life, spending years at a time in an often hostile environment, both through the presence of American Indians and an unrelenting landscape filled with mental and physical extremes. As Schullery (1997) suggested, for most it was not the freedom that drove mountain men into the Rocky Mountains, but rather the chance for economic exploitation. The early Euro-American and European 'mountain men' also provided detailed descriptions and maps for the explorers and expeditions that would follow. It is ironic that, because they had such a detailed working knowledge of the region, they provided a stepping-stone that would unlock the region to scores of others who would domesticate and modify the landscape forever.

In 1806, while at the Mandan Village on the Missouri River, John Colter, a Virginian, was given permission to leave the Lewis and Clark Expedition (on its return from the Pacific) to travel west in search of beaver and other game animals. At that time, Colter joined two trappers, Forrest Hannock, and Joseph Dixon, and went about finding the source of the Missouri River, where it was believed a large number of beaver existed. This partnership quickly failed and Colter found himself heading east once again. In 1807, he arrived at Fort Manuel, a fur trading post at the confluence of the Bighorn and Yellowstone Rivers in modern day Montana (Daughery 1999). Manuel Lisa, proprietor of the post, had been searching for able men to travel throughout the region informing tribes of the trading opportunities the fort could offer. An exceptional woodsman, Colter left the fort in the winter of 1807, and by spring of 1808, had traveled over 500 miles in a region that up that point had never been explored by Europeans (Haines 1996). Colter finally left the wilderness of the Rocky Mountains in 1810, after evading Blackfoot Indians in what is today's Gallatin Valley of southwestern Montana. He arrived in St. Louis and met with William Clark, who was composing a map of the expedition to the Pacific Ocean. Colter informed Clark of the wonders that lay just south of their own eastbound trek in 1806, and Clark subsequently added Colter's route through the Rockies on his famous map of 1812 (Gray 1934). The simple act of adding Colter's route and descriptions of his travels to this map and report, which was viewed by eastern aristocrats and politicians, set about a pattern of travel and exploration which changed the perceptions of the American public of the West.

The first known chronicler of the Yellowstone area was Daniel Potts, who first visited Yellowstone Lake in 1826. Osborne Russell, who was the first to contact the Tukudika, also provided one of the best sources of detailed descriptions of the region outside the Geyser Basins. Russell traveled extensively throughout the region starting in 1834 (Schullery 1997). Other notable fur-trading operations in the region were the Rocky Mountain Fur Company, and the American Fur Company. The American Fur Company was operated by General William Ashley and Major Andrew Henry at the mouth of the Yellowstone River, and was later sold to long-time trappers Jedediah Smith, William Sublette, and David Jackson (Haines 1996), for whom William Sublette named Jackson's Hole in 1929 (Gray 1934).

The northern reaches of the region were trapped extensively beginning in 1808, but it was not until the 1820s that the southern parts, including Jackson's Hole, were explored and trapped, primarily through the Rocky Mountain Fur Company and its notable trappers: Kit Carson, Jim Bridger, Old Bill Williams, and Joe Meek (Sanborn 1978). Of particular note was Jim Bridger, who would eventually become synonymous with fur trapping in the West. Bridger's fame came from not only his "tall-tales" of mountain living and the region in general, but more importantly his ability to disseminate detailed knowledge of the region through word of mouth storytelling and mapping. His maps would subsequently provide the basis for the region's earliest explorations by government expeditions. Captain W.F. Raynolds, Lieutenant J.W. Gunnison, and Father Pierre Jean De Smet, a Jesuit priest, would all find Bridger's maps and knowledge of the region indispensable for their own travels (Haines 1996).

The 1830s saw the region's fist tourist. Warren Angus Ferris, a clerk for the American Fur Company, spurred by rumors of natural curiosities in the Yellowstone area, traveled there in 1832 for pleasure rather than economic gain (Haines 1996), and in the process ushered in a new form of exploitation of the landscape that continues to this day. By the late 1830s the beaver population, its most prized game, was brought to near extirpation through overexploitation and, coupled with changes in eastern and European markets for fur, signaled the end of the fur-trade era throughout the West (Lackett and Hobbs 2008). The Grand, Middle, and South Tetons bear some of the earliest regional Euro-American names, dating to 1819; the French trappers who named them knew them

as ‘Les Trois Tetons’ or ‘the Three Breasts’ (Samuel 1986). The knowledge of the fur-trappers in written, cartographic, and oral form would form the basis for the next explorations of the region, those of prospectors and government expeditions.

The Prospectors

Between the termination of the fur-trading era in the 1840s and the region’s first gold strike in 1862, very little is recorded, and thus known, about the region. It should be noted, however, that the reason for the lack of travelers and information from this era is largely the result of the inaccessibility of the region. At that time, it was only accessible via three routes: from the west by Mullan Road (which was noted as being nothing more than a packhorse trail), from the east by steamboats up the Missouri River from St. Louis, and from the south via a spur of the Oregon Trail. Haines (1996) has suggested that the prospectors who mined the region after 1860 found very little in the way of wealth, but their knowledge of the region and their descriptions of its splendor were passed on to other miners, building on the accounts of earlier fur trappers and bringing the region further into the nation’s consciousness.

To the north of the GYE, the discovery of gold in the Deer Lodge Valley at Grasshopper Creek, Montana, would again bring new Euro-Americans to the region. Because of the mining booms at Bannock and Virginia City, on May 28, 1864, President Abraham Lincoln signed legislation creating the Territory of Montana. In the winter of that year, the first legislative assembly of the newly created territory convened and awareness of the damage caused by mining camps on the region’s environment, particularly its wildlife, became apparent. Mr. Ebenezer D. Leavitt of Beaverhead County gave notice that he intended to introduce a bill pertaining to the preservation of fish and game. Although this bill never materialized, a bill concerning trout, which were easily exploited by miners, did. The bill submitted by James Stuart of Beaverhead County passed and became a law, designating that the only lawful manner in which to catch trout was via rod or pole, line and hook, and outright prohibited the common practice of harvesting fish through seines, nets, drugs, and the construction of dams (Council Journal 1866).

In Virginia City, to the west of today’s Yellowstone National Park, bison, deer, elk, and wolves were being consumed at tremendous rates. This consumption, while

providing subsistence food, clothing, and shelter for the region's prospectors, was quickly recognized as being detrimental to the individual wildlife populations and the environment as a whole. Perceptions began to change, and with those changes came laws (Books 2000). Newly created laws included the prohibition of fishing with explosives in 1876, the dumping of sawdust and mill waste into streams and rivers in 1881, the collection of bird eggs in 1883, and the prohibition on hunting elk and deer in Montana Territory in 1893 (Alderhold 2005). As news of the demise of the bison on the Great Plains was retold across the country, a new consciousness was building, one that realized that wildlife are not inexhaustible resources. It would take several years, if not decades, for this consciousness to manifest itself in real action through the enforcement of laws in the region, but the initial groundwork had been laid.

The Expedition Years

Although initial descriptions of the Yellowstone region were met with skepticism nearly universally, the introduction of government-sanctioned and private expeditions into the region would begin to change such perceptions. As expedition reports found their way to politicians in Washington, DC, and eventually to the general public through newspapers and magazines, they were met with a heightened interest about the region and its natural wonders. Expeditions were fundamentally different and set apart from early fur trapping and prospecting in the region, as they were not focused on commercial or economic gain – at least initially – but rather on curiosity and scientific endeavors.

A string of unsuccessful expeditions begun in the early 1800s continued in 1856, when Captain William F. Raynolds and geologist Ferdinand V. Hayden were sent to map the Yellowstone River. Unable to reach the headwaters due to poor weather in the mountains, the expedition moved south through Jackson's Hole and over the Teton Pass. Eventually the expedition found their way to the Three Forks of the Missouri, but in the process they had circumnavigated the Yellowstone region entirely (Haines 1996).

In 1865 Father Francis Xavier Kuppens, a Jesuit priest from the St. Peter's Mission on the Sun River in Montana Territory, was led to the Grand Canyon of the Yellowstone and the Firehole Basin by members of the Piegan tribe. Two years later, Kuppens regaled the territorial governor with tales from his journey and the wheels were set in motion for a full-fledged expedition led by the Governor. Although the Governor

was killed shortly before the scheduled departure, two members of the Montana Territorial Volunteers, Captain Charley Curtiss and Surgeon James Dunlevy, insisted on pushing forward, and eventually made it as far as Mammoth Hot Springs. Their reports and the subsequent newspaper articles that followed were enough to convince David E. Folsom, Charles W. Cook, and William Peterson, local gold miners from Montana, to make the journey in 1869. Their expedition was a success, and although initial attempts to publish their reports in major newspapers and magazines in the east failed, eventually the Western Monthly Magazine of Chicago picked up the story (Haines 1996).

For the first time details of the region emerged to the public at large, and based on the descriptions several subsequent expeditions occurred. The Washburn-Langford-Doane expedition of 1870 departed from Fort Ellis, near present day Bozeman, on August 22. Nathaniel P. Langford's interest in undertaking the expedition stemmed from his involvement in Jay Cooke and Company of St. Paul, Minnesota, which was a subsidiary of the Northern Pacific Railroad. By this time, the railroad was interested in boosting promotion for its Northern Line, and its managers felt that detailed knowledge of the area and the subsequent dissemination of that information would bring new customers and investment in the line. Following the completion of the expedition, Langford began a lecture tour across the country. Present at one of these lectures was Ferdinand V. Hayden, with the US Geological Survey. He was so impressed with Langford's presentation that he approached Congress for appropriations to fund an official expedition. Congress quickly passed the Sundry Civil Act of March 3, 1871, that afforded Hayden $40,000 for the exploration of the sources of the Missouri and Yellowstone Rivers (Haines 1996).

Prior to the Hayden expedition, all information regarding the region was in either text or cartographic form, with very few exceptions (e.g., Moore's sketches of physical features produced during the Washburn Expedition). This would change as both Thomas Moran, artist, and William Henry Jackson, photographer, were included as members of the expedition. The trip yielded detailed geological, botanical, and zoological descriptions and specimens, as well as many sketches, paintings, and photographs. Immediately upon Hayden's return, he was presented with a letter from A.B. Nettleton of Jay Cooke and Company, who suggested the creation of a national preserve in the region.

By March of the following year, President Ulysses S. Grant signed the Act of Dedication creating Yellowstone National Park (Haines 1996).

The Hayden Expedition of 1872 and the considerable influence of the Northern Pacific Railroad were driving forces behind the actual creation of the park, but those who came before them paved the way. Their vivid descriptions and cartographic representations were more than adequate to ensure a legacy of preservation and conservation that still exists today (Haines 1996).

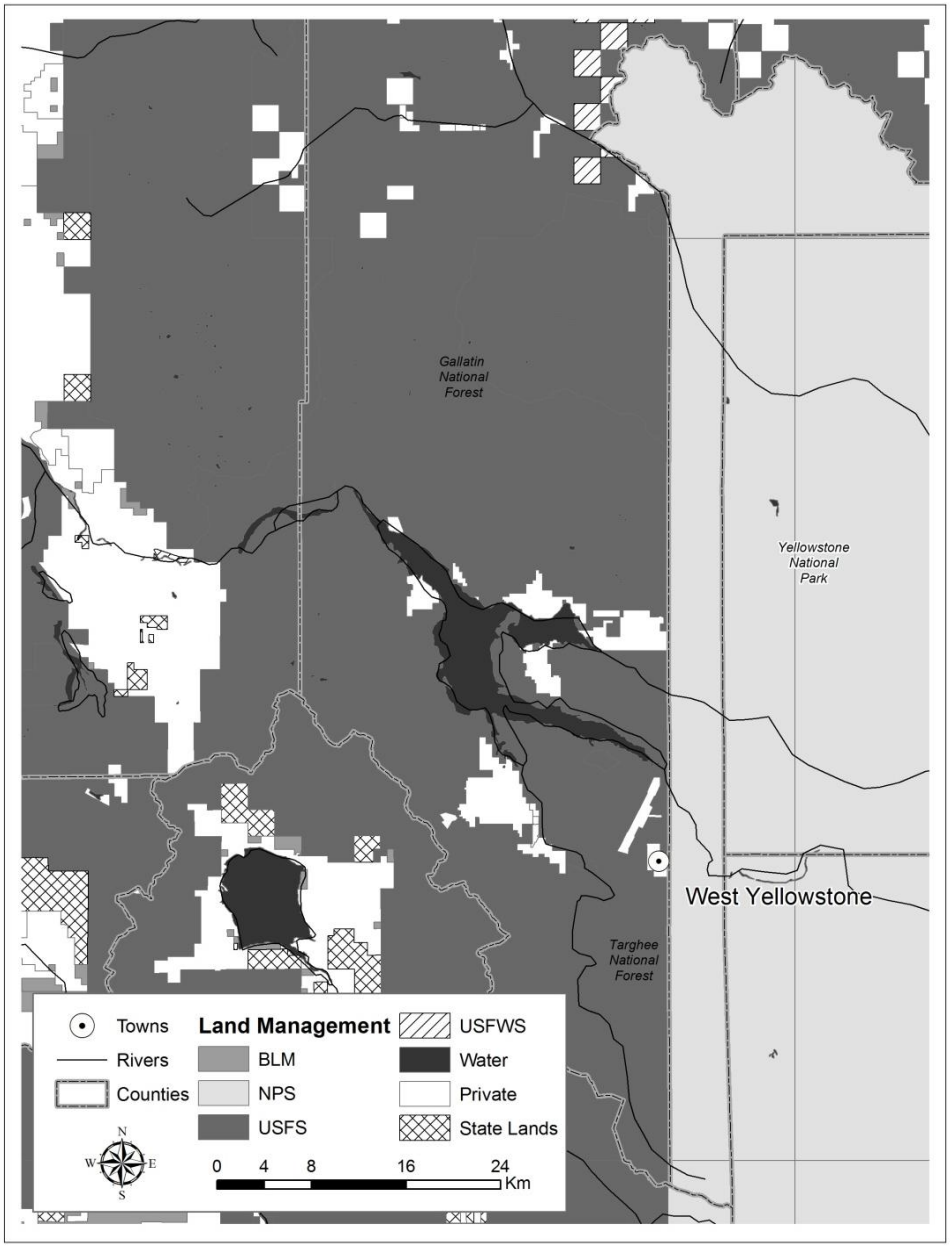
Though the Greater Yellowstone Ecosystem consists of over 20 million acres, each mountain range and valley is unique in its history. These histories have shaped the land in varying ways and degrees since human settlement first began. The Homestead Act of 1862 brought Americans westward in increasing numbers. They settled first in the rich agricultural lands of the Midwest, and when those lands became overcrowded, they moved further westward. Eventually they found their way to the valleys of the Northern Rocky Mountains. Numerous reasons exist for why these picturesque valleys were not settled earlier in the Homesteading era, however. Even those who wanted to settle these lands faced the same challenges that have always plagued the region including, isolation, climate, and topography. To better understand and appreciate modern perceptions, priorities, and goals of study communities, it is important to explore how the communities of Jackson, West Yellowstone, and Red Lodge evolved into the amenity-driven, tourist gateways they are today.

West Yellowstone, Montana

In 1871, a group of six men from Deer Lodge, Montana, entered what would become Yellowstone National Park. From Deer Lodge they traveled by horse to the bustling mining community of Virginia City, then through Raynolds Pass to Henry's Lake in Idaho, and finally along the Madison River to what became the park's western boundary (Waite 2006). They did not know it at the time, but their route would be followed by scores of tourists in the decades and centuries to come. By 1880, a network of roads and stage lines was well established throughout the region (Shea 2000), including the Sawtell Free Road from Virginia City to the Lower Geyser Basin. The Bassett Brothers Stage Line and the Gilmore and Salisbury Stage Line connected eastern

Idaho and Mammoth Hot Spring, providing a vital link that brought mail and supplies into the newly established park. The Marshall and Goff Stage Line established a formal tourist market when it built a new line in 1897 to the location that became West Yellowstone (Figure 4-2) (Waite 2006).

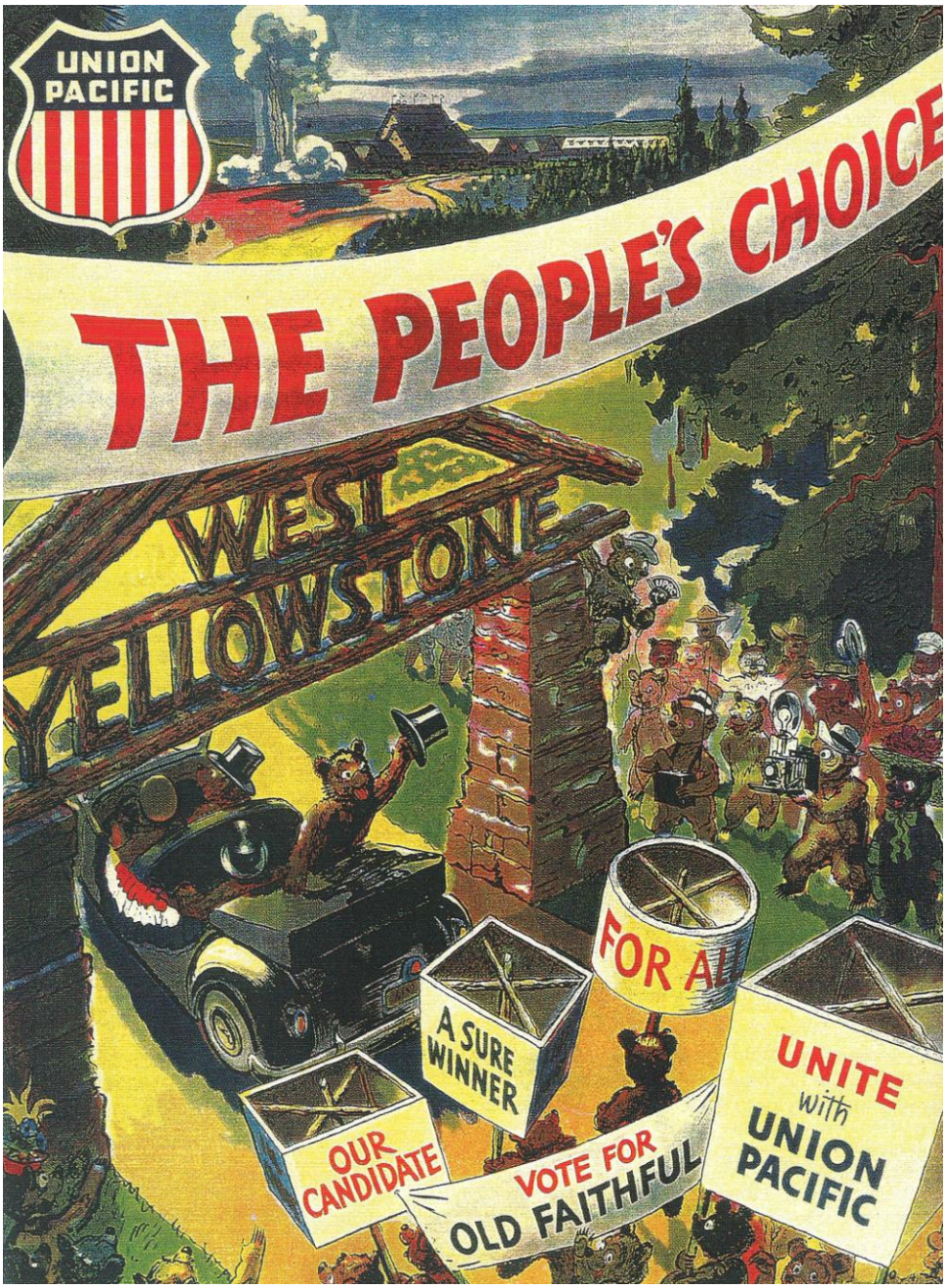
Figure 4-2 West Yellowstone, Montana (data source: BSI 2011)



Early stagecoach lines were replaced in 1898 by railroads when the Union Pacific Railroad laid tracks to Monida, Montana, 72 miles from the western boundary of the park. While tourists of the day could take the rail from the East to Salt Lake City, the trip did not truly begin until they arrived in Monida. From the small outpost, tourists took the Monida/Yellowstone Stage Line, including its four horse changes, to the first commercial establishment in the region, Dwelle's Grayling Inn, eight miles from present day West Yellowstone. Through 1906, the Inn would host as many as 125 tourists per night during the summer months. Hoping to capture the increasing tourist market, the Union Pacific made plans to extend its line from Ashton, Idaho, to the western boundary of the park in 1905; the first passenger train arrived on "Train Day," June 11, 1908 (Shea 2009). Union Pacific began to promote the West Entrance as the most popular entrance to the park (Figure 4-3). In 1908, the Union Pacific brought 7,172 visitors to the West Entrance, and by 1915, that number would grow to over 32,000. To accommodate the growing tourist demand for services, and because of the community's isolation from even facilities in the park, the railroad built extensive facilities including a depot, baggage building, an employee dormitory, and dining facilities (Waite 2006).

The community that rose around the railroad facilities had humble beginnings. Surrounded by National Forest and National Park lands, initial settlers were required to negotiate leases with the Forest Service, with three families acquiring land leases on the north side of the tracks soon after the line was completed (Shea 2009). Tourist enterprises soon sprung up, including the construction of tenting facilities by the Wylie Permanent Camping Company and the Monida and Yellowstone Stage Company (Waite 2006). Hotels and businesses soon followed, and by 1913, the 13 leaseholders of the initial town site had erected 50 buildings, including the Yellowstone Hotel. In 1920, President Woodrow Wilson signed legislation removing the town site from Forest Service control, with existing leaseholders purchasing their properties and the remaining sites sold at auction. The town site needed a name and considering its proximity to the Madison River and because the Riverside Ranger Station (USFS) was located on the site, the name Riverside was chosen. Over the coming years, the name would change from Riverside, to Yellowstone (November 17, 1909), and eventually West Yellowstone

Figure 4-3 Early Promotional Material for Union Pacific and West Yellowstone (Waite 2006)



(January 07, 1920), but the town site, albeit small, would firmly establish itself as the primary gateway to Yellowstone National Park (Shea 2009).

While tourists were flocking to West Yellowstone during the summer months, the harsh winter weather (West Yellowstone averages 143 inches of snow annually) and the

community's isolation proved to be an obstacle to a year-round economy, a condition that remains to this day. The introduction of the automobile in 1916 and the first auto camp 14 miles inside the park at Madison Junction was believed by many to be the solution to the community's economic woes. However, the harsh winter climate would prove to be too much even for the automobile. Touring buses, including the 250-bus fleet of the Yellowstone Company provided an additional mode of transportation for travelers, as did the construction of an airport. Air service provided by National Park Airways, a subsidiary of Western Airlines, began in 1925, but low passenger numbers and the difficulty of landing the larger planes that were coming into service at the time forced the closure of the airport until 1963, when a new larger air facility was built on the north end of town (Shea 2009). Train service to West Yellowstone ended on August 28, 1959, when a magnitude 7.5 earthquake struck the region, killing 28 and damaging the tracks near Hebgen Lake (Waite 2006). Although snowplanes were first used in 1948 to transport tourists into the park during the winter months, it would not be until the 1960s that personal snowmobiles and snowcoaches were allowed in YNP. Their introduction ushered in a new lifeline for a year-round economy for the community, and a controversy that exists to this day.

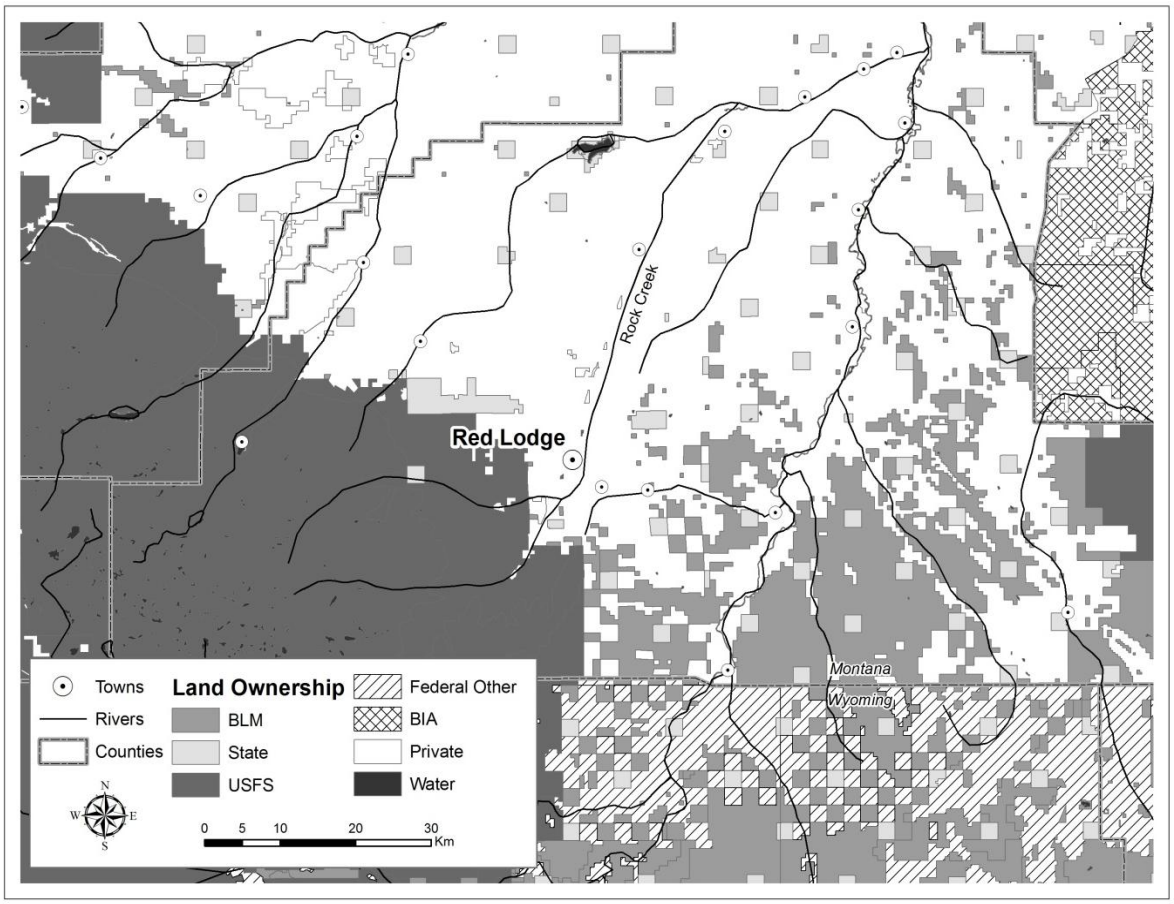
With the exception of on-going debate surrounding winter access to Yellowstone National Park, the community of West Yellowstone remains much the same as it did when train service ended in 1959. Tourism infrastructure has increased in recent decades, including the remodeled West Yellowstone Chamber of Commerce that serves as an information center for the region, the Grizzly Discovery Center where visitors can experience grizzly bears and wolves in a controlled environment, the IMAX Theater, and the Yellowstone Historical Center. Tourist services have also improved, including the remodeling of the Three Bears Lodge that saw extensive damage from fire in ____, new restaurants, and a multi-level, time-share facility on the south end of town. However, tourists will still find trusted sources for fly-fishing gear, cheap tacos out of refurbished school busses, and the rustic, some call it kitschy, character that complements West Yellowstone's status as the most popular entrance to Yellowstone National Park. In 2009, the park hosted 3.3 million visitors, with nearly a third (755,519) of those visitors entering the park through the west gate.

Red Lodge, Montana

Red Lodge (Figure 4-4) is geographically constrained by the Yellowstone River to the north, the Pryor Mountains and Big Horn River to the east, and the Beartooth and Absaroka Mountain Ranges to the south and west. The first European to traverse this challenging terrain was Cabezo De Vaca, who in 1535 crossed the region en route to the Sun River and eventually Saskatchewan. He was followed approximately 200 years later by M. De la Verandrye, who arrived at Pryor Creek in 1743. While today the region is known for its rich coal deposits, the original catalyst for early exploration and settlement was beaver pelts. The fur trade flourished until the early 1840s, with a peak correlating with the construction of Manuel Lisa's fort (Fort Lisa) in 1811, near present-day Bismarck, North Dakota (Gaurino 2000). Although early trappers impacted the environment considerably through their exploitation of beaver, they also built lasting relationships with American Indian tribes in the region, most notably the Crow. The relationship between trappers and the Crow was best expressed when the former joined the latter in a battle between the Crow and Blackfeet in the Gallatin Valley. It was also expressed in the name of the community itself. Local lore suggests that the name of the community was based on the story of a Crow festival that occurred near the town site where spoiled meat resulted in the area becoming known as Bad Lodge. An opposing story suggests that Red Lodge was given its name when the first European settlers arrived and were astounded by the number of brightly painted lodges of the Crow.

While relations between early trappers and the Crow may have begun cordially enough, this would quickly change once the prospector James "Yankee Jim" George arrived searching for gold (Waite 2006). Instead of gold, what Yankee Jim found in 1866 was a 14 foot seam of semi-bituminous coal on the gradual slopes that made extraction inexpensive and easy (Lampi 1961). Coal deposits were also found in nearby Washoe, Bear Creek, and Joliet, and spurred additional prospectors to settle the region.

Figure 4-4 Red Lodge, Montana (data source: BSI 2011)



The Rocky Fork Coal Company was soon founded with the backing of the Northern Pacific Railroad, and with the goal of persuading the federal government to remove the Crow Tribe from its lands so that the rich ore could be mined (Waite 2006). This occurred in 1875, when the Crow were removed from Mission Creek, and transplanted 18 miles up the Stillwater River (Zupan and Owens 1979), and in 1882, when the Crow ceded control of 1.5 million acres of their reservation on the Stillwater to the federal government. The removal of lands from the Crow Reservation resulted in the immediate settlement of the region, and by 1891, 400 miners arrived in Red Lodge to work the coal seams (Waite 2006). However, the community rose so rapidly due to increasing demand for coal for use in smelters in Butte and Anaconda, Montana, that little oversight was given to the town's construction or planning, resulting in a haphazard array of homes, businesses, and roads (Wiltsie 1998).

The vast grasslands surrounding the mines were quickly settled with cattle ranchers, and the once densely forested benches on either side of Rock Creek were quickly cleared of timber for use in the mines and the community that was taking shape (Wiltsie 1998). The proliferation of cattle and sheep operations around Red Lodge resulted in the community gaining the nickname of "Gem of the Mountains" (Lampi 1961), but such operations and continuing mining were having an impact on the environment. In 1886, the area between Rock Creek, the Stillwater River, and the Beartooth Plateau held nearly 1 million cattle and at least 25,000 sheep (Zupan and Owens 1979). With the opening of the Rocky Fork Branch of the Northern Pacific Railroad, the town continued to grow, with over 1100 residents by the spring of 1892, when the town was officially incorporated. The Rocky Fork Branch provided local cattle and sheep ranchers with the opportunity to easily ship their product to market, with nearly 400 carloads of cattle (8,000 head), and 8,400 head of sheep shipped in 1893. Today the heavy influence of the Northern Pacific Railroad can still be seen in town: most of the streets were named after company officials and influential businessmen of Montana (Waite 2006). The combination of fertile agricultural lands, rich coal deposits, and a growing population resulted in a rapid and "dramatic acceleration in land use and landscape change" (Wiltsie 1998). Recognizing the tremendous impact that miners and settlers were having on the natural environment, President Theodore Roosevelt protected the region from further exploitation by establishing the Absarokee Forest Reserve in 1902 (Guarino 2000).

By 1910, nearly three-quarters of the town's population were immigrants themselves, or children of immigrants, and combined with the local cowboy culture resulted in a unique cultural character rich in tradition (Lampi 1961). As immigrants had done in the eastern United States, they formed close-knit groups and neighborhoods in Red Lodge. Neighborhoods such as Little Italy, Finn-Town, and the Slavic End soon were built. Because the community was hemmed in by mountains, ethnic groups began to purchase picnic and festival properties a few miles from town including "The Happy Brothers Picnic Ground," a place where those from Yugoslavia could continue their old country traditions. By the 1920s, nearly every ethnic group had a corresponding festival, and when the Finnish and Italian community bands joined to form the "City Band,"

tensions between groups began to dissipate. Relations improved further when Doctor Seigfriedt, known locally as the father of tourism in Red Lodge, opened his Piney Dell Lodge and encouraged ethnic groups to use the facility as a cultural center (Zupan and Owens 1979). This was furthered during the depression era when groups were forced to interact through programs such as the Works Progress Administration and the Civilian Conservation Corps.

To capitalize on what locals felt was an opportunity for economic diversification, various ethnic groups joined together to establish the "Festival of Nations" in 1951. On the third week in August 1951, groups of Finnish, Scandinavian, Slovenian, Scotch, Irish, German, Dutch, and Italians each performed a one-hour nationality program during nine consecutive nights to capacity crowds. When the festival was complete, an unofficial registration book that only a small fraction of attendees signed indicated that tourists from 33 states, 39 Montana counties, and Canada were represented. Although the Festival of Nations continues to this day, tourists during all seasons have the opportunity to appreciate the rich cultural diversity present in the community through the installation of 32 national flags that adorn light posts across town (Zupan and Owens 1979). In addition to the Festival of Nations, the Red Lodge "Home of the Champions" rodeo occurs each Independence Day weekend at the local fair grounds. Having begun in 1953, the event now hosts professional rodeo stars from across the globe to capacity of crowds of over 7,000 each afternoon, and suggests the continued close ties the community has with agriculture and ranching (Zupan and Owens 1979).

Coal mining in south-central Montana declined after World War II, as homes and businesses switched to cheaper gas and electrical sources (Axline 2004). In 1924, mining operations were halted on the West Bench in favor of mines that could produce the resource more cheaply. This resulted in an immediate decline in the town's population and economy. In 1910, the population of the community was 4,860; by 1930, it had declined to about 3,000. With declining economies as a result of decreased mine production, the community began to explore economic alternatives, including tourism. Spurred by demand for dude ranches in western Montana, the town began to market itself as "the west," with four dude ranches opening near Red Lodge by 1930 (Waite 2006). That year coal-mining operations expanded across the Beartooth Mountains to Cooke

City, Montana, at the edge of Yellowstone National Park. To connect the mining areas and provide local merchants with a connection to the lucrative tourism industry in the National Park, the Beartooth Highway (Highway 212) was constructed via the Park Approach Act in 1936 (Gaurino 2000; Bratton 1928). Tourists could now take a sleeper car from Chicago to Billings, the Rock Fork Branch to Red Lodge, and then a bus over the Beartooth Plateau to Yellowstone. Promotional material of the era from the Northern Pacific railroad suggested the importance of the road to attracting new tourists, "Red Lodge HIGH Road, loftiest of all Yellowstone Park approaches, is the newest attraction for the Yellowstone Tour. Opening to railroad travelers with the 1937 season, it has added to Yellowstone wonders the grandeur of 'sky-line' alpine panoramas." In its first year of operation, the Beartooth Highway carried over 7,000 tourists between the city of Red Lodge and YNP; however, because of its high elevation (3351m), the road could only be open during the summer months (Waite 2006).

Mining in the Red Lodge area ended in 1953 when the Montana Coal and Iron Company, following the deaths of 74 workers a decade earlier, closed the Smith Mine. On February 27, 1943, 77 miners started their shift at the Smith Mine a few miles from Red Lodge, with 74 killed due to concussion and gas poisoning from a gas explosion. While the specific details of the disaster are still widely unknown, it was suggested that the incident could have been prevented, as the company did not heed the state mine inspector's assessment that the mine had "serious deviations from safety standards" (Zupan and Owens 1979). Hoping again to extend the local economy beyond the summer season, local business owners began to toil with the idea of opening a ski resort, and by 1965, five separate facilities had been built, although most were quickly closed due to climatic conditions and natural disasters. The first such operation was the Willow Creek Ski Area, which opened in 1941, three miles from town on National Forest Land, was later renamed Grizzly Peak Ski Run, and eventually Red Lodge Mountain Resort (the only remaining ski resort). In 1948, the Shangri-La Ski Area, 15 miles from town, was destroyed by a forest fire, and the Sundance Winter Sports Area on Mount Maurice was closed in 1965 due to scouring winds that passed down Rock Creek Canyon and left the mountain virtually devoid of snow during the winter months (Zupan and Owens 1979).

While agriculture remained a dominant force in the local economy during the 1960s, and wheat production and the canning of peas and beans increased, this would change with the closing of the community's canning facility in 1975. Continued declines in population, an increase in drug use, the closure of the Northern Pacific rail line, and a large riot at the 'Home of the Champions' rodeo, had locals concerned over the fate of their town. By the end of the 1970s, tourism and expanded services at the local ski resort, Red Lodge Mountain, brought the first wave of amenity migrants to the area. Property values skyrocketed as agricultural lands adjacent to the Beartooth Plateau were converted to subdivisions, with a significant number of homes being vacation or second homes (Guarino 2000). The Arab Oil Crisis in 1973 that brought renewed interest in the regions oil and gas reserves, combined with rising tourism visitation rates, increasing property values, and strong commodity prices resulted in the community growing to over 8,000 residents during the 1980s. However, flooding on the Clarks Fork River, a winter that saw record snowfall, two years of drought, and a devastating grasshopper infestation resulted in a decline in new home construction in all areas of the county except near Red Lodge by the end of the decade. The 1990s saw modest population growth, and although the economy was starting to improve due primarily to strong agricultural markets, rising home values and the local real estate market had reached a level that was prohibitive for local residents. While the community attempted to benefit from a growing tourism industry by initiating a three percent sales tax on consumer goods that added over $1 million to local coffers in 1995, most local merchants saw a dramatic decline in goods sold to local residents as a result. Instead, county residents were traveling to Billings to purchase the majority of their goods (Zupan and Owens 1979).

In 2000, tourist-related revenues in the community had reached over $20 million annually, although the constant influx of amenity and second home migrants has left many long-term residents expressing concern over a lack of community cohesion. In addition, parts of the county were increasingly becoming bedroom communities to Billings, further alienating local residents (Zupan and Owens 1979). In 2007, JMA Ventures, a San Francisco-based real estate investment firm, purchased Red Lodge Mountain Resort for an undisclosed price. Although the company agreed to continue providing golf and ski services as it had in the past, it also hoped to develop

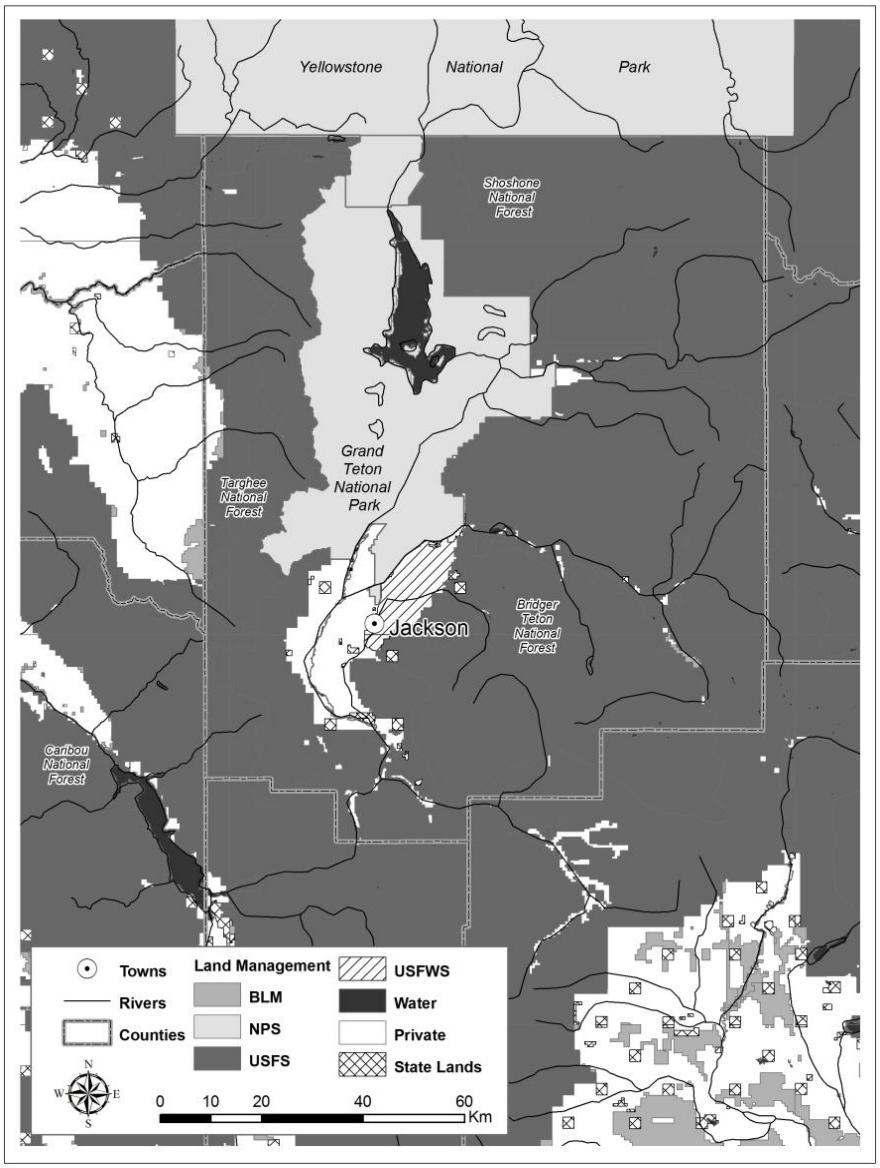
approximately 800 acres of slope-side property for residential and commercial purposes (French 2010).

With two mountain ranges (Beartooth, Pryor), a National Recreation Area (Bighorn Canyon), a State Park (Cooney Reservoir), an expanding ski resort (Red Lodge Mountain Resort), three rivers, and numerous creeks and mountain lakes providing countless tourist and recreation opportunities, Carbon County and Red Lodge are poised to continue their trajectory as a tourist and amenity-migrant destination. The question that plagues most local residents, however, is how to maintain the strong cultural traditions and the community's quality of life into the future.

Jackson, Wyoming

In 1884, permanent settlement began in the Teton Valley (Figure 4-5) with the arrival of John Holland, John Carnes and his wife, and Millie Corelle. Holland and Carnes, who had trapped in the valley previously, supplemented their income in their early years as hunting guides. In 1887, sixteen more individuals settled, and by 1888, the population reached 20 men, two women, and one child. In 1889, six covered wagons, containing five Mormon families, made the trip over the Teton Pass from Idaho, a trend that would continue for decades. Although initial settlers attempted to "prove-up" their homesteaded lands through traditional agriculture such as row crops, Jim May began cultivating hay. By 1896, May had 150 acres of hay, and in 1897 he secured 160 additional acres through the Desert Lands Act. The additional land was used to raise cattle, a practice that others quickly adopted as well. While hay grew naturally throughout the valley, May and others found it necessary to divert water from the Gros Ventre River for irrigation due to variability in precipitation (Daughery 1999). Settlers found that the valley produced enough hay with irrigation to feed their cattle throughout the hard winter months. During the summer months, however, cattle were driven into the surrounding mountains as forage became available, most notably the Gros Ventre Range (Lackett and Hobbs 2008).

Figure 4-5 Jackson, Wyoming (data source: BSI 2011)



In 1891, the Forest Reserve Act[1] was signed by President Benjamin Harrison, and Yellowstone Park Timber Reserve (1,239,040 acres) was formed. The Act had two profound impacts on the residents of Jackson Hole: first, it closed most of the northern sections of the valley to settlement because they were included in the Reserve, and second, it started a process by which the communal summer lands used by ranching

[1] Reserves created under this legislation generally became National Forests in 1907.

operations would eventually be managed by federal agencies. President Grover Cleveland continued to remove lands from settlement with the creation of the 829,440 acre Teton Forest Reserve. However, some of these lands would eventually find their way back to private ownership when President Theodore Roosevelt established the Teton National Forest (1,991,200 acres), which protected the Teton Mountain Range and its related highlands, but re-opened much of the land on the north end of the valley for settlement. These newly re-opened lands included areas adjacent to Blacktail Butte that were eventually settled by eight families of Mormons from Utah and Idaho (Daughery 1999).

An official census was undertaken on July 1, 1900. All settlers between Hoback Junction, to the south, and the north end of the valley were included in the census. Twenty-five percent of the population was congregated along the Gros Ventre River to the south of the ever-expanding town of Jackson and made up of Mormon immigrants from Utah and Idaho. The census also found that, of the 191 households then present in the valley, 145 were headed by farmers or ranchers who worked over 23,000 acres of land. As the population grew, new migrants found themselves forced to take up marginal lands in the periphery of the valley, well away from water sources and located on poorer soils. Realizing the limitations presented by crop agriculture in the valley, these settlers instead focused on cattle ranching (Daughery 1999).

Homesteading peaked between 1908 and 1919, and thereafter quickly declined. This decline was facilitated by severe droughts, especially that of 1919, and declining commodity prices following World War I (Daughery 1999). Soon after, ranchers felt the constraints of an increased conservation ethic at the government level through the establishment of the Taylor Grazing Act of 1914. The act prohibited grazing on federal lands to all except those who had land proximal to the National Forest, as well as establishing fees and permits for grazing activities and timber harvesting. This was met with concern from locals who had used the forestlands above the valley communally since the initial settlement period (Lackett and Hobbs 2008).

While communal grazing lands were being supplanted through permits and fees, other lands in the region were also being set aside for the benefit of the valley's top game species, although this was largely met by public support. With an increasing human

population came increasing pressure on elk herds which flourished prior to the fragmentation of the land brought about by the settlement process. Traditional elk migratory corridors were being blocked and critical habitat was being destroyed. This resulted in elk herds raiding ranchers' winter haystacks while other locals, concerned about the worsening condition of the elk due to malnourishment, began to feed elk by hand. To alleviate the pressure on the cattle ranching and hay producing industries, the valley's economic mainstay at this time, the federal government began to set aside land in the valley for the protection of the elk in 1912 (James 1934; Knight 1994; Lackett and Hobbs 2008). In that year, Congress purchased over 1000 acres northeast of Jackson on Flat Creek and combined this land with an additional 1000 acres in undeeded public lands, creating the National Elk Refuge. This was later expanded with the donation of lands by the Izaak Walton League and the J.D. Rockefeller, Jr., Corporation, expanding the size of the refuge to its current size of over 100 square kilometers (Nelson 1994; Lackett and Hobbs 2008).

By the 1920s the ranches and cattlemen of the valley had found their use of the mountains for summer forage reduced, restricted, or taxed, and the incoming settlers who were venturing into the valley also found that the availability of land had been restricted through the inclusion of much of the valley's lands in the public domain. However, residents were also starting to reap the economic benefits of their close proximity to Yellowstone National Park, the National Elk Refuge, and Teton National Forest. The realization that the aesthetic beauty and recreational potential of the region's lands could be profited from would spur the largest debate in Jackson Hole's history, and divide the once close-knit community for decades to come (Daughery 1999).

By the 1910s, economic activity in the valley was shifting focus from agriculture and ranching operations to a more recreation and tourism based approach. The catalyst for this shift was the acquisition of 320 acres of land north of the settlement of Wilson along the west side of the Snake River by Struthers Burt and Horace Carncross. An additional 320 acres were added through the Desert Lands Act, and the Bar BC dude ranch was formed. Dude ranches, although not full fledge cattle operations, gave their customers western experiences such as horseback riding, packtrips, and hunting and fishing expeditions, all in a scenic mountain environment. Other tourism related

industries, spurred by the success of dude ranching, also began to form. Harrison Crandall homesteaded 160 acres on the south end of Jenny Lake and eventually developed a photography business, while Home Richards acquired 160 acres for the express purpose of opening a gas station, barber shop, and rental cabins (Daughery 1999). As increased mobility allowed an increasing number of tourists to visit the valley for recreation activities, tours of Yellowstone National Park, and the numerous dude ranches, concerns grew about the shifting character of Jackson Hole.

One method used to ensure that the more traditional livelihoods and environments that many locals desired remained was the preservation of the land itself through government intervention. The extension of YNP into Jackson Hole had been discussed since the parks inception in 1872, and the creation of the Teton and Yellowstone Timber Preserves, and later the Teton National Forest continued this trend (Samuel 1986). The discussion of park extension continued in 1918 when Wyoming Senator Frank Mondell introduced a bill for park extension in Congress. The bill was quickly blocked by Senator John Nugent of neighboring Idaho, who was concerned that the extension of the national park would hurt his state economically through the reduction of available sheep grazing lands on the western slopes of the Teton Range. Originally, the local residents of the valley were against the bill, as they did not want further federal presence in the area. They were also concerned with how increasing tourism would impact the frontier qualities of the region and the established dude ranching industry. Specifically, they were concerned that overnight and short-term stays in the valley would replace extended stays on the dude ranches. It was noted at the time that increasing tourism would also result in the construction of tourist infrastructure such as lodges, hotels, and gas stations, which had slowly been increasing with increased tourist visits, much to the dismay of dude ranches (Daughery 1999).

Sentiments of dude rancher's, including Struthers Burt, a local conservationist, began to change as they realized that the only way to preserve the valley from continued settlement, and thus its aesthetic appeal to their customers, was the protection of the land by the federal government. Even cattlemen were beginning to realize the importance of park extension as a tool of preservation and in 1925, Pierce Cunningham, a rancher, Struthers Burt, and others met to discuss a plan of action (Betts 1978; Knight 1994).

Also present at the meeting was then-superintendent of Yellowstone National Park, Horace Albright. Together, Albright, Burt and other local conservationists began the process of creating Grand Teton National Park to save Jackson Hole from further environmental degradation and increasing commercial exploitation. Those present agreed to sell all or portions of their property, if it meant the lands would be preserved; the issue at this point, however, was how to finance it. Albright and Burt managed to raise enough money to send Jack Eynon and Dick Winger, both present at the initial meeting, to visit with wealthy individuals who had stayed at the numerous dude ranches over the years. While nothing materialized from these visits, a chance visit with one of the nation's wealthiest individuals presented itself soon after. In 1924, John D. Rockefeller, Jr., ventured west with his family to visit YNP and other parks in the region. As superintendent of the park, Albright saw his chance to find financial backing, and agreed to take the family on a tour of the park. Albright convinced the family that they should see the Teton Range and Jenny Lake. During their tour, Rockefeller expressed his concern of the growing commercial activity present in the valley and vowed to help (Daughery 1999).

Rockefeller incorporated the Snake River Land Company in 1927 and donated $2 million for the sole purpose of acquiring 30,000 acres of land that would eventually be transferred to the National Park Service (James 1936; Samuel 1986). The company was established in secrecy and with the exception of those present at the initial meeting in 1925, residents of the valley were not aware that Rockefeller was behind the land purchases. The group feared that if residents learned of Rockefeller's involvement they would be hesitant to sell, as they saw wealthy easterners as a threat to their frontier valley, or cause a land speculation boom, which would place the parcels out of reach for a reasonable and fair price. Thus, on July 7, 1927, President Coolidge signed an executive order whereby 8,000ha of private land was placed in the public domain for the further protection of the valley's elk. Finally, on February 16, 1929, 39,000ha, including the Teton Range, although excluding much of the Jackson Hole valley itself, were set aside when Grand Teton National Park was established. However, the lands Rockefeller had purchased and attempted to donate were not included in the initial park (Daughery 1999). These lands would eventually be established as the Grand Teton National Monument in

1943, but the land remained fragmented, as did the opinions of residents of the valley itself on the prospects of even further expansion of the park.

The largest opposition for park expansion came from cattle ranchers and hunting guides who were intent on continuing their grazing and guiding practices as they had for a generation. Of equal concern was the realization that by setting aside such large tracts of land in the valley, Teton County and the state of Wyoming would not benefit from those lands being on the tax roll. Eventually the NPS conceded by allowing hunting and grazing to continue and reimbursing the county for lost tax revenues. In 1950, Grand Teton National Park and Grand Teton National Monument were merged to form Grand Teton National Park, covering nearly the entire Jackson Hole Valley and the Teton Mountain Range (Samuel 1986; Knight 1994; Daughery 1999). The final addition to the land preservation in Jackson Hole occurred in 1972 when the USFS transferred 10,000ha of land to the NPS, creating the John D. Rockefeller Memorial Parkway. This land for the first time connected Yellowstone National Park and Grand Teton National Park, fulfilling the dream that began in 1872 (Daughery 1999).

While the idea of an enlarged Yellowstone National Park may have taken more than 60 years to mature, and the process to create it may have taken over 2 decades to transpire, the fact remains that it was local residents who were the catalyst for the preservation and conservation of the valley. Though the process was filled with numerous hurdles extending from opposition to the federal government and from local residents; mutual respect, cooperation and concessions eventually allowed an estimated 2.5 million visitor per year to enjoy the spectacular scenery and recreational opportunities that first brought settlers to the valley in 1884.

Chapter Four Summary

For comparative assessment, three communities were chosen for this study. Gateway communities like those within the GYE possess many of the qualities that new migrants seek (particularly in the 'New West'), including high environmental quality, numerous recreational opportunities, and cultural amenities. National park and national forest gateways often demonstrate change and stresses related to population growth, social and economic change, and environmental connections—in other words,

characteristics that may lead to particular concerns with sustainability. The communities of West Yellowstone and Red Lodge, Montana, and Jackson, Wyoming, were chosen as study sites for these reasons, and because they exhibit a variety of social characteristics. Because of these differences, the three study communities can be thought of as having separate economic foci, varying from West Yellowstone and its economic reliance on the tourism industry, to Red Lodge, with a mix of both tourist and agricultural based industries, and Jackson, a resort community that has prospered enough to draw other financial, professional and services industries into the county and may be considered a stand-alone economy not solely dependent on tourism. In addition, West Yellowstone is spatially constricted (and hence constricted in population and business growth possibilities); Red Lodge is further off the 'beaten path.'

Chapter 5 - Methods

A multi-source, mixed methods approach was implemented to better understand the perceptions, goals, and priorities of members of three communities in the Greater Yellowstone Ecosystem as they relate to sustainable community development and natural resource management, as well as the institutions and agencies that influence locally-induced change and decision making processes. Methods included archival research, content analysis, and key informant interviews. In addition to providing a broader spatial and temporal perspective on local to regional conditions, this approach allows for the triangulation and cross-validation of findings.

Mixed Methods

Prior to the mid-1900s, research across nearly all disciplines fell under one of two paradigms, positivism and constructivism. Positivists focused on the collection and analysis of empirically-driven quantitative data, where hypotheses were drawn directly from theory, or a deductive approach. This approach focused on objectivity in research and the separation of investigator and the investigated, which was intended to reduce or eliminate influence between the two. Constructivist's, on the other hand, focused on the collection of qualitative data with an emphasis on interpretation and meaning, where theory was developed through the knowledge seeking process, or an inductive approach. Ontologically this approach differs from positivism in its basis on the notion of multiple realities, and that an important aspect of the research process was the connection between investigator and the investigated (Johnson, Onwuegbuzie, and Turner 2007; Bazeley 2004; Sale, Lohfeld, and Brazil 2002).

In the 1960s, social scientists began to deviate from the positivist/constructivist paradigm, applying the concept of triangulation, or multiple operationalism. First introduced by Campbell and Fiske (1959), multiple operationalism stated that multiple methods could be implemented to validate research results. Over the next several decades the concept of triangulation was refined, by researchers, including Webb, Campbell, Schwartz and Sechrest (1966), who coined the term triangulation; Bouchard (1976), who suggested that multiple methods could be used to validate research results;

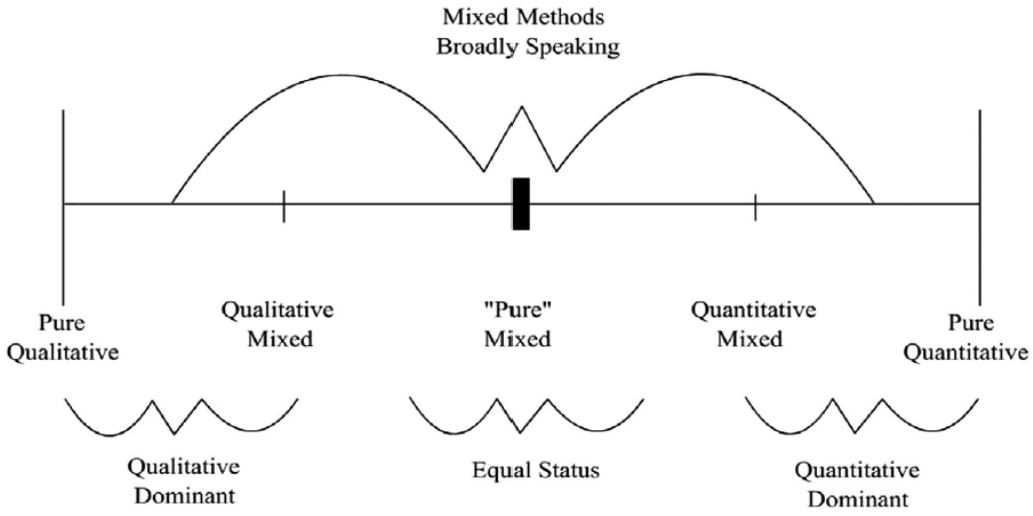
and Denzin (1978), who suggest ed that biases based on the investigator, the data source, and the method implemented could be reduced or eliminated through data triangulation, investigator triangulation, theoretical triangulation, and methodological triangulation (Johnson, Onquegbuzie, and Turner 2007).

Jick (1979) suggested that the advantage of conducting research based on triangulation stemmed from the fact that it allowed a higher degree of confidence in research results and more creative data acquisition techniques. It also provided the opportunity for synthesis and integration, which resulted in more robust data sets, and the ability to detect contradictions. Further, Morse (1991) introduced two variations of triangulation, simultaneous and sequential, that are the cornerstones of modern-day mixed methods approaches. Simultaneous triangulation occurs when multiple methods are utilized during the data acquisition phase of research, but with limited interaction among data sets during the analysis phase. Sequential triangulation occurs when the results from one method of data acquisition and analysis complement a subsequent phase (Johnson, Onwuegbuzie, and Turner 2007).

Although the concepts of triangulation and multiple operationalism remain critical to the social sciences, there are numerous definitions of what constitutes a mixed methods approach. What is not contested, however, is that the foundation of mixed methods is based on the collection, analysis, and interpretation of both qualitative and quantitative data that focus on the same phenomenon (Creswell 2009; Qnwuegbuzie and Leech 2006). The primary advantage of this approach is its ability to combine data sets and analysis procedures into one study. In the past, multiple data sets would have been treated as separate studies and subsequently synthesized. Further, the more the various methods employed are integrated throughout the research process, the stronger the final result (Yin 2006).

This study is based on the qualitative-dominant mixed methods approach (Figure 5-1) as defined by Johnson, Onwuegbuzie and Turner (2007), where quantitative data is utilized in an otherwise qualitative study to broaden concepts and theories, and bring contradiction and similarities between data sets and methods into sharper focus. In

Figure 5-1 The Three Major Research Paradigms, Including Subtypes of Mixed Methods Research (source: Johnson et al. 2007)



addition, this study implemented a semi-sequential approach to mixed methods where the data acquisition and analysis in one segment of the study informed, provided insights into, and ultimately strengthened subsequent phases of research. In particular, the archival research phase and the content analysis of newspapers in study communities were used to inform and focus the key informant interview phase of the study. Ultimately, triangulation of research results was based on all three methods, and the results were synthesized to inform and develop concepts and theories that are relevant to individual study communities and the region as a whole.

Grounded Theory

Content analyses of data and the coding of texts in this study are based in the theoretical framework of grounded theory. In its basic form, grounded theory is an inductive and systematic method that suggests that theories can be discovered or formulated through the constant comparison of collected data (Glaser and Strauss 2009; Babchuk 2009). This runs counter to the scientific method that suggests that a hypothesis or theoretical framework must first be defined before data acquisition begins. The ultimate goal of grounded theory is to construct hypotheses to understand phenomena (Haig 2006). It is designed to not only explain and describe, but potentially also to

provide some level of predictability of the phenomenon under examination. Further, it may seek to determine how respondents react to changes over time and space, the potential consequences of their response(s) to that change, and the broader socio-economic conditions that may affect change (Corbin and Strauss 1990).

Holstein (2003) suggested that grounded theory is based on three approaches; constructivist, objectivist, and interactionist. Constructivist approaches to grounded theory are based on the experiences of both the researcher and the participant under observation, and on how participants construct meanings and actions related to the subject under consideration. This type of research is then a direct reflection of the researcher's experience and thinking in the context of the phenomenon of study. Objectivist approaches, on the other hand, are based on objective facts and themes that are separate from the researcher's own experiences and relationship to the subject matter, and provide an external authority on the participant's conditions. The interactionist theoretical perspective assumes that multiple realities exist, and that results are interpretations of real world scenarios and not necessarily exact reality. Further, this approach acknowledges that the researcher is immersed in the participant's world, but that the aim of the study is to determine the participant's meanings of his or her experience, and not the shared experiences of researcher and participant.

In traditional grounded theory, hypotheses, research questions, and theories arise iteratively through the data acquisition process, whereas in this study research questions were pre-determined and largely drove key informant interview questioning. Although the same can be said for the content analysis of newspaper articles, specifically because this research was based on keyword searches of texts, the overlying process of grounded theory was implemented. That is, keyword searches allowed for the acquisition of data that are predisposed to contain content focused on those keywords. However, while keywords did focus the study towards particular concepts, they did not determine the outcome of the coding process, nor were hypotheses stated on what the data would reveal. Instead, concepts and theories arose organically through the coding process as in traditional grounded theory (Holstein 2003).

This study utilized the interactionist approach. I acknowledge that my own experiences, perceptions and biases are present throughout the research process, and thus

objectivity may at times be compromised. However, the ultimate goal of this study was to determine the many realities that exist in the study communities, and while past perceptions and experiences may guide questioning, they do not dictate the study's outcome.

Archival Research

A variety of data from numerous sources was collected for a broader understanding of the physical, biological, economic, and social characteristics of the study sites. Archival research based on government documents (e.g., environmental impact statements) and historical accounts was implemented to understand long-term trends in each community regarding sustainable community development and natural resource management. This research included documents collected through local, county, and state historical societies (West Yellowstone, Jackson Hole, Gallatin County, Carbon County, and Wyoming Historical Societies); local and regional non-governmental organizations (e.g., Greater Yellowstone Coalition, Community Foundation of Jackson Hole, Sonoran Institute [Bozeman], Montana Wilderness Association); state agencies (Montana Department of Fish, Wildlife and Parks; Wyoming Fish and Game; Montana Natural Resource Information System; Wyoming Wildlife and Natural Resource Trust); as well as U.S. Forest Service and National Park Service archives (Heritage and Research Center, Gardiner, Montana; University of Wyoming-National Park Service Research Center). These resources allowed for a more detailed exploration of the historical context of social, economic, and environmental change in individual study areas, and the region as a whole. Demographic and economic data were collected through the U.S. Bureau of the Census, and through the Montana, Idaho, and Wyoming state Divisions of Labor and Statistics to understand better socio-economic characteristics of the study areas.

Content Analysis of Newspapers

The use of printed materials as a basis for quantitative analysis can be traced back to eighteenth century Sweden, where a collection of 90 hymns, known as the *Songs of Zion*, were analyzed (Krippendorff 2004). The purpose of the analysis was to identify prevalent symbols in the hymns, and their value (favorable, unfavorable and neutral) to parishioners and the Lutheran Swedish State Church (Dovring 1954). With the boom of

newspapers in the early twentieth century came ever increasing interest in public opinion and, as a result, the technique of quantitative newspaper analysis evolved (Krippendorff 2004). It was hypothesized that there are two fundamental relationships between the content in newspapers and their audiences. First, that the information in newspaper articles molds the general public's opinions, attitudes, and beliefs, and second, that the same information was a reflection of the general public's opinions, attitudes, and beliefs (Woodward 1934). The identification of the two relationships suggests that newspaper articles could be utilized to understand better community life, human behavior, and social characteristics (Janes 1958). As the twentieth century progressed, the economic and political culture allowed the analysis of mass communication to expand outside of newspapers to include textbooks, comic strips, and speeches. This was especially evident during World War II, when the content analysis of propaganda became widespread. By the 1940s, content analysis had spread to psychology, anthropology, and history, and would be further expanded with the advent of mechanical translation and abstraction via computers (Krippendorf 2004).

Berelson (1952) first defined content analysis as an "objective, systematic, and quantitative" method for describing the content of communication. Kolbe and Burnett (1991) expanded upon this and suggested that the importance of content analysis was in its ability to evaluate the symbolic meaning of communication in a systematic manner (Lombard, Snyder-Duch, and Bracken 2002). However, the most widely circulated definition of content analysis has been attributed to Krippendorf (2004, 1980), who defined it as a replicable research tool which allows for the inference of the symbolic meaning(s) of text in relation to its context. Traditionally, content analysis is based on data that are read, interpreted, and understood by people other than the analyst (*e.g.*, the general public), who may infer symbolic meanings based on their own goals, views, and beliefs. Content analysis is implemented to infer the symbolic, or intended, meaning from texts that may not be inherently evident to the casual observer, while simultaneously attempting to reduce the amount of meaning the analyst's own goals, views, and beliefs have on the context of the analysis (Krippendorff 2004).

Content analysis has several advantages as a research method. It allows for the examination of patterns and trends; it allows for the analysis of social interaction and

shifts in public opinion (Stemler 2001), especially over extended periods of time (Weber 1985), and for the analysis of what is actually being communicated and not the motives of the author or the reaction of the audience (Berelson 1952). There are, however, several assumptions that are inherent in conducting content analysis. Content analysis assumes that the relationships and inferences made on the data actually exist and can be validated, that the meaning ascribed to the data is compatible with the original author's intent and the audiences' understanding of the material, and that the quantification of 'symbolic meanings' is a meaningful endeavor (Berelson 1952).

However, even with these assumptions in mind, the greatest advantage of this research method is in its ability to code and categorize data (Stemler 2001). Coding is the process by which text-based documents are summarized or reduced to separate or unify concepts, themes, or keywords. Three approaches to coding textual documents exist. They differ based on the method of coding, the origin of the code, and the reliability of the coding process. Conventional coding is based on the analyst deriving the coding scheme directly from the data. This approach is particularly useful when data on the phenomenon under study are not well understood and where strong research literature is lacking. The primary advantage of this approach is that it is not based on preconceived expectations and the analyst gains insights directly from the studied material. The disadvantage is that all relevant and critical themes or concepts may not be explored as they are not evident to the analyst. A second approach, directed coding, uses existing theory as the framework for analysis. The advantage to this approach is that it allows existing theory to be validated. However, because of this, it may also result in a heavily biased analysis. The final approach, summative coding, is based on the comparison, exploration, and interpretation of the data context. Its advantage is in its simplicity and its ability to delineate specific key concepts and their context. However, this may limit the analyst's ability to develop a deeper or more critical understanding of the phenomenon under study (Hsieh and Shannon 2005).

Use of Content Analysis in This Study

This study used content analysis to classify newspaper articles from the *West Yellowstone News* (West Yellowstone, Montana), *Carbon County News* (Red Lodge,

Montana) and *Jackson Hole News & Guide* (Jackson, Wyoming) dated from January 1, 2000, to December 29, 2009, to address research questions 1.1-1.4, and 2.1-2.2. In addition, newspaper content analysis provided the background and local context for key informant interviews. The local weekly newspapers were chosen as they would be the most representative of the perceptions of the individual communities and the region as a whole. Articles were sampled based on key word and key phrase searches of the online versions of the newspapers. The *West Yellowstone News* is published every Friday, and circulates to more than 1,800 individuals. The *Carbon County News* is published every Thursday, and circulates to approximately 3,000 individuals. The *Jackson Hole News and Guide* is published daily with an estimated circulation of over 6,000.

This study acknowledges the fact that news agencies can have particular biases, and that not all events, topics, or themes are equally reported. This selection bias is the result of competition for space in individual newspaper editions, norms in reporting, and editorial concerns (Earl et al. 2004). Further, because of the time-intensive nature of online newspapers and storage capabilities of news agencies, especially those in smaller markets, articles that appear in hard copy editions of newspapers may not appear in digital form. The selection of articles published electronically is often relegated to the online editor. For example, the online edition of the *Carbon County News* only included articles that were front-page stories, editorials, and opinion articles in the printed version of the paper. The online editor in this instance does have the opportunity to include important articles pertaining to the county that were not included on the front page (Garcia 2010, personal communication). In contrast, the online edition of the *West Yellowstone News* contains all articles that appear in the print edition of the newspaper (Blow 2011, personal communication).

Key Word Selection

Keyword[2] searches allow for the systematic retrieval of data related to the individual keywords in a given database. Taking a directed coding approach, the six

[2] Key words, or keywords, include both individual words and very short phrases or terms, generally two words (adjective and noun, e.g.)

initial key words chosen to infer resident perceptions of community development and natural resources include 'economic development,' 'community development,' 'natural resources,' 'conservation,' 'land management,' and 'sustainability'. Keywords were chosen based on a review of primary literature relating to sustainability, community development, and natural resource management. A pilot study (Bergstrom 2009) indicated that these keywords were adequately suited to explore perceptions of sustainable community development and natural resource management in the study communities. Although other keywords were explored during the pilot study phase, the six keywords chosen best represented the themes under examination. Specifically, keywords were chosen to address the three spheres of sustainability (economics, environment, and society) (WCED 1987).

In each of the newspapers under examination, Boolean operators (i.e., 'and', 'or', 'not' etc.), which establish the relationship between keywords, were not utilized as they were not recognized by the online newspaper search engines. Because of this, multi-word keyword searches (i.e., natural resources) returned results for both words and not necessarily the combination of the two words. As a result, articles that were not consistent with the themes under examination were removed from the study sample.

West Yellowstone News, West Yellowstone, Montana

To access articles in the *West Yellowstone News*, keywords were entered into the online search engine on the newspapers website (*www.westyellowstonenews.com*). The use of the advanced or guided search options allowed for a refined search based on specific keywords, date of publication, and category of article (i.e., news, sports, and obituaries). Filtering was based on those articles between January 1, 2000 and December 31, 2009, and the categories news, community, and opinion. Articles' titles matching the refined search were copied and pasted into a single word processing document, and those articles that were not representative of the intended symbolic meaning or subject matter of the keyword were removed (i.e., sports, obituaries, calendars of events, etc.,). Articles were then separated by keyword and year of publication. Any article that appeared under multiple key words in a given year was removed. This provided a complete list of all relevant article titles based on keyword and year of publication. Each article was then re-

opened in the online newspaper search engine and copied into separate word processing documents for coding and analysis.

Jackson Hole News and Guide, Jackson, Wyoming

To access *Jackson Hole News and Guide* articles, keywords were entered individually into the online search engine on the newspaper's website (*www.jhnewsandguide.com*). The complete list of article titles for each keyword entered was then transferred into a word processing document and saved based on keyword. Because the online search engine did not allow for a refined search, each article was then separated based on year of publication and keyword. This subset was then reduced, eliminating texts that were not representative of the intended keyword subject. Each remaining article title was then transferred into a Microsoft® Excel spreadsheet, based on the year the article was published and its associated keyword. By transferring the article titles into *Excel*, the original hyperlink to the online article was maintained for ease in access. Because multiple keywords may appear in individual articles, duplicate articles were removed implementing the Microsoft Excel "Remove Duplicate" feature. This provided a complete list of all relevant article titles based on keyword searches and year of publication. All article titles were then combined into the year of publication in a single *Excel* worksheet and sorted alphabetically. A random sample of article titles (discussed below) was conducted for each year to establish a final list of articles. Each article that was randomly selected was then re-opened in the online newspaper archive through the hyperlink established in the spreadsheet, copied into separate word processing documents, and saved under the year of publication for coding and analysis.

Carbon County News, Red Lodge, Montana

To access articles based on a keyword search of the *Carbon County News*, the newspaper's online archive was utilized (*www.carboncountynews.com*), but unlike the *West Yellowstone News* and the *Jackson Hole News and Guide*, the *Carbon County News* did not maintain a search engine to access articles. Articles were stored on the newspaper's online website based on date and year of publication. The storage of newspaper editions changed over time, necessitating multiple methods of data acquisition. Each newspaper edition was individually accessed and keywords were

searched manually. Several editions in individual years were not analyzed as they were not present in the online archive of the newspaper (Table 5-1).

Online editions of the *Carbon County News* for December 31, 2008 to December 30, 2010, and March 29, 2007, to December 27, 2007, were stored by the publisher based on category of presented material (news, school and sports, and opinion). Keyword searches were conducted for each article in individual categories. Matching articles were copied into separate documents and saved under year of publication. Online editions for the January 4, 2007, to March 22, 2007, and January 5, 2000, to January 5, 2006, were listed in digest form, with all articles presented in a single webpage. Keyword searches were conducted for each edition, with matching articles copied into separate documents and saved under year of publication.

Keyword searches of the *Carbon County News* consisted of searching each article separately in the saved word processing document using the software's search tool. Those articles that matched at least one keyword search were maintained for further coding and analysis. This subset of articles was then reduced, eliminating texts that were not representative of the intended symbolic meaning of the keyword.

Sampling

According to Webster's College Dictionary (2003), sampling is "the act, process, or technique of selecting a suitable sample," where a sample is "a representative part of a single item from a larger whole or group; or a part of a statistical population whose properties are studied to gain information about the whole." Several types of samples have been identified in the literature, with use depending on the intended outcome of the study. Teddlie and Yu (2007) suggested that four main approaches to sampling should be explored: probability sampling, purposive sampling, convenience sampling, and mixed methods sampling. Probability sampling is traditionally used in quantitative studies that hope to represent a sample of the entire population. The primary sampling method in this approach is the simple random sample, where inclusion in the sample is not dictated by the inclusion of other samples, and that all members of the population have an equal opportunity to be sampled. The purposive sampling approach is traditionally used in qualitative studies where the goal is to define specific traits in the sample population that

Table 5-1 Missing Articles - Carbon County News

Year	Reason for Missing Edition(s)
2000	Missing May 17 to December 31, 2001 editions
	19 total editions analyzed
	April 19 and April 26, 2000 are same editions
2001	Missing April 26-December 31, 2001 articles
	16 total editions
	Jan 31, 2001: File Not Found
	Feb 7, 2001 and January 24, 2001 are same editions
2002	Jan 1 to August 8, 2002 missing
2003	Missing March 27, 2003
	Missing April 17, 2003
	April 24, 2003 File Not Found
2004	Missing August 26, 2004
2005	Aug 4, 2005 missing
2007	July 12, and 19th same edition
	August 30, 2007 missing edition
	Nov 22, 2007 missing edition

will be relevant to the research question. This approach is also known as critical case sampling (Onwuegbuzie and Collins (2007), and judgment sampling (Marshall 1996b). Convenience sampling is utilized when the researcher needs easily accessible and willing participants, while a mixed method sampling approach uses both probability sampling and purposive sampling approaches. An additional sampling approach not discussed by Teddlie and Yu (2007), is theoretical sampling. This approach is based on the premise that as theories emerge from the data, additional sampling may be needed to examine and elaborate upon that theory (Marhsall 1996b). Regardless of the sampling method employed, the process to determine the appropriate method is based on the goal of the study, the research objective(s) and purpose, and the research question(s) and design (Onwuegbuzie and Collins 2007).

Content Sampling

For the content analysis of local newspapers, a probability sampling approach, specifically a simple random sample, was implemented; this was based on use of the selected articles relevant to the keyword searches as the 'sample population'. This

approach ensured that all individuals in the population (all keyword related articles) had an equal and independent opportunity to be selected; it should be noted that this assumes that all relevant articles had been identified and that these constitute the population of sustainable development-related articles. To determine the sample size of newspaper articles to be analyzed the following formula was used (Creative Research Systems 2010):

$$SS = \frac{Z^2 * (p) * (1 - p)}{C^2}$$

Where:

Z = Z value (e.g. 1.96 for 95% confidence level)

p = percentage picking a choice, expressed as decimal (.5 used for sample size needed)

c = confidence interval, expressed as decimal (e.g., .04 = ± 4)

For the *West Yellowstone News*, a total of 384 articles were retrieved based on keyword searches, with a sample of 193 articles retained for analysis (Table 5-2). Of the articles sampled, five were deemed not representative of the themes under examination during the coding process and were removed. They were replaced with five subsequent articles based on random number generation (see below) from the original population. For the *Carbon County News*, a total of 1130 articles were retrieved based on keyword searches, with a sample of 287 retained for analysis (Table 5-3). Of the articles sampled, 14 were deemed not representative of the themes under examination and were removed and replaced. For the *Jackson Hole News and Guide*, a total of 2440 articles were retrieved based on keyword searches, with a sample of 333 retained for analysis (Table 5-4). Of the articles sampled, 31 were deemed not representative of the themes under examination and were removed and replaced.

Table 5-2 *West Yellowstone News*: Sample Calculation

Year	Original Population (N)	Percent of Original Population	Final Sample (n)
2000	5	0.01	3
2001	18	0.05	9
2002	7	0.02	4
2003	33	0.09	17
2004	31	0.08	16
2005	19	0.05	10
2006	31	0.08	16
2007	54	0.14	27
2008	104	0.27	52
2009	82	0.21	41
Total	384		193

Table 5-3 *Carbon County News:* Sample Calculation

Year	Original Population (N)	Percent of Original Population	Final Sample (n)
2000	77	6.81	20
2001	49	4.34	12
2002	42	3.72	11
2003	79	6.99	20
2004	109	9.65	28
2005	120	10.62	30
2006	119	10.53	30
2007	128	11.33	33
2008	179	15.84	45
2009	228	20.18	58
Total	1130		287

Table 5-4 *Jackson Hole News & Guide*: Sample Calculation

Year	Original Population (N)	Percent of Original Population	Final Sample (n)
2000	3	0.12	1
2005	7	0.29	1
2006	403	16.52	55
2007	595	24.39	81
2008	755	30.94	103
2009	677	27.75	92
Total	2440		333

A random number generator was implemented to calculate a random sample for each newspaper (Haahr 2006). The random number generator was based on the initial population of all newspaper articles (i.e., *West Yellowstone News, N*=384). To maintain adequate distribution of sample size over multiple years, the percentage of each year's articles was calculated. This percentage was then sampled from each individual year. A randomly assigned sequence of numbers was obtained from the random number generator based on the percentage of total articles for each year. These numbers were then transferred into the *Excel* worksheet for each newspaper, with each article receiving a separate number. The articles were then sorted from lowest to highest based on this number sequence and the sample was transferred to another worksheet.

Interview Sampling

The sample of key informant interviews was based on a purposive sampling approach, where interview subjects were chosen based on their perceived knowledge of the research questions. One of the largest issues facing researchers who conduct purposive sampling is the determination of sample size. Guest, Bunce and Johnson (2006) reviewed 24 books and seven databases relating to purposive sampling research methods and found that none established practical guidelines for determining sample size. They noted that the only consensus was that sample size should be determined inductively and that sampling should continue until a state of theoretical saturation

occurred. Theoretical saturation in this instance is defined as the point in which no additional information, concepts, or themes emerge.

Of the literature reviewed by Guest, Bunce and Johnson (2006), three studies were found to be applicable for key informant interviews. Bernard (2000) suggested that at least 26 interviews should be conducted when undertaking ethnographic studies. Kuzel (1992) suggested a sample size of six to eight interviews when researching a homogeneous sample, and Bertaux (1981) found that the smallest acceptable sample size for a qualitative-based study was 15. However, Guest, Bunce and Johnson found that when analyzing their own qualitative data that a sample size of 12 interviews was sufficient to reach theoretical saturation.

In this study, I found that theoretical saturation was achieved differently for each of the study communities based on the content of each individual interview and how well interviews collectively addresses research questions. On average, 10 key informant interviews were conducted in each community, for a total of 32 interviews. The total number required (for the three communities combined) thus exceeded Bernard's (2000) value of 26 interviews for ethnographic studies, and Bertaux's (1981) sample size of 15 for qualitative studies, and Kuzel's (1992) sample size of six to eight interviews for a homogeneous sample. However, it does fall short of Guest, Bunce and Johnson's (2006) recommended sample size of 12 in each study community. There are two reasons that this sample size was not achieved. First, after review of initial key informant interviews in each community, it appeared that theoretical saturation had been met. Second, due to the highly seasonal nature of these communities, and their economic dependence on recreation and tourist activities, the number of available key informants decreased as the field season progressed.

Content Analysis and Coding Techniques

Introduction

Coding of newspaper articles and key informant interview transcripts was conducted using the ATLAS.ti qualitative data analysis software package (version 5.0.66) (ATLAS.ti 2010). All techniques described below were obtained through the user's

manual (Friese 2004). *ATLAS.ti* facilitates qualitative data analysis at two separate levels, the conceptual, and the textual. Although the majority of analyses are conducted at the textual level, where documents are coded, the conceptual level allows contextual relationships between codes or themes to be visualized. The over-arching structure that contains and stores all relevant data while coding is known as a "hermeneutic unit." The hermeneutic unit consists of the documents to be analyzed, the codes, memos, and quotations for developing concepts, and conceptual linkages such as families and networks. The first step in creating a hermeneutic unit was to assign primary documents or data sources. In this instance, primary documents consisted of newspaper articles for the three newspapers under examination, as well as the key informant interview transcripts. All articles in an individual newspaper, as well as all interview transcripts, were analyzed as separate hermeneutic units. This allowed for detailed analysis in each unit, and analysis between units. Primary documents were then assigned to individual or multiple "primary document families" (Table 5-5). Families were used to classify a group of primary documents and allowed for ease of data analysis, most notably queries and searches (e.g., search for all editorials involving West Yellowstone).

Coding

The primary process involved in traditional grounded theory is that of coding, which can be further divided into substantive coding and theoretical coding. Substantive coding is the process by which data, in this instance text, are divided into separate themes or categories. Theoretical coding consists of building a larger theoretical construct based on the substantive codes. Put more plainly, theoretical coding is based on patterns that emerge from substantive coding and result in hypotheses or theories (Holton 2007).

For this study, coding and inferring consisted of reading each article individually and determining which code is (or codes were) most applicable to the ideas presented in the article. Codes and categories were based on the individual focus of each article; additional themes that arose were identified and added to the coding process, allowing for more precise categorization and the facilitation of inferences of meaning. Coding and inferring was accomplished through three methods, Open Coding, Code In Vivo, and Code By List. Open Coding consisted of creating a new code for a selected text based on

Table 5-5 Primary Document Families for Each Newspaper

Primary Document Families
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
News
Editorial
Letter to the Editor

user input (e.g., if a quotation was regarding the acquisition of land, the coder could manually type Land Acquisition as the code). Code In Vivo allows coding based on the specific selected text (i.e., if Land Acquisition was selected in the text, it would automatically become the code). Lastly, a quotation could be selected manually from theexisting codebook (Code by List). A single coding list (Appendix A) was utilized for all newspaper content analysis and key informant interviews for consistency across data sources and subsequent analysis. To eliminate codes that were redundant or where two or more codes described the same theme, synonymous codes were manually merged into single codes after all newspaper articles and interview transcripts were analyzed.

Families and Super-Families

To manage large sets of codes, the Families feature in *ATLAS.ti* was utilized. This allows multiple codes to be grouped together based on larger themes (i.e., all codes involving bison can be grouped together into a bison family) for ease in querying and analysis. Families could also be grouped together using the Super-Families feature (Appendix B). Super families consist of multiple families that represented overall themes or categories (i.e., bison, wolves, and grizzly families could be placed into the super-family natural resources). This feature allowed complex queries to be formed for more effective data analysis.

Intercoder Reliability and Testing

Intercoder reliability, also known as intercoder agreement, is a method by which independent coders are used to evaluate the consistency of content analysis coding, and the likelihood that other coders would judge or classify information in the same way as the researcher. In qualitative methods such as content analysis, success is determined by the consistency in which texts are coded between multiple coders. The primary benefit in this regard is to determine the validity of the original researcher's coding schema, with a high level of intercoder reliability justifying the researcher's coding choices (Burla et al. 2008).

Several methods to determine intercoder reliability exist, but there are limitations and care must be taken to ensure accurate results. Percent agreement is an intercoder reliability statistic that indicates the number of times two coders agree in raw percentages (Freelon 2010). Although percent agreement is the most often used method implemented to determine intercoder reliability, it has been suggested that it may not be adequately robust, as it overestimates true intercoder agreement by not taking into account agreement by chance (Lombard et al. 2011). Indices that are more robust include Cohen's Kappa, Fleiss' Kappa, and Krippendorff's Alpha (Lombard et al. 2010). Cohen's Kappa accounts for chance agreements by determining the distribution of "values across categories for different coders." Krippendorff's Alpha is often considered the "best" index of intercoder reliability, as it account for chance agreements, and allows for several scales of measurement (nominal, ordinal, ration, interval) (Lombard et al. 2002).

In developing intercoder reliability tests, two fundamental characteristics are critical to ensure valid results. First, a sample of at least 30 documents is necessary to ensure adequate representation of the original population of documents. Second, intercoder reliability coefficients above .80 are generally considered to be statistically significant and indicate agreement between the primary coder and testers (Lombard et al. 2010).

While many software products are available to determine intercoder reliability coefficients, the freeware software package ReCal3 was chosen for this study. ReCal3 is an online program that computes intercoder reliability for data coded by three or more

coders. The primary benefit of this program is that calculates the four most popular reliability coefficients: percent agreement, Fleiss' Kappa, Cohen's Kappa, and Krippendorff's Alpha (Freelon 2010).

For this study a random sample of ten articles were taken from each of the three community newspapers. A random number generator was implemented (see sampling techniques for newspaper articles, above) to determine the articles for analysis in each newspaper. A representative paragraph was chosen from each sampled article based on the main theme of the entire article for intercoder reliability testing. A representative paragraph was chosen to limit redundant or time-consuming coding by reliability testers. A list of 30 codes was developed as a representative sample of all codes. These codes were the most-utilized codes during initial coding when possible; however, some codes were omitted, as they did not adequately represent the articles under examination.

Intercoder reliability testing began with the primary researcher coding each of the 30 articles using the pre-defined list of codes. Five reliability testers were given identical articles and code lists with instructions on how to code individual articles. Results were entered into a spreadsheet and compared against the primary researcher's results. These results were then entered into the ReCal3 program to determine intercoder reliability coefficients. Results indicated an average pairwise Cohen's Kappa value of 0.8389, or substantial agreement among coders. A Cohen's Kappa value of zero indicates no agreement among coders, while a value of one indicates perfect agreement. ReCal3 results also indicate a Krippendorff's Alpha value of 0.8393, or reliable. A Krippendorff's Alpha of zero indicates that disagreements are systematic and exceed what can be expected by chance, while values of one indicate perfect reliability (Recal3 2011).

Statistical Analysis

The objective of statistical analysis of content analyses was to determine if an association existed between coded entries and study communities. Analysis of these data began with descriptive statistical analysis of coded entries for each study area, and are available at the beginning of Chapter 6. Descriptive statistical analyses were performed

in Excel 2010, with all subsequent statistical analyses (test for normality and test for dependence) conducted with SAS (Statistical Analysis System) version 9.2 (SAS 2011).

Test for Normality

Two tests were necessary to determine if further statistical analysis of coded entries would be feasible: a test for normality, and a test of dependence. The GLIMMIX procedure for General Linear Mixed Models was implemented to determine normality and dependence of coded newspaper entries (n = 204) for each study community newspaper. The GLIMMIX procedure calculated four separate tests of normality (Table 5-6): Shapiro-Wilk, Kolmogorov-Smirnov, Carmer-von Mises, and Anderson-Darling, with an alpha (α) of 0.05. For each test, the null hypothesis was that data are normally distributed, while the alternative hypothesis (Ha) was that the data are not normally distributed. If the p (probability) values were less than α (0.05), then the null hypothesis that the data were normally distributed would be rejected. Each of the four separate tests for normality resulted in $\alpha < 0.05$, and the null hypothesis that data were normally distributed was rejected.

Table 5-6 GLIMMIX Normality Test

Test	**Statistic**		**p**	
Shapiro-Wilk	W	0.599955	pr < W	0.0001
Kolmogorov-Smirnov	D	0.251913	Pr > D	0.01
Carmer-von Mises	W-sq	13.69342	Pr > W-sq	0.005
Anderson-Darling	A-sq	7.038141	Pr > A-sq	0.005

Test for Dependence

The Pearson chi-square test was implemented to test for independence (dispersion) with an alpha (α) of 0.05. Chi-square tests are used to compare observed values against a model based on expected results if the data were normally distributed. The null hypothesis for this test was that variables are independent (Ha: variables are not independent). Results indicated a Pearson χ^2 value of 5252.30, with 8.58 degrees of freedom, and p <.0001. A p-value of less than α and a correspondingly large χ^2 value

suggest that the data are dependent, or overdispersion is present. Initial statistical analysis suggested that not only are the coded variables not normally distributed, but they also are highly dependent (e.g., bison management, bison hazing, interagency bison management plan, etc.), both of which precluded additional statistical analysis at the specific code level.

Statistical Analysis by Category

In an attempt to reduce issues related to non-normality and dependence, the 204 coded variables were aggregated into seven categories (Table 5-7) for further analysis. With aggregation, values indicate the number of coded entries for each category; this was done for each study area community. To determine if there is an association among code categories and study communities, the frequency procedure (FREQ PREC) was calculated using SAS software. The PROC FREQ procedure allows statistics to be calculated within and across strata in a contingency table. A 3x7 contingency table was created (three communities by seven categories) (Table 5-8). All contingency tables are located below, at the end of the statistical analysis section. Within contingency tables, frequency indicates the total number of references for a particular category, percent indicates the percent of references, the row percent indicates the percent in a particular row, while the col percent indicates the percent in a particular column.

Table 5-7 Aggregated Categories

	Location		
Category	West Yellowstone	Red Lodge	Jackson
Natural Resources	179	38	222
Economic Development	84	38	40
Community Development	72	110	85
Government	67	71	79
Sustainability and Conservation	40	26	51
Growth and Development	23	44	139
Tourism and Recreation	20	44	48

A Cochran-Mantel-Haenszel (CMH) statistic test was conducted to determine if the data in the contingency table were independent at $\alpha = 0.05$, with $H_{o:}$ category and locations are independent (table 4). Results from the CMH test produced a CMH value of 34.5947 (1 degree of freedom, and $p < 0.0001$). H_o was rejected, suggesting that category and location are not independent when taken collectively.

A second contingency table was created (Table 5-9) and a CMH test was conducted that treated each category separately to determine the categories that had contributed significantly to dependence in the contingency table. For each category, a separate χ^2, Likelihood Ratio χ^2, and Mantel-Haenszel χ^2 were calculated ($\alpha = 0.05$). Results again confirmed that dependence existed between categories and locations when taken as a whole (p-value < .0001), but based on cell χ^2 values (low values indicated association) (see contingency table), three categories could be considered as independent (categories four, five, and seven) and warranted further analysis.

A contingency table (Table 5-10) was created for the three independent categories, with χ^2 and Likelihood Ratio χ^2 tests conducted ($\alpha = 0.05$) to test for dependence. Results suggested that categories 4, 5, and 7 are independent with all three locations (p-value < 0.05), but that the cell χ^2 values for Tourism and Recreation indicated that it is dependent when analyzed separately from all categories and can thus be dropped from the analysis of independence. A contingency table was created for categories 4 and 5 (Table 5-11), and χ^2 and Likelihood Ratio χ^2 tests were conducted ($\alpha = 0.05$) to test for dependence. Results suggest that categories 4 and 5 (government, and sustainability and conservation) are independent based on $p > 0.05$.

Because categories 4 and 5 continued to show independence, they were dropped, and analysis was conducted on a contingency table created for categories 1,2,3,6, and 7 (Table 5-12). Results indicated that these categories are dependent (associated with each other) based on $p < 0.05$.

Statistical analysis based on individual categories compared to study communities suggest that association exists among the categories ‘community development,’ ‘economic development,’ ‘growth and development,’ ‘natural resources,’ and ‘tourism and recreation,’ but not ‘government’ or ‘sustainability and conservation.’ It is important

to note that the analysis conducted above only considered relationships among all study communities and the seven key words, and did not take into consideration relationships between categories and communities on an individual basis.

Pairwise Analysis by Community

To test for dependence (association) between individual communities and categories of coded newspaper articles, a partitioning χ^2 analysis was conducted. This allowed the comparison of two communities at a time (i.e., West Yellowstone and Red Lodge, Red Lodge and Jackson, and West Yellowstone and Jackson) with $\alpha = 0.05$. A contingency table was created for each of the comparison datasets. Results for the comparison between West Yellowstone and Red Lodge (Table 5-13) suggest that H_o is rejected ($p < .0001$ and likelihood ratio $\chi^2 < .0001$). Results for the comparisons between Red Lodge and Jackson (Table 5-15) and between West Yellowstone and Jackson (Table 5-14) also reject H_o (also with $p < .0001$ and likelihood ratio $\chi^2 < .0001$). This suggests that when taken collectively there is not statistically significant evidence that a relationship exists between study communities and categories, but when compared pair-wise the relationship between communities and categories is statistically significant.

Table 5-8 All Categories and All Communities Contingency Table

		Location			
Category		**West Yellowstone**	**Red Lodge**	**Jackson**	**Total**
Natural	Frequency	179	38	222	439
Resources	Percent	11.78	2.5	14.61	28.88
	Row Pct	40.77	8.66	50.57	
	Col Pct	36.91	10.24	33.43	
Economic	Frequency	84	38	40	162
Development	Percent	5.53	2.5	2.63	10.66
	Row Pct	51.85	23.46	24.69	
	Col Pct	17.32	10.24	6.02	
Community	Frequency	72	110	85	267
Development	Percent	4.74	7.24	4.59	17.57
	Row Pct	26.97	4120	31.84	
	Col Pct	14.85	29.65	12.8	
Government	Frequency	67	71	79	217
	Percent	4.41	4.67	5.2	14.28
	Row Pct	30.88	32.72	36.41	
	Col Pct	13.81	19.14	11.9	
Sustainability	Frequency	40	26	51	117
and Conservation	Percent	2.63	1.71	3.36	7.7
	Row Pct	34.19	22.22	43.59	
	Col Pct	8.25	7.01	7.68	
Growth	Frequency	23	44	139	206
	Percent	1.51	2.89	9.14	13.55
	Row Pct	11.17	21.36	67.48	
	Col Pct	4.74	11.86	20.93	
Tourism	Frequency	20	44	48	112
and Recreation	Percent	1.32	2.89	3.16	7.37
	Row Pct	17.86	39.29	42.86	
	Col Pct	4.12	11.86	7.23	
Total	Frequency	485	37	664	1520
	Pct	31.91	24.41	43.68	100

Table 5-9 Contingency Table with Chi-Square Values

		Location			
Category		**West Yellowstone**	**Red Lodge**	**Jackson**	**Total**
Natural	Frequency	179	38	222	439
Resources	Expected	140.08	107.15	191.77	
	Cell Chi-Square	10.816	44.627	4.7641	
	Percent	11.78	2.5	14.61	28.88
	Row Pct	40.77	8.66	50.57	
	Col Pct	36.91	10.24	33.43	
Economic	Frequency	84	38	40	162
Development	Expected	51.691	39.541	70.768	
	Cell Chi-Square	20.195	0.06	13.377	
	Percent	5.53	2.5	2.63	10.66
	Row Pct	51.85	2346	24.69	
	Col Pct	17.32	10.24	6.02	
Community	Frequency	72	110	85	267
Development	Expected	85.194	65.169	116.64	
	Cell Chi-Square	2.0434	30.84	8.5812	
	Percent	4.74	7.24	4.59	17.57
	Row Pct	26.97	4120	31.84	
	Col Pct	14.85	29.65	12.8	
Government	Frequency	67	71	79	217
	Expected	69.24	52.965	94.795	
	Cell Chi-Square	0.0725	6.141	2.6317	
	Percent	4.41	4.67	5.2	14.28
	Row Pct	30.88	32.72	36.41	
	Col Pct	13.81	19.14	11.9	
Sustainability	Frequency	40	26	51	117
and Conservation	Expected	37.332	28.557	51.111	
	Cell Chi-Square	0.1906	0.229	0.0002	
	Percent	2.63	1.71	3.36	7.7
	Row Pct	34.19	22.22	43.59	
	Col Pct	8.25	7.01	7.68	

		Location			
Category		**West Yellowstone**	**Red Lodge**	**Jackson**	**Total**
Growth	Frequency	23	44	139	206
	Expected	65.73	50.28	89.989	
	Cell Chi-Square	27.778	0.7844	26.692	
	Percent	1.51	2.89	9.14	13.55
	Row Pct	11.17	21.36	67.48	
	Col Pct	4.74	11.86	20.93	
Tourism	Frequency	20	44	48	112
and Recreation	Expected	35.737	24.337	48.926	
	Cell Chi-Square	6.9295	10.157	0.0175	
	Percent	1.32	2.89	3.16	7.37
	Row Pct	17.86	39.29	42.86	
	Col Pct	4.12	11.86	7.23	
Total	Frequency	485	371	664	1520
	Percent	31.91	24.41	43.68	100

Statistic	**DF**	**Value**	**p-value**
Chi-Square	12	216.9287	< .0001
Likelihood Ratio Chi-Square	12	230.5231	< .0001
Mantel-Haenszel Chi-Square	1	34.5947	< .0001

Table 5-10 Contingency Table (Categories 4,5, and 7)

		Location			
Category		**West Yellowstone**	**Red Lodge**	**Jackson**	**Total**
Government	Frequency	67	71	79	217
	Expected	61.79	68.60	86.61	
	Cell Chi-Square	0.44	0.08	0.67	
	Percent	15.02	15.92	17.71	48.65
	Row Pct	30.88	32.72	36.41	
	Cel Pct	52.76	50.35	44.38	
Sustainability	Frequency	40	26	51	117
and Conservation	Expected	33.32	36.99	46.70	
	Cell Chi-Square	1.34	3.26	0.40	
	Percent	8.97	5.83	11.43	26.23
	Row Pct	34.19	22.22	43.59	
	Cel Pct	31.50	18.44	28.65	
Tourism	Frequency	20	44	48	112
and Recreation	Expected	31.89	35.41	44.70	
	Cell Chi-Square	4.43	2.08	0.24	
	Percent	4.48	9.87	10.76	25.11
	Row Pct	17.86	39.29	42.86	
	Cel Pct	15.75	31.21	26.97	
Total	Frequency	127	141	178	446
	Percent	28.48	31.61	39.91	100

Statistic	**DF**	**Value**	**p-value**
Chi-Square	4	12.9562	0.0015
Likelihood Ratio Chi-Square	4	13..7808	0.008

Table 5-11 Contingency Table Categories 4 and 5

		Location			
Category		**West Yellowstone**	**Red Lodge**	**Jackson**	**Total**
Government	Frequency	67	71	79	217
	Expected	69.52	63.02	84.46	
	Cell Chi-Square	0.09	1.01	0.35	
	Percent	20.06	21.26	23.65	64.97
	Row Pct	30.88	32.72	36.41	
	Cel Pct	62.62	73.20	60.77	
Sustainability	Frequency	40	26	51	117
and Conservation	Expected	37.48	33.68	45.54	
	Cell Chi-Square	0.17	1.87	0.65	
	Percent	11.98	7.78	15.47	35.03
	Row Pct	34.19	22.22	43.59	
	Cel Pct	37.38	26.80	39.23	
Total	Frequency	107	97	130	334
	Percent	32.04	29.04	38.92	100

Statistic	**DF**	**Value**	**p-value**
Chi-Square	2	4.1522	0.1254
Likelihood Ratio Chi-Square	1	4.2595	0.1189

Table 5-12 Contingency Table Categories 1,2,3, 6, and 7

		Location			
Category		**West Yellowstone**	**Red Lodge**	**Jackson**	**Total**
Natural	Frequency	179	38	222	439
Resources	Expected	139.92	101.42	197.66	
	Cell Chi-Square	10.92	39.66	3.00	
	Percent	15.09	3.20	18.72	37.02
	Row Pct	40.77	8.66	50.57	
	Cel Pct	47.35	13.87	41.57	
Economic	Frequency	84	38	40	162
Development	Expected	51.63	37.43	72.94	
	Cell Chi-Square	20.29	0.01	14.88	
	Percent	7.08	3.2	3.37	13.66
	Row Pct	51.85	23.46	24.69	
	Cel Pct	22.22	13.87	7.49	
Community Development	Frequency	72	110	85	267
	Expected	85.10	61.69	120.22	
	Cell Chi-Square	2.02	37.84	10.32	
	Percent	6.07	9.7	7.17	22.51
	Row Pct	26.97	41.2	31.84	
	Cel Pct	19.05	40.15	15.92	
Growth	Frequency	23	44	139	206
and Development	Expected	65.66	47.59	92.75	
	Cell Chi-Square	27.71	0.27	23.06	
	Percent	1.94	3.71	11.72	17.37
	Row Pct	11.17	21.36	67.48	
	Cel Pct	6.08	16.06	26.03	
Tourism	Frequency	20	44	48	112
and Recreation	Expected	35.70	25.88	50.43	
	Cell Chi-Square	6.90	12.70	0.12	
	Percent	1.69	3.71	4.05	9.44
	Row Pct	17.86	39.29	42.86	
	Cel Pct	5.29	16.06	8.99	
Total	Frequency	378	274	534	1186
	Percent	31.87	23.1	45.03	100

Statistic	**DF**	**Value**	**p-value**
Chi-Square	8	209.68	< .0001
Likelihood Ratio Chi-Square	8	220.37	< .0001

Table 5-13 West Yellowstone and Red Lodge Contingency Table

		Location		
Category		**West Yellowstone**	**Red lodge**	**Total**
Natural	Frequency	179	38	217
Resources	Expected	123	94.05	
	Percent	20.9	4.4	25.4
	Row Pct	82.5	17.51	
	Col Pct	36.9	10.24	
Economic	Frequency	84	38	122
Development	Expected	69.1	52.88	
	Percent	9.81	4.44	14.3
	Row Pct	68.9	31.15	
	Col Pct	17.3	10.24	
Community	Frequency	72	110	182
Development	Expected	103	78.88	
	Percent	8.41	12.85	21.3
	Row Pct	39.6	60.44	
	Col Pct	14.9	29.65	
Government	Frequency	67	71	138
	Expected	78.2	59.81	
	Percent	7.83	8.29	16.1
	Row Pct	48.6	51.45	
	Col Pct	13.8	19.14	
Sustainability	Frequency	40	26	66
and Conservation	Expected	37.4	28.61	
	Percent	4.67	3.04	7.71
	Row Pct	60.6	39.39	
	Col Pct	8.25	7.01	
Growth	Frequency	23	44	67
and Development	Expected	38	29.04	
	Percent	2.69	5.14	7.83
	Row Pct	34.3	65.67	
	Col Pct	4.74	11.86	

		Location		
Category		**West Yellowstone**	**Red lodge**	**Total**
Tourism	Frequency	20	44	64
and Recreation	Expected	36.3	27.74	
	Percent	2.34	5.14	7.48
	Row Pct	31.3	68.75	
	Col Pct	4.12	11.86	
Total	Frequency	485	371	856
	Percent	56.7	43.34	100

Statistic	**DF**	**Value**	**p-value**
Chi-Square	6	122.56	<.0001
Likelihood Chi-Square	6	129.06	<.0001

Table 5-14 West Yellowstone and Jackson Contingency Table

		Location		
Category		**West Yellowstone**	**Jackson**	**Total**
Natural	Frequency	179	222	401
Resources	Expected	169.26	231.74	
	Percent	15.58	19.32	34.9
	Row Pct	44.64	55.36	
	Col Pct	36.91	33.43	
Economic	Frequency	84	40	124
Development	Expected	52.34	71.66	
	Percent	7.31	3.48	10.79
	Row Pct	67.74	32.26	
	Col Pct	17.32	6.02	
Community	Frequency	72	85	157
Development	Expected	66.27	90.73	
	Percent	6.27	7.4	13.66
	Row Pct	45.86	54.14	
	Col Pct	14.85	12.8	
Government	Frequency	67	79	149
	Expected	61.63	84.37	
	Percent	5.83	6.88	12.71
	Row Pct	45.89	54.11	
	Col Pct	13.81	11.9	
Sustainability	Frequency	40	51	91
and Conservation	Expected	38.41	52.59	
	Percent	3.48	4.44	7.92
	Row Pct	43.96	56.04	
	Col Pct	8.25	7.68	
Growth	Frequency	23	139	162
and Development	Expected	68.38	93.62	
	Percent	2	12.1	14.1
	Row Pct	14.2	85.8	
	Col Pct	4.74	20.93	

		Location		
Category		**West Yellowstone**	**Jackson**	**Total**
Tourism	Frequency	20	48	68
and Recreation	Expected	28.70	39.30	
	Percent	1.74	4.18	5.92
	Row Pct	29.41	70.59	
	Col Pct	4.12	7.23	
Total	Frequency	485	664	1149
	Percent	42.21	57.79	100

Statistic	**DF**	**Value**	**p-value**
Chi-Square	6	92.568	<.0001
Likelihood Chi-Square	6	100.0707	<.0001

Table 5-15 Red Lodge and Jackson Contingency Table

Category		Red Lodge	Jackson	Total
Natural	Frequency	38	222	260
Resources	Expected	93.20	166.80	
	Percent	3.67	21.45	25.12
	Row Pct	14.62	85.38	
	Col Pct	10.24	33.43	
Economic	Frequency	38	40	78
Development	Expected	27.96	50.01	
	Percent	3.67	3.86	7.54
	Row Pct	48.72	51.28	
	Col Pct	10.24	6.02	
Community	Frequency	110	85	195
Development	Expected	69.90	125.10	
	Percent	10.63	8.21	18.84
	Row Pct	56.41	43.59	
	Col Pct	29.65	12.8	
Government	Frequency	71	79	150
	Expected	53.77	96.23	
	Percent	6.86	7.63	14.49
	Row Pct	47.33	52.67	
	Col Pct	19.14	11.9	
Sustainability	Frequency	26	51	77
and Conservation	Expected	27.60	49.40	
	Percent	2.51	4.93	7.44
	Row Pct	33.77	66.23	
	Col Pct	7.01	7.68	
Growth	Frequency	44	139	183
and Development	Expected	65.60	117.40	
	Percent	4.25	13.43	17.68
	Row Pct	24.04	75.96	
	Col Pct	11.86	20.93	

		Location		
Category		**Red Lodge**	**Jackson**	**Total**
Tourism	Frequency	44	48	92
and Recreation	Expected	32.98	59.02	
	Percent	4.25	4.64	8.89
	Row Pct	47.83	52.17	
	Col Pct	11.86	7.23	
Total	Frequency	371	664	1035
	Percent	25.85	64.15	100

Statistic	**DF**	**Value**	**p-value**
Chi-Square	6	118.0184	<.0001
Likelihood Chi-Square	6	123.9808	<.0001

A note on reading content analysis results and discussion

This study differentiates between articles and references (or "quotes"). An article is considered a newspaper article in its entirety. A reference or quote is considered a passage in an article, about or referring to a topic relevant to sustainability as identified in this research. An article may consist of numerous individual references, each relating to separate topics. For example, an article could contain references to bison management and its impacts on local economies. In this instance, passages in the article related to bison management would be coded in the family 'bison management,' and the super-family 'natural resources.' Passages in the article related to economics would be coded in the 'economics' family and the 'economic development' super family. This article would then be analyzed in the results chapter as occurring in both the natural resources category, and the economic development category.

Chapter 6 is divided into discussion based on each individual community, and the prevalent topics in that community. The beginning of each section will give an overview of how many articles pertained to a given topic, and how many references there were to that topic. For example, in West Yellowstone 193 articles were analyzed. Fifty-seven of those articles (30 percent) were categorized as relating to natural resources. This

suggests that 57 separate articles contained at least one code related to natural resources. In addition, 179 quotes (37 percent of all references) were categorized as focusing on topics related to natural resources. Because an individual code could not be used more than once in a single article, this suggests there were 179 separate instances of references to natural resources in the 57 articles, or approximately 3 natural resource-related codes per article.

While recognizing how many articles pertained to a given topic is valuable, results are discussed based on references because this provided for a broader understanding and appreciation of the topic under consideration, and allowed for an in-depth appraisal of priorities in study communities.

Key Informant Interviews

The key informant technique is a research method for improved understanding of the opinions and beliefs of community members who may have specialized knowledge of the subject under examination as result of their positions in society (Rubin and Babbie 2009; Marshall 1996). Tremblay (2009) suggested that researchers should be conscious of several factors when selecting key informants, paying particular attention to their roles in the community, overall knowledge of the subject matter, willingness to participate in the research process, and ability to communicate their opinions and beliefs. If the criteria are met, the key informant technique provides a number of advantages, especially when based on interviews. As opposed to general mailed or in-person surveys, key informant interviews provide for a relatively high response rate. Further, they allow for a more thorough examination of the subject matter because fewer answers are missed, and because the researcher has the opportunity to clarify responses and probe deeper into particular subject matters (Rubin and Babbie 2009). However, the technique does have its weaknesses in that key informant interviews have the potential to be more expensive and consume more time than other methods. Respondents may also feel more concerned about a lack of anonymity, which may result in less than candid responses (Rubin and Babbie 2009). In addition, respondents often are not be representative of the entire population and may not have a full understanding of the phenomenon under study

(Marshall 1996). Depending on the nature of the research, this may not be a major concern.

Because the key-informant technique is based in ethnography it is particularly well suited to study the patterns of problems and their causes within societies, and allows those patterns to be linked to local, regional, national, and global socio-economic and socio-political structures. These patterns and connections may then be utilized to provide beneficial plans and actions for local communities (LeCompte, Schensul and Schensul 1999). For this study, key informant interviews allowed for an increased understanding of local perceptions, priorities, and goals related to sustainable community development and natural resource management, as well as the power and influences that are most prevalent in each community. Specifically, key informant interviews addressed research questions 1.1-1.4 and 2.1-2.2. It should be noted that key informant interview responses,

Key Informant Data Collection and Analysis

Development

A list of potential key informants was developed in March of 2010. This list was compiled using local Chambers of Commerce, city and county offices, and local, regional, and national non-government organizations. Key informants were initially contacted in April of 2010 via email or mailed letter to explain the project and inquire about availability for May-August 2010 interviews. Based on responses, approximately 10-15 interviews were conducted in each of the study areas, with a total of 32 key informant interviews conducted. Semi-structured interviews with local government officials (e.g., mayors and city council members, operations managers, public works employees, building and planning officials, parks and recreation representatives, open land boards, and planning and zoning commissions), local and regional non-governmental organizations and institutions (e.g., Greater Yellowstone Coalition, Gallatin Valley Land Trust, Madison Valley Ranchlands Group), and local business owners (e.g., hotel/motel operators, recreational equipment rental agencies, bars/restaurants, recreational guide services) were performed between May 2010 and August 2010.

Attempts were made to conduct interviews with representatives of both the National Park Service and the US Forest Service. As of April 2010, the US Forest Service had experienced a high level of turnover in their field offices in the Greater Yellowstone Ecosystem. In addition, several forest supervisors from the region had recently taken positions outside the GYE, and were unavailable for interviews. Representatives of the National Park Service were willing to participate in the research; however, an extensive application, proposal, and review process was in place at the national level. In March of 2010, a completed application (application, research proposal, and peer reviews) was submitted to the National Park Service Research Permit and Reporting System (http://science.nature.nps.gov/research) for both Yellowstone (#54957) and Grand Teton national parks (#55032). After situations that saw both permit applications misplaced, permits were denied and contact with individual park research coordinators was encouraged. As each park limits the number of research projects during a given year – typically around 200 – it was suggested that submitting the application the following year was best course of action. In addition, the peer reviews submitted were not deemed acceptable as they were located at institutions with which the researcher had academic and professional ties. Thus, key informant interviews with representatives of the NPS and USFS are not included in this research. It is hoped that future research will include such interviews: they are viewed as being important the sustainability discourse in the Greater Yellowstone Ecosystem.

In-person key informant interviews occurred between June 7 and June 10, 2010, in West Yellowstone, between June 14 and June 17, 2010, in Jackson, and between June 26 and July 22, 2010, in Red Lodge. In addition to scheduled interviews, spontaneous interviews (snowball interviews) were conducted based on input from key informants. Two interviews were conducted with non-government organizations on June 24, 2010, and August 1, 2010, in Bozeman, Montana. Due to key informant preference, three interviews were conducted via email on August 31, 2010, September 22, 2010, and November 14, 2010.

The semi-structured interview questionnaire (Appendix I) consisted of 11 primary open-ended focal questions and two open-ended probing sub-questions. Basic demographic data were also collected. Respondents were asked the same questions in

approximately the same sequence; however, questions could be added, removed, or changed depending on responses. This allowed for the maximum breadth of coverage of primary topics and themes and allowed collection of additional insights from key informants. Qualitative interview data were collected using digital tape recorders (when approved by the interviewee), transcribed into individual Microsoft Word documents, and analyzed using a systematic content analysis process implementing the same techniques as the newspaper content analysis process.

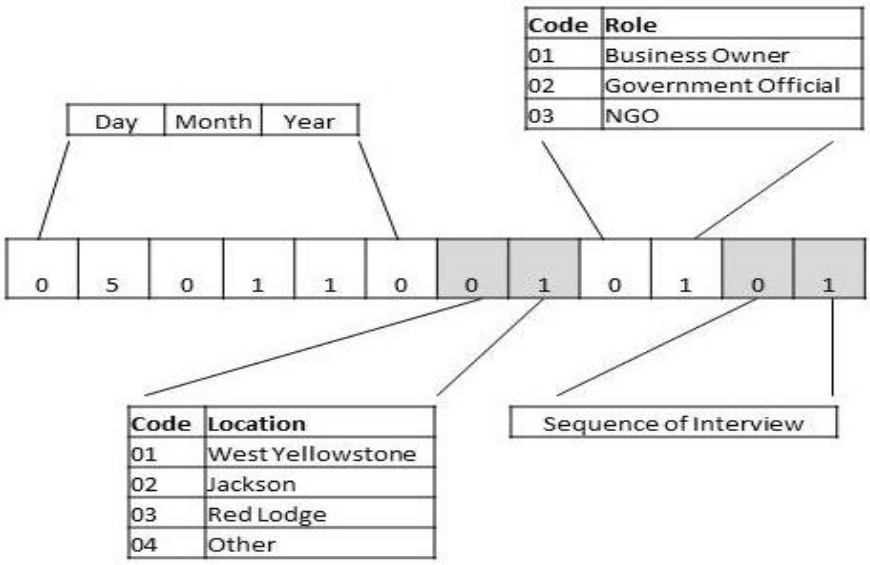
Potential for Interview Biases

Although every attempt was made to reduce or eliminate influence/bias in key informant interviews (*i.e.*, respondents answering similar questions in similar order), some influence/bias was observed during the interview process. Influence or bias was experienced on questions related to the triple bottom line (environment, economy, and society). In particular, key informant were asked what element of the triple bottom line was prioritized in their community. If key informants were unfamiliar with the triple bottom line, the interviewer explained the concept. This may, in certain instances, have led to key informant responses that were not indicative of their perceptions of the top priorities in the community. In future iterations of key informant interviews it is suggested that the interviewer ask for overall priorities first, with follow up questions related to the triple bottom line, if relevant in those terms.

Data Confidentiality

To ensure confidentiality of key informant identities, each interview was assigned a numeric identifier consisting of the date of interview, a pre-determined numeric code for each community (01-04), the informant's role in the community (01-04), and the number of the interview if multiple interviews were conducted on the same day (e.g. 050110010101) (Figure 5-2). The Institutional Review Board and the University Research Compliance Office for Kansas State University approved (IRB #5464) the confidentiality component of this study, key-informant interview questions, and the informed consent statement (Appendix D) prior to fieldwork. The informed consent statement was presented to each informant prior to the beginning of the interview.

Figure 5-2 Interview Identifier Schematic



Transcription

Immediately following each interview session a summary was written describing the most salient points in the interview and other critical information to aid in later analysis and improved subsequent interviews. Interviews conducted with the use of a digital voice recorder were uploaded to the interviewer's computer and saved based on its unique identifier. Transcription of the digital audio files utilized *Express Scribe* version 5.13 (NCH Software 2010) playback software. Interviews were transcribed (Appendix J) verbatim into *Word* documents, with the unique numeric identifier as file name. Transcripts began with the first interview question (introductory statements were not transcribed). Interview questions were identified by the interviewer's initials while responses were identified by the initials KI (key informant). If multiple key informants were simultaneously interviewed, informants were identified by number (i.e., KI1, KI2 etc.). Linguistic fillers and verbal pauses (e.g. um, ah) were generally removed to improve clarity of response. Because interviews were initially transcribed at a reduced playback speed, each interview was listened to and edited a second time at full speed ensuring greater accuracy in transcription. Lastly, interview transcripts were edited for grammar to retain clarity of content.

Content Analysis

The content analysis of key informant interview transcripts was accomplished with techniques similar to those employed in the newspaper analysis. The primary difference was that transcripts were coded for content, as well as specific interview questions. By coding specifically based on interview questions, it was possible to query based on those questions and derive quantitative results across multiple interviews. For example, each respondent was asked, "what was the biggest challenge your community faced." Each response was coded based on individual answers (e.g., Biggest Challenge: federal policies). It was then possible to quantify responses to determine how many key informants felt that federal policies were their biggest challenge. Further, it was possible to query how responses varied spatially based on each transcript's Primary Document Family, and other related attributes. For example, it was possible to determine whether key informants who lived in their community for less than 10 years and were government officials were more likely to say that federal policies were their biggest challenge than those who had lived in their community for more than 10 years and were business owners.

Statistical Analysis

Analysis of these data began with descriptive statistical analysis of coded entries for each individual study area. Because of the relatively low number of key informant interviews (n=32), and because variables were highly correlated , additional statistical analysis was not possible.

Chapter Five Summary

A multi-source, mixed methods approach was implemented to better understand the perceptions, goals, and priorities of members of three communities in the Greater Yellowstone Ecosystem as they relate to sustainable community development and natural resource management, as well as the institutions and agencies that influence locally-induced change and decision making processes. Methods included archival research, content analysis, and key informant interviews. In addition to providing a broader spatial and temporal perspective on local to regional conditions, this approach allows for

triangulation and cross-validation of findings. Archival research included documents collected through local, county, and state historical societies, non-government organization, and state and federal agencies including the National Park Service and the U.S. Bureau of the Census. Content analysis consisted of the classification of newspaper articles from *West Yellowstone News, Carbon County News*, and *Jackson Hole News & Guide*. The local weekly newspapers were chosen as they would be the most representative of the perceptions of the individual communities and the region as a whole. A total of 35 semi-structured interviews were conducted with key informants between May and August 2010. Key informant interviews allowed for an increased understanding of local perceptions, priorities, and goals related to sustainable community development and natural resource management, as well as the power and influences that are perceived to be most prevalent in each community.

Chapter 6 - Results: Newspaper Content Analysis

Newspaper Content Analysis[3]

This study used the content of analysis of local newspapers (*West Yellowstone News*, *Jackson Hole News & Guide*, and *Carbon County News*) to investigate decision maker and stakeholder priorities for the local and regional environment, community, and economy (research questions 1.2-1.3), as well as whether those priorities were related to sustainability goals (research question 1.4). In addition, content analysis provided the opportunity to determine the actions that had been taken to promote sustainability (research question 2.2), as well as community perceptions related to vulnerability, resilience, adaptation, and mitigation of change (research questions 3.1 -3.2). The content analysis of multiple local newspapers through the Greater Yellowstone Ecosystem also allowed for a comparative analysis of the three amenity-driven communities under investigation.

West Yellowstone

A total of 193 articles from the *West Yellowstone News* between January 1, 2000, and December 31, 2009, were analyzed. Of these, 57 articles (30 percent) were categorized as focusing on topics related to natural resources. This was followed by economic development, government, community development, and sustainability and conservation (Table 6-1). A total of 179 references, or 37 percent of all analyzed quotes, were categorized as focusing on topics related to natural resources. This was followed by economic development (17 percent), community development (15 percent), government (14 percent), sustainability and conservation (8 percent), growth (5 percent), and tourism and recreation (4 percent) (Table 6-2). The analysis and discussion of individual sub-categories are based on their preponderance within their associated category of

[3] Mentions of individuals' names in this section are based strictly upon published comments. Information from interviews is not provided by name.

Table 6-1 *West Yellowstone News*: Articles by Category

Category	Number of Articles	Percent
Natural Resources	57	29.5
Economic Development	54	28.0
Government	50	25.9
Community Development	49	25.4
Sustainability	27	14.0
Tourism and Recreation	23	11.9
Growth	20	10.4

Table 6-2 *West Yellowstone News*: References by Category

Category	Number of References	Percent
Natural Resources	179	36.9
Economic Development	84	17.3
Government	72	14.8
Community Development	67	13.8
Sustainability	40	8.2
Tourism and Recreation	23	4.7
Growth	20	4.1

newspaper references, and priority in their respective community based on key informant interview discussions.

Natural Resources

When considering the individual constituents of natural resources, West Yellowstone's most-discussed topic was the bison management plan, accounting for 63 percent of natural resource-related quotes (Table 6-3) (Appendix E). The bison plan references can be further broken into 12 separate categories (Table 6-4) that vary in importance from bison management (11.7 percent of quotes) to the Buffalo Allies of Bozeman (0.6 percent).

Today, one of the largest concerns facing the residents, business proprietors, and tourists to West Yellowstone is the decade(s)-long debate regarding the management of bison and the Interagency Bison Management Plan (IBMP). The issue involves the last

Table 6-3 *West Yellowstone News*: References to Natural Resources

Natural Resources	Number of References	Percent of All Concerns Mentioned	Percent of Category
Bison Management	113	23.3	63.1
Forest Fires	10	2.1	5.6
Forest Service	7	1.4	3.9
Wolves	9	1.9	5.0
Weather and Climate	5	1.0	2.8
Bears	4	0.8	2.2
Hunting	4	0.8	2.2

Table 6-4 *West Yellowstone News*: Bison Management References

Natural Resources	Number of References	Percent of All Concerns Mentioned	Percent of Category
Bison Management	21	4.3	11.7
Dept. of Livestock	19	3.9	10.6
Brucellosis	16	3.3	8.9
Hazing and Slaughter	15	3.1	8.4
Horse Butte	12	2.5	6.7
Buffalo Field Campaign	11	2.3	6.1
Bison Hunt	6	1.2	3.4
Bison Capture Facility	4	0.8	2.2
Bison	3	0.6	1.7
Church Universal and Triumphant	3	0.6	1.7
Livestock Industry	2	0.4	1.1
Buffalo Allies of Bozeman	1	0.2	0.6

free roaming herd of bison in its native habitat, and its departure from Yellowstone National Park (YNP) each spring in search of forage near West Yellowstone and Gardiner, Montana.

At stake is the Montana's designation as a "brucellosis free state," allowing the cattle to be shipped throughout the country without the added expense of brucellosis vaccination (see Chapter 3). Brucellosis and bison ultimately pit the Montana Department of Livestock (DOL), the Montana Stockgrower's Association, and the cattle ranchers of southwestern Montana against environmental and animal rights advocates

(Kiasatpour and Whitfield 2008). As Montana Governor Schweitzer suggested in 2007, "we in Montana do not intend to lose our brucellosis-free status" (Hoffmann 2007a).

To limit the potential exposure of cattle to the disease, the IBMP was adopted in 2000 to facilitate the coordination of bison management in the region. To protect cattle from obtaining the disease the IBMP allows for the herding, or hazing, of bison back into Yellowstone National Park. Those bison that do not respond to hazing are either transferred to capture facilities to be tested for the disease, or slaughtered (Kiasatpour and Whitfield 2008; Daniels and Hillman 2002; Ragan 2002). Because of its polarizing nature, the bison management issue is one of the largest concerns facing the citizens of the GYE today. Further, because the bison are often considered the symbol of YNP, this issue has spread outside the confines of the region. As Representative Raul Grijalva of Arizona suggested before the House Natural Resource Committee in 2007, "the slaughter of bison needs to stop." Representative Nick J. Rahall of West Virginia followed, stating that "slaughter is not management, it is the approach of a bygone era" (Hoffman 2007a).

Anti-IBMP sentiments abound in West Yellowstone, and are typified by Monica RavenHeart of Livingston, Montana, who stated, "Forgive them for they know not what they do" when asked to express her feelings toward the continued slaughter of bison (RavenHeart 2008). Further frustration exists among community members who feel that the large budget of the IBMP could be better used to establish "a real winter range for bison, i.e., negotiating conservation easements with landowners and buying out grazing allotments, efforts that would help all wildlife and cash strapped ranchers at the same time" (Leusch 2001). These sentiments were also expressed by the US Government Accountability Office (GAO) when it found that "despite eight years and $16 million spent since 2002, the IBMP is failing to allow bison to range freely out of Yellowstone National Park" as it was originally established to do (WYN 2008a).

Because the community of West Yellowstone depends heavily on the tourism industry, the bison management argument can also be framed in economic terms. This was exemplified when Stephany Seay, of the Buffalo Field Campaign, stated "tourists aren't stopping along the roadside to take pictures of cattle – they are awestruck by wild buffalo (Seay 2007). Joe Gutkoski, a bison advocate furthered this argument when he suggested that "buffalo on public land can be an economic gift to Montana, the Last Best

Place"(Gutkoski 2007), while Katie Flynn, a local business owner, expressed concern that continued hazing operations would be detrimental to her livelihood. She stated, "my guests are appalled by what they see here" (Flynn 2008). Advocates for the IBMP, however, have argued that its implementation ensures the economic viability of local ranchers. When speaking of changes to the IBMP, which allowed bison to freely roam on private property outside the Park, John Bloomquist, a lawyer for the Montana Stockgrowers Association, stated, "we have two livestock producers whose herds, whose livelihoods and whose economic viability, whose entire operation, is at risk if the Department of Livestock does not properly manage bison" (Person 2009).

One of the most contentious locations relating to bison management in Montana has been Horse Butte Peninsula, a springtime destination for bison on the shores of Hebgen Lake. In 1998, the Montana DOL was issued a 10-year permit to establish a portable bison capture facility for brucellosis testing on two acres of Gallatin National Forest land located on the peninsula. This permit was later re-issued in 2009 for an additional 10-year period (WYN 2009a). The re-authorization of capture facilities on the peninsula angered some residents, who place the blame for extending the permit on Mary Erickson, Gallatin National Forest Supervisor, who ultimately signed off on the permit. Residents such as Tristan Husby feel that as forest supervisor, Erickson's job is to "manage and conserve the habitat for wildlife in the Gallatin National Forest on behalf of American citizens" (Husby 2009).

Bison advocates suggested that not only are federal lands surrounding Horse Butte cattle-free, but also that Horse Butte itself is cattle-free year-round, eliminating the possibility of cattle-bison interaction or the transmission of brucellosis (Brown 2008; Seay 2008). Further, beginning in 2003, a group of landowners on Horse Butte formed the 'Horse Butte Neighbor of Buffalo' (HOBNOB), and publically called for the termination of hazing activities on Horse Butte. Co-founder of HOBNOB Karrie Taggart stated in a letter to the Governor of Montana, Judy Martz, "I feel like you are stealing something from me; stealing my right to enjoy the animals. We're all tired of it; the noise and disruption. We've had enough" (Warner 2004). Other concerns on Horse Butte included the danger of hunting on the peninsula. In a letter to Governor Schweitzer, Horse Butte resident Ann Stovall noted, "It's bad enough that you are

allowing these so-called hunters to hunt these magnificent animals in the first place, but what is really bad is that the hunters and the Department of Livestock are given priority above the safety of the people and animals that live out here" (Hoffman 2007c).

By 2007, the management of bison on Horse Butte had taken a turn. No longer were residents simply protesting against the hazing of bison on public lands as in the past, but it was felt that private property rights were also being violated (Abramo 2007):

> The DOL can come onto our property, and we cannot stop them. We will fight you to the death on this issue. We are making it known far and wide what hypocrites you really are. Cattle, that do not exist, are more important than native wildlife…We know the truth. We've known it all along. This is not about bruscellosis [sic]. This is about power, control, a blade of grass, and the almighty dollar (McClure 2007).

A 700-acre parcel of Horse Butte critical to bison management was purchased by a couple from Salt Lake City who wrote:

> Under this new ownership cattle will no longer be allowed to graze on the ranch and we are deeming our private property a Bison Free Zone and a wildlife preserve. Any government entry onto the land without permission will be construed as trespassing and be subject to prosecution to the full extent of the law. The current policy of hazing is inhumane, senseless, a waste of taxpayer dollars and an embarrassment to the state of Montana. We trust you will respect our private property rights (McMillin 2007a).

Despite strong opposition, State Veterinarian Marty Zaluski countered, "the state livestock department has the legal authority to go onto private land, if necessary, to conduct bison management activities" (McMillin 2007a). In addition, Republican Denny Rehberg of Montana suggested it was the National Park Service's job to protect the cattle industry, stating, "Why don't you fix your herd? Don't let diseased herds walk around the park, because you won't want us, as livestock herders, to have an infected herd in among your wildlife." Governor Schweitzer added "We in Montana do not intend to lose our brucellosis-free status," and suggested that to ensure this he proposed paying ranchers to remove cattle from bison migrating grounds, or slaughtering those bison who tested positive for the disease while vaccinating the rest (Hoffmann 2007a). A shift in the implementation of the IBMP, which allows female bison unlimited access to Horse Butte from November through May is, however, seen as a step in the right direction and a

compromise by both sides of the issue as bison are allowed to forage on the land prior to the introduction of cattle (Sang 2009a).

One thing is clear: the bison is the iconic symbol of Yellowstone National Park, and the community of West Yellowstone. The close relationship that exists between the town and the species is most readily witnessed through the success of the 'Where the Buffalo Roam' project. The project was promoted by Clyde Seely, vice president of the West Yellowstone Economic Development Council, who saw the success of similar projects in Calgary and Chicago, with their painted cows, and the painted ponies of Salt Lake City (Warner 2006a). Seely sold the idea of local businesses donating $3000 each for the chance to display a bison for one year in front of their business. He suggested, "I can guarantee you that in the course of a busy day in the summer, hundreds of tourists will take a photograph of the bison that's standing in front of your business" (Warner 2006b). All told, 25 near life-sized buffalo were constructed and painted by local and regional artists for display throughout the community by 2007 (Stoddard 2007). In the spring of 2008, ten painted buffalo calves were unveiled to the public in coordination with the appearance of bison calves throughout the region, as well as a 'Buffalo Roam Treasure Trail Map,' which allowed tourists to explore the town and the painted statues (Hoffmann 2008). Most of the painted buffalo roamed out of town on August 29, 2009, but not before adding even further to the economic base of the community. Over $165,000 was raised through a live auction of the painted buffalo, and while the majority of the 35 painted buffalo left West Yellowstone, 10 remained through their purchase by local businesses (Hoffman 2009).

Economic Development

A total of 54 articles, or 28 percent of all analyzed articles for West Yellowstone, were categorized as focusing on topics related to economic development (Table 6-1). When considering the individual constituents of economic development, the most discussed topic was the Yellowstone National Park Winter Access Plan, accounting for 41 percent of all economic development-related quotes. This was followed by the resort and bed tax, and the West Yellowstone Economic Development Council (WYEDC) (Table 6-5) (Appendix F).

Table 6-5 *West Yellowstone News*: Economic Development References

Economic Development	Number of Quotes	Percent of All Articles	Percent within Category
Snowmobile - Winter Use Plan	34	17.6	40.5
Resort/Bed Tax	11	5.7	13.1
WYED	10	5.2	11.9
New Businesses	9	4.7	10.7
Economic Development	3	1.6	3.6
Economic Diversification	3	1.6	3.6
Tourism - Economics	3	1.6	3.6

Yellowstone's Winter Access Plan

Just as the bison management issue pit buffalo advocates against livestock advocates, winter tourism in Yellowstone NP has pitted snowmobile advocates against non-snowmobile advocates. Tourism is big business in West Yellowstone, and this business is drawn almost exclusively from the millions of visitors who enter the park each year. Specifically, the park as a whole had 3.3 million visitors in 2009, with West Yellowstone hosting 55.4 percent, or 1.8 million visitors in total. The vast majority of those visitations occurred during the summer months of May through September, with only 1.5 percent of all visitors entering the park through West Yellowstone during the months of December through March (NPS-PUSO 2010). However, winter visitors are critical to the year-round survival of local businesses, and the debate between how to ensure the protection of the park while simultaneously improving the economic viability of local businesses has stirred for over a decade. Sung, Phaneuf and Thurman (2008) suggested that it is the region's abundant snowfall, the 186 miles of groomed snowmobile trails in the park, and the additional 400 miles of trails outside the park that have drawn snowmobilers year after year. Additionally, differing views on how to manage winter use in the park has resulted in a near-continuous string of lawsuits and management plans. These lawsuits and shifts in management plans have left the NPS strained as it continually revises and files environmental impact statements, and has left communities like West Yellowstone planning their livelihoods around the actions of extra-local institutions and agencies. Further, they have forced the snowmobile industry to invest in

technologies that may never be adopted, while also re-focusing the efforts of environmental organizations on this single activity.

Motorized winter use of the park began in 1949. However, it was not until 1990, with a winter use plan that allowed un-restricted access to Grand Teton and Yellowstone National Parks, that environmental groups began to take notice. In 1997, the Fund for Animals filed a lawsuit against the National Park Service, claiming that the environmental impact statement (EIS) prepared by the NPS failed to consider the implications of snowmobile use on endangered and threatened species. This resulted in a reversal of the winter use plan, and the NPS eventually called for the phasing out of snowmobiles by 2003. Marsha Karle, a representative for YNP, suggested at the time that the limitations imposed on winter use was "a viable option, both economically and as a way to see the park." Karen Wade, Park Service Regional Director added, "our obligation in managing winter use in these parks is to ensure that public activities we allow conserve park resources and values for future generations" (AP 2000). The late Senator Craig Thomas was concerned over public access to federal lands, noting "whether or not you are a snowmobile user, it is not overstating things to say that the recreational and use rights of everyone to access public lands are at stake when a federal agency makes no real effort to accommodate them" (AP 2000).

Here is the crux of the issue: how to manage the lands for the enjoyment of the people while simultaneously protecting the lands for future generations. Environmental groups such as the Greater Yellowstone Coalition have argued since at least 2001 that one of their primary concerns was the pollution produced by snowmobiles. Mike Clark, director of the GYC stated at that time that "although automobile numbers outnumber snowmobiles 16 to 1 during the course of a year in Yellowstone, snowmobiles pour out up to 68 percent of the park's annual carbon monoxide emissions and up to 90 percent of Yellowstone's yearly hydrocarbon pollution" (Clark 2001). However, not all residents or environmentalists were on board with the GYC's position, with residents such as Jerry Fussell speaking out against the organization's tactics.

> I am an environmentalist and Life Member of The Nature Conservancy who prefers cross-country skiing. It is, nevertheless, my opinion that certain environmental organizations have engaged in unethical practices in the effort to achieve their goal to ban snowmobiles in Grand Teton and

> Yellowstone National Parks. I speculate that the resultant rage, both expressed and unexpressed, among politicians and other interested parties has provided much of the energy being put forth to overturn the ban (Fussell 2001).

Others felt that the Greater Yellowstone Coalition and other anti-snowmobile use groups had not given the industry or rental operations in West Yellowstone the opportunity to test newly emerging technologies such as the 4-stroke engine. An opinion article from 2004 suggested, "The many thoughtful, law-abiding, winter-loving, park-loving visitors who choose to make that visit, under controlled conditions and on a proper snowmobile, deserve the opportunity to demonstrate that they can do so without damaging or degrading the park or the experiences of other visitors" (WYN 2004b)

At about the same time the winter use ban was supposed to take effect (2003), community leaders, and business owners in West Yellowstone and the state of Montana began to predict their economic demise. The Town Council of West Yellowstone predicted, in July 2003, that a total loss in revenues of $3.5 million, or $1 million per month was to be expected (WYN 2003a). At the same time, U.S. Representative Denny Rehberg of Montana assembled a five person Economic Development Assessment Team to determine potential outcomes if a ban was implemented (WYN 2004). Although the Town Council and Assessment Team looked to the future, local business owners attempted to protect their own and their community's way of life. local business owner Clyde Seely stated, "I'm committed to do whatever it takes, for as long as it takes. I'll never say die, never give up, not until the very last shred of hope is gone. So much is at stake. Without snowmobiles in the park our community is in very serious trouble." In response to the loss of 60,000 winter visitors annually, Seely added,

> It is beyond my imagination how in the world we are ever going to duplicate the 60,000 visitors who come here in the winter to see the park on a snowmobile. There is no other draw that can do what Yellowstone does, and no other way to adequately attract sufficient visitors that (sic) via the snowmobile (Seely 2004).

Others, such as Vikie Hancock of Buhl, Idaho, put the blame for the winter access issue on business leaders and the community itself. As she noted, "It seems the business leaders of West [Yellowstone] hitched their futures on a snowmobile years ago and can't

get un-hitched. The town has promoted them so well that the image of West Yellowstone is a place over-run with hoards of sleds, a town with no room for anyone else." Her solution was the promotion of other winter recreational activities in the region such as cross-country skiing, while simultaneously promoting snowmobiling in the national forests, as opposed to the national park (Hancock 2004).

By 2007, the NPS had increased the daily number of snowmobiles in the park to 540, up from 278, but those machines were to conform to BAT (Best Available Technology) standards that reduced air and noise emissions. Further, the 2007 winter use plan for the first time required all visitors to be guided through the park by commercial operators (WYN 2007). As one frustrated resident suggested at the time, "economically, the town of West Yellowstone cannot survive much more of this" (Warner 2007) Public comment periods leading up to the 2007 NPS decision also saw the re-visitation of an old argument, park plowing. Recognizing a perceived decline in interest in snowmobiling, longtime resident Doug Edgerton noted that not only would plowing of park roads result in the potential for a "true year round economy to develop, not dependent on snowfall, or ruined by the lack of it," but also the opening of the park to segments of the public to which the traditional "expensive and very exclusive winter over snow experience" had been previously limited (Edgerton 2006). This was echoed by business owner Bill Oldroyd, who noted, "plow those roads, and allow private vehicles in the Park. People on a budget can't afford the Park in winter." Shane Roos added "West Yellowstone is dying, business is dying," as a result of winter access litigation, while professor of political sciences at Montana State University Jerry Johnson concluded, "we've reached the bottom and are now working our way back up out of that hole" (Hoffman 2007c)

The winter of 2008 brought with it a continued decline in snowmobile usage nationwide, with winter visitors declining in the region by as much as 30 percent. This resulted in businesses reducing employee numbers, or closing for the winter months outright (McPherson 2008). In the autumn of 2009, another public comment period was opened by the National Park Service seeking input on a revision to the winter use plan that would reduce daily snowmobile numbers to 318, the number proposed in 2008. This EIS was agreed upon by US District Judge Emmet Sullivan of Washington, D.C, but was later overruled by US District Judge Clarence Brimmer of Wyoming (Sang 2009b).

Community Development

A total of 49 articles, or 25 percent of all analyzed articles for West Yellowstone were categorized as focusing on topics related to community development (Table 6-1). When considering the individual constituents of community development, the most discussed topic was strategic planning and visioning (Table 6-6) (Appendix G), accounting for 21 percent of all community development-related references. This was followed by the Buffalo Roam Project (10 percent), education (10 percent), and medical services (10 percent).

Strategic Planning and Visioning

"How does a tourist town grow? Where is the community headed? Where is it likely to be in five years? Where do we want to be?" (WYN 2001). These have been the questions that have plagued West Yellowstone for decades, and a question which the community hoped to address through the development of a formal strategic long-term plan. The unique challenges faced by a tourist-driven community were well articulated at a Chamber of Commerce meeting in 2003:

> Tourism will continue to be a realistic income for many of us living in Montana. When the numbers start to add up…strategic planning becomes very necessary if we are to maintain control and not rob ourselves of quality of life for the sake of profit. The strategic plan seeks to do this through the management of information and the sues of assets while creating teams and partnerships which give voice to all Montanans (WYN 2003b).

In order to develop a long-term plan for the community, approximately 30 citizens began to meet as members of the "West Yellowstone Community Visioning Group" in 2001 (Warner 2001a). The group's main task was to draft goals for three areas: economics, society, and governance. The primary goal for economics was to "increase the economic stability of West Yellowstone through a year-round, diversified revenue stream." Social goals would focus on making "available health care, housing options, education opportunities, and leadership" available. Finally, the focus of governance was to allow for "greater communication and information sharing with agencies and entities that effects [sic] the health, welfare and economy of the city" (Warner 2001b).

Table 6-6 *West Yellowstone News*: Community Development References

Community Development	Number of Quotes	Percent of All Articles	Percent within Category
Strategic Planning/Visioning	15	7.8	20.8
Buffalo Roam Project	7	3.6	9.7
Education	7	3.6	9.7
Medical	7	3.6	9.7
Senior Center	6	3.1	8.3
Social Development	5	2.6	6.9
Community Center	4	2.1	5.6
Historic District	4	2.1	5.6
Public Outreach	4	2.1	5.6

During initial meetings, seven goals were established, all of which the group hoped would be accomplished in the coming year. These goals were to begin the process of town beautification, to develop a recreational complex concept, to determine the feasibility of year-round usage of the airport, to determine an effective health care scenario, to identify affordable housing options, to implement extended educational opportunities, and to promote healthier communication for all stakeholders (WYN 2001). The goals and areas of focus (Table 6-7) that were established in 2001 were eventually re-focused into five goals and ten rated action items (Table 6-8).

Table 6-7 West Yellowstone Community Visioning Goals

Goal	Description
A	Define and implement programs that enhance the appearance and character of the Town through cooperative efforts among Town government, private property owners, and community based organizations
B	Determine and implement enhanced and sustainable health services in West Yellowstone
C	Increase housing options in West Yellowstone
D	Create and implement a strategy to enhance educational, recreational, and employment opportunities

Table 6-8 West Yellowstone Community Vision Group Action Items

Item number	Description
1	Implement expanded educational opportunities in the West Yellowstone area by encouraging partnerships with colleges, universities, and institutions for appropriate courses of study
2	Define and develop a community recreation/recreational facility plan/senior center/community center
3	Partner to develop a marketing plan that includes strategies to promote current and new business enterprises
4	Expand and diversify the year-round economy by exploring other economic options for the community (i.e., casino, college, western heritage center); conduct an environmental study; develop a strategy to market what we have (groomed ski trails)
5	Enhance, expand and promote the Yellowstone Historic Center
6	Develop a culturally appropriate town theme, including design standards
7	Explore possibility to developing an extended care facility
8	Establish a sign ordinance in town (eye level signs)
9	Explore possibility of establishing telecommunication diagnostics
10	Explore opportunities for community health nursing program internship through MSU School of Nursing

Evident across goals, actions items, and areas of focus was the development of both the community and local economy, and while the Visioning Group focused on both, citizens were concerned that the economy might take precedent, and resident Tom Heyes warned that,

> if the community succeeds, the businesses will succeed. What is good for the community will be good for the businesses. The reverse is not necessarily true. If business success is the only end to which we aspire, it will be insufficient. We do not need success at any cost. The cost of success is too often a place where no one wants to live or visit. Creating a sustainable community that draws repeat customers year after year, in all seasons, and still allows a good environment for its residents should be the vision to which we aspire (Heyes 2003).

Medical Services

One of the issues facing an isolated community like West Yellowstone is access to health care and medical facilities. Until early 2008, the only medical services available were through two mental health counselors from Gallatin County and Montana State

University who visited the community on Mondays and Wednesdays, and a doctor from California who flew in at her own expense weekly to provide pro bono service (Dittman 2008; McPherson 2008). For a community that swelled to over 10,000 people daily

during the summer months, and one where the nearest medical facilities were in Bozeman, Montana, or Ashton, Idaho, this situation was unacceptable (McPherson 2009a). In 2009, the West Yellowstone began to move forward with the idea of establishing its own medical facility. Their goal was a facility that included a "pharmacy, chiropractor, outreach services such as home care, long term care, dentistry, counseling and mental health" (McPherson 2009a). They sought donations from out of town foundations, federal grants, and the prospect of the clinic itself generating funds over the long term (McPherson 2009b). With the non-profit status of the clinic approved by the state and a site for the new facility approved by the city, the prospect of a medical facility in West Yellowstone seems to be becoming a reality (McPherson 2009c).

Sustainability and Conservation

A total of 27 articles, or 14 percent of all *West Yellowstone News* articles analyzed, focus on topics related to sustainability and conservation (Table 6-1). Considering the individual constituents of sustainability and conservation (Table 6-9), the most discussed topic was the Greater Yellowstone Coalition (GYC). While the GYC can be considered a conservation-based organization, their high level of referencing in relation to West Yellowstone is based on its involvement in the winter access debate—actually an economic issue (see above). The community's recycling program, which accounted for 15 percent of all sustainability-related quotes, is its highest priority in relation to sustainability and conservation, when GYC referencing is considered as related to economic sustainability. This was followed by the "Green Up West Yellowstone" program, accounting for 8 percent of all sustainability-related articles.

The community of West Yellowstone views sustainability as one of its top priorities, and concerns for the topic are mentioned repeatedly by residents, through opinion articles, as well as through the Chamber of Commerce who ran numerous stories regarding their "Green Up West Yellowstone" program. The antecedents of the program began in 1997 when the NPS initiated its "Greening up the Parks" program. At that time, several local businesses took the lead by gaining Energy Star status through the Montana Department of Environmental Quality (DEQ). The Energy Star certification process involved the examination of business operations and,

Table 6-9 *West Yellowstone News*: Sustainability and Conservation References

Sustainability and Conservation	Number of Quotes	Percent of All Articles	Percent within Category
Recycling	6	3.1	15.0
Sustainable Wildlife	3	1.6	7.5
Green Up West Yellowstone	3	1.6	7.5
Sustainability	2	1.0	5.0
Sustainable Community	2	1.0	5.0
Compost	2	1.0	5.0
Renewable Energy	1	0.5	2.5
Sustainability - Environment	1	0.5	2.5
Sustainable Forestry	1	0.5	2.5

> their existing practices regarding waste stream management, energy use and reduction, use of cleaning products and solvents that may be detrimental to the environment… and through the process of identification(sic) non-sustainable practices, were able to change and implement new products/procedures that made their operations more sustainable (Clarkson 2008).

The Chamber of Commerce also sponsored the inaugural West Yellowstone Green Up Conference in May 2008, which concluded that "greening up and recycling is alive and very well in West Yellowstone and Yellowstone National Park, but more needs to be done" (Warden 2008b). Subsequent articles suggested exactly what that "more" could entail, including the designation of "a family member as the 'Green Conscience' of the household to remind all that they are committed to recycling." Further suggestions focused on local businesses, including hotels and motels which could establish,

> a program to make their properties more environmentally friendly: i.e., install low-flow showerheads, participate in the Friends of the Earth Program with a monetary donation given to the Yellowstone Foundation for each guest who elects to opt into the program. Changes in laundry detergents and cleaning solvents should be looked into. Replace amenities with newer ones that come in biodegradable containers and reduce the impact on the environment (Clarkson 2008b).

In addition, markets and retail stores could consider,

> removing all Styrofoam products from their shelves and replacing them with paper products. Sales of plastic cups should be curtailed, and cups made of sugar cane should be available. Start a campaign to reduce or eliminate plastic bags from your check-out system (Clarkson 2008b).

The Chamber of Commerce even went so far as to remind the citizens of West Yellowstone that:

> the choice has never been so clear. Will our actions forge a world with collapsing natural ecosystems, mass scale species extinction, growing pollution and waste, increasing social and economic disparity, and a lack of basic services to billions on the planet? Or will they contribute to healthy ecosystems, social and economic equality, healthy habitats and a better quality of life for all (Clarkson 2008b).

Citizens also responded by suggesting ways in which they—as consumers—could better sustain the environment, including the use of wind and solar solutions to reduce nonrenewable energy use, as well as the transition to electric vehicles (WY 2008d), or adopting clean car emission standards such as those in California (Conradi 2008). Others bemoaned a recent decision by the US Department of Agriculture to require all school lunch programs to use only products certified by the National Animal Identification System, instead of the bountiful locally produced products (Merrill 2008). The ever present threat of forest fires brought residents to suggest fire connections to global warming through influxes of carbon dioxide, noting that by purchasing locally grown, harvested and processed lumber, the threat could be mitigated (Engstedt-Simpson 2008). Finally, a Governor's conference in town brought forth the ideas of the "No Child Left Inside Project" which focused on the need to "reconnect children to the out of doors…to develop a sense of place and a connection to the land" (Hoffmann 2008b).

Recycling began in West Yellowstone as it did in many rural communities across the country, by a lone resident collecting aluminum cans in the back of his pickup truck (Warner 2008b). The operation was taken over by local resident Gordon Berger, who, with the help of a small bailer, was soon recycling up to 50,000 pounds of recyclable material a year. In 2005, Gus Tureman was issued a conditional use permit for recyling, and Two Seasons Recycling was established (Warner 2005c). As of 2008, Tureman employed six seasonal employees and recycled 900,000 pounds of cardboard, steel,

aluminum, plastic, and paper annually (Warner 2008b). The community has embraced the recycling program through education programs initiated by the Chamber of Commerce, but a number of obstacles remain. First among them is the inability of the recycling facility to collect glass products due to a lack of commitment from a buyer, although Tureman has suggested that recyclable materials could replace sand for winter road surfaces (Warner 2008c). The other major concern is the lack of biodegradable food and coffee-related products in local restaurants. Although the recycling program saved the residents of West Yellowstone from the hour and a half drive to Four Corners or Bozeman to recycle products, the facility eventually closed in 2008 due to the high transportation costs associated with the community's isolation (WYN 2008e). Due to resident and tourist demands, the facility was re-opened in 2010 with limited services for commercial clients, as well as collection bins for plastic bottles that are placed around town; residents may bring recyclable material to the facility itself (Blow 2010).

Growth and Development

A total of 20 articles, or 10 percent of all analyzed articles for West Yellowstone, were categorized as focusing on topics related to growth and development (Table 6-1). When considering the individual constituents of growth and development (Table 6-10), the most-discussed topic was the acquisition of land, accounting for 61 percent of all growth-related articles. This was followed by affordable housing, accounting for 17 percent of all growth-related articles.

Land Acquisition and Affordable Housing

West Yellowstone is a 'landlocked' community' for lack of a better term. To the east lies Yellowstone National Park, to the north Gallatin National Forest, to the west Beaverhead National Forest and to the south Targhee-Caribou National Forest. These lands literally extend to the city limits, and thus in order for the community to expand spatially, land must be acquired from a federal agency. Even outside the confines of the city itself, the battle to protect lands from the rapid population growth the GYE has experienced in recent decades is often overwhelming. The lack of private land in the GYE has resulted in a speculation boom that has out-priced long-term residents, and left

Table 6-10 *West Yellowstone News*: Growth and Development References

Growth	Number of References	Percent of All Quotes	Percent of Category
Land Acquisition	14	2.9	60.9
Affordable Housing	4	0.8	17.4
Private Property Rights	3	0.6	13.0
Residential Development	1	0.2	4.3
Old vs. New West	1	0.2	4.3

non-government environmental groups scrambling to protect what can be saved economically for future generations.

The placement of land into conservation easements or other types of protection has been extremely successful in the GYE, but a constantly shifting land market and amenity migration have resulted in a seemingly unending battle. An example of efforts to conserve lands is the 2001 donation of $8.2 million by the Doris Duke Charitable Foundation of New York for the acquisition of 60,000 acres in the GYE, with some of that money filtering down to local non-government organizations such as the Sonoran Institute and Greater Yellowstone Coalition of Bozeman (Furu 2001a). An example of the shifting real estate market occurred in late 2001, when the owner of the Candlestick Ranch in Ennis, Montana, a 7-square mile property used for fly-fishing, placed the property on the market. Known as "Three Dollar Bridge" in the fishing community, for the rusted old box on a bridge where wading anglers placed a $3 donation, the "place familiar to anglers worldwide for its agile and wild trout…and expansive views of grasslands and mountains," was deemed at 'high-risk' for development and sub-division, and thus local residents and national organizations had to act quickly. A $200,000 option to buy was put in place to allow conservation interests to purchase the property outright, but an additional $5 million had to be raised first. The first to step forward was by a local rancher who donated $3 million in return for 3,500 acres of adjacent ranchlands (Furu 2001b). Two conservation groups, Montana Trout Unlimited and the River Network (Portland, Oregon), in addition to anglers from 36 states, collaborated over the course of a four-year period to protect the land (Furu 2001c).

It is evident that local residents are interested in maintaining the region's rural character and its abundant wildlife, with landowners such as Walker Cross donating 145 acres of his property on Raynolds Pass to the Nature Conservancy. Walker noted that he "wanted that land to be free of development," because he saw "homes going up all around the area and that bothers me because of how it affects wildlife passing through" (Warner 2005a).

In 2005, the US Forest Service contacted West Yellowstone to determine their interest in acquiring 130 acres of land that were immediately adjacent to the town. The town council considered the acquisition a top priority as it felt it would facilitate the diversification of the community (Pronovost 2005). A resolution was quickly passed through the town council (Resolution No. 469), and plans were set in motion to "be certain it meets specific needs that are vital" to the community, and that the community can "realize its total potential." Development of the site included the possibility for medical facilities, town government facilities, or a school site (Warner 2005b). In addition to the 130 acres proposed in 2005, two federal properties totaling over 600 acres were also sought after in 2008. Future plans for the parcels were intended to double the size of the town and included proposals for "a Western Arts Center, light industry, town house development, golf course and developments connected with the historic district" (Warner 2008a).

While town leaders may be looking to the future in terms of growth and expansion, they also recognize that issues such as affordable housing are perennial problems facing the West Yellowstone economy (McPherson 2008; WYN 2004). Those such as Mike Slevin felt that the town needed to focus first on affordable housing, specifically, affordable ownership. Slevin suggested that "the year-round work force deserves to be considered when any land swap is to be considered, and I'm not talking about employee housing (which has an important place for our seasonal workforce), but for those who have decided to make this town their families home" (Slevin 2008). It has been suggested that resort tax bonds might serve as one potential source to improve affordable housing conditions in the community (WYN 2007b).

Red Lodge, Montana

A total of 287 articles from the *Carbon County News*, dated from January 01, 2000, to December 31, 2009, were analyzed. Of the 287 articles analyzed, 104 articles (37 percent) were categorized as focusing on topics related to community development. This was followed by government, tourism and recreation, and growth (Table 6-11). A total of 116 references, or 31 percent of all analyzed references to sustainable development topics, focus at least partially on topics related to community development. This was followed by government (22 percent), growth (14 percent), tourism and recreation (14 percent), economic development (11 percent), natural resources (11 percent), and sustainability and conservation (7 percent). The analysis and discussion of individual sub-categories below is based on the preponderance of references within their associated category, and priority in the community based on key informant interviews.

Community Development

A total of 104 references, or 37 percent of all analyzed references for Red Lodge, were categorized focusing on topics related to community development (Table 6-11). When considering the individual constituents of community development (Table 6-12) (Appendix H), the most discussed topic was education, accounting for 28 percent of community development-related references, followed by medical services (13 percent).

One-third of America's public schools are located in communities of less than 2,500 and 21 percent of all students attend rural schools (Beeson and Strange 2003). It has been suggested that many of these schools and their students are at a high risk of failure due to a lack of quality education. Beeson and Strange (2003) ranked Montana schools as "Urgent/Critical," urging policymakers to address issues in rural education when they evaluated the schools based on average rural teacher's salary, student to teacher ratio, expenditures on transportation, enrollment rates, and other indicators. While no evidence from the *Carbon County News* suggested that any such matrix was used in considering the status of education in the county, education was the most discussed topic between 2000 and 2010. The construction of a new high school in Red Lodge was of particular importance to Carbon County during the study period.

Table 6-11 *Carbon County News*: Articles by Category

Category	Number of Articles	Percent
Community Development	104	36.2
Government	62	21.6
Tourism and Recreation	41	14.3
Growth	40	13.9
Economic Development	36	12.5
Natural Resources	36	12.5
Sustainability	24	8.4

Table 6-12 *Carbon County News*: Community Development References

Community Development	Number of References	Percent of All References	Percent of Category
Education	32	11.1	27.59
Medical	15	5.2	12.93
Community Involvement	14	4.9	12.07
Community Development	13	4.2	11.21
Domestic Violence	6	2.1	5.17
Fun Run	6	2.1	5.17
Historic Society	4	1.4	3.45
Non-Profits	4	1.4	3.45
Quality of Life	4	1.4	3.45

With aging infrastructure, numerous communities in Carbon County focused their attention toward upgrading existing educational facilities and the construction of new ones. One of the primary concerns with the construction of a new high school was the selection of an appropriate site. The site that was chosen had previously been home to a settling pond, which pumped mine water out of nearby coalmines, a coal slack dump, and the town garbage dump (Alberi *et al*. 2001). Although general concerns by the public were raised regarding the safety of the site, the Montana DEQ conducted an environmental assessment and found that minimal mitigation, including a concrete cap, would limit corrosive effects and increase the structural integrity of the building (Wallace 2005b). In 2007, a Billings, Montana, architecture firm won the building bid and was

also selected to conduct renovations to the old high school, which would now serve as a K-8 facility (Wallace 2007). Of particular note was the firm's agreement to use the natural landscape to their best ability, including the views afforded by the site's elevation, as well as climatic variables such as solar and wind to help regulate the facility's temperature (CCN 2007). It was also noted that by constructing a new high school, community members might be able to decrease their own travel by hosting athletic events, including state tournaments (Wallace 2005a). The 54,000 square foot facility was opened in 2009 (CCN 2009b).

Government

A total of 62 articles, or 22 percent of all those analyzed for Red Lodge, focused on topics related to government services (Table 6-11). The most discussed constituent of this sustainable development category of concern is water and sewer services, accounting for 18 percent of government-related quotes (Table 6-13). In 2008, the city of Red Lodge updated their growth policy. The purpose of the policy was to sustain and improve the community's sense of place and to determine future growth and development by providing policy-related guidance for public investment and land use decisions. Municipal water services were addressed, specifically increased demands due to development and a concern about aging infrastructure, both of which resulted in substantial infrastructure investment. To help alleviate some of the burden on taxpayers, the city authorized the establishment of a three percent resort tax on non-essential goods and services, with 79 percent of the revenues earmarked for infrastructure improvements (City of Red Lodge 2008). The updated city growth policy, as it relates to infrastructure (especially municipal water services), was one of the most discussed topics between 2000 and 2010, accounting for five percent of all analyzed articles.

Even prior to the establishment of the 2008 growth policy, Red Lodge was grappling with issues related to inadequate infrastructure. In February of 1998, the Montana DEQ established a moratorium on new sewer construction within city limits: it deemed the existing system overloaded and contributing excessive amounts of phosphates and nitrates into nearby Rock Creek. In order to lift the ban, the DEQ required the immediate improvement of existing systems. As part of the improvement, the city approved the replacement of the existing three-cell lagoon (Beaumont 2000;

Table 6-13 *Carbon County News*: Government References

Government	Number of References	Percent of All References	Percent of Category
Water and Sewer	14	5.2	18.4
Transportation	10	3.5	13.2
Municipal Services	9	3.1	11.8
Politics	9	3.1	11.8
Fire and Rescue	8	2.8	10.5
Infrastructure	7	2.4	9.2
Animal Control	4	1.4	5.3
Forest Services	4	1.4	5.3
City Government	3	1.0	3.9
Law Enforcement	3	1.0	3.9
Annexation	2	0.7	2.6
Weed District	2	0.7	2.6
Library	1	0.3	1.3

Grovenstein 2000) with a split treatment plant. The newly elected mayor at the time worried that the new treatment plant would not be adequate over the long term, and that the state might in the future change discharge regulations, rendering the project obsolete (Beaumont 2000).

Further, residents were worried that the new treatment plant would negatively affect riparian habitat along Tanglewood Creek (where current discharge occurred). The issue was compounded when a representative of the DEQ suggested that the city had no right to divert Rock Creek to preserve the habitat along Tanglewood Creek, and that residents would be required to re-establish water rights, an issue that infuriated residents (CCN 2001b). Another major issue related to aging infrastructure was the 100-year-old city water lines and a storage capacity deficiency. By 2006, the city was running a 500,000-gallon deficit in water storage, according to the state DEQ (Beaumont 2006), and the city was losing over 65 percent of its water through leaking pipes. To alleviate these issues the city sought funding from a variety of sources, and was successful in obtaining over $2.1 million in grants from the Montana Department of Natural Resources and Conservation, the Treasure State Endowment Program, the US Environmental Protection Agency, and the USGS Rural Development Fund. The city

also obtained $5 million in low-interest loans from the US Rural Development Agency (Baker 2008).

Nearly nine years after Red Lodge began the process of updating its water treatment plant, the city began discussing further upgrades, including a solar array to provide power to the plant, which was approved in October of 2010. The Mayor's Climate Protection Committee (MCPC) conducted a survey of the city's energy use and found that the water treatment plant had the second highest energy use, behind streetlights. Based on this finding, the city council unanimously approved a $500,000 project to install a solar power array, with 52 percent of the funding coming from a grant through the Montana DEQ (CCN 2009a). Of particular importance to the city council was that the project would meet 14 percent of the MCPC's reduction goal for the city's carbon footprint (Elliot 2009). One of the most contentious issues related to the solar array was who would pay for the loan when the array stopped generating energy savings. To answer this question, Jason Priest, a Carbon County Alderman, suggested that revenues from the resort tax could be used. His primary concern, however, was the 60-year payback period on the loan, with only a 20-30 year life span of the facility (Priest 2009a, 2009b).

Growth and Development

A total of 40 articles, or 14 percent of all *Carbon County News* analyzed articles, focus on issues related to growth and development (Table 6-11). When considering the individual constituents of growth (Table 6-14), the most discussed topic was residential development, accounting for 30 percent of all growth-related quotes. This was followed by affordable housing, accounting for 19 percent of growth-related quotes. According to Gude *et al*. (2006), the GYE has experienced rapid rural development on private lands in recent decades. A lack of effective land use policies has resulted in development on sensitive and fragile lands, highly productive agricultural lands, and lands proximate to water resources. In the 2008 Growth Policy for Red Lodge, the community recognized that local decisions, including residential and commercial development, have regional impacts. It also was recognized that in-migrants are likely to choose large-lot subdivisions in peripheral areas, and that those choosing to live within city limits may be

Table 6-14 *Carbon County News*: Growth and Development References

Growth	Number of References	Percent of All References	Percent of Category
Residential Development	16	5.6	30.19
Affordable Housing	10	3.5	18.87
Commercial Development	6	2.4	11.32
Growth	5	1.7	9.43
Gravel Pit	4	1.4	7.55
Zoning and Planning	3	1.0	5.66
Land Acquisition	2	0.7	3.77
Mixed Use Development	2	0.7	3.77
Real Estate Market	2	0.7	3.77
Amenity-Migrants	1	0.3	1.89
Biggest Challenge - Growth	1	0.3	1.89
Private Property Rights	1	0.3	1.89

prohibited by high real estate values. To mitigate the impacts of exurban sprawl and rising home values, the growth policy suggested a modification to the Red Lodge Development Code, to include zoning districts which had not previously existed, and requirements for developers to specifically address affordable housing (City of Red Lodge 2008).

At least eight major subdivisions were proposed between 2000 and 2010 in and around Red Lodge, with only one being denied. Numerous concerns were raised in relation to residential development, including private property rights, environmental and cultural impacts, and water resources. In 2001, it was suggested that the approval of the Paradise Meadows Development east of town was based on private property rights concerns and a fear of litigation (Crandall 2001). The 8,500-acre Beartooth Valley Ranch subdivision on the east slope of the Beartooth Mountains was subjected to an EIS when the developer requested right-of-way access and road improvements from the Bureau of Land Management. The EIS was required because of possible impacts on natural and cultural resources, including threatened and endangered species, hydrology, and cultural artifacts (Beaumont 2004a).

Another concern for residents and county commissioners alike was the availability of water resources. Of particular concern was the Grand View at Remington Ranch, a 74-lot subdivision approved by the county commission. At issue was the potential cessation of flood irrigation, which has been a major source of groundwater recharge. To mitigate impacts associated with limited groundwater recharge the developer agreed to initial individual wells on the property, with proposed plans to connect to city services (Beaumont 2004b). Other concerns included narrow setbacks, lack of sidewalks, narrow streets, and a lack of proposed parklands (Beaumont 2004c), a requirement of the 2008 growth policy. Lastly, residents were concerned with the cost of development (*e.g.*, Kirk 2007).

One of the major revisions to the city's growth policy was the provision that developers include affordable housing options in their proposals. This resulted in nearly four percent of all analyzed articles discussing issues related to affordable housing. A 2005 study by Montana State University-Billings suggested that the median income in Red Lodge was $32,000, while the median home cost was $204,000, resulting in what the Economic Development Corporation considered "a real disconnect between what people are being paid here and what they can afford to buy." To help mitigate the impacts of rising real estate values on residents, the Red Lodge Affordable Housing Committee was formed, with their first initiative being a mailed survey to over 800 residents with the hopes of determining affordable housing needs (Wallace 2005c). Results of the survey suggested that residents who earned between 80 to 100 percent of the median income considered their need for affordable housing as critical. The next step for the Committee was to determine suitable lands for potential housing sites and the acquisition of funds for those lands and housing units (CCN 2006a).

By October 2006, the Affordable Housing Project had purchased six parcels of land, with five applications for housing approved (CCN 2006b). The success of the Affordable Housing Project had additional benefits to the residents of Red Lodge through the donation of lands for affordable housing by residents (Baker 2008b). In 2009 it became known that a non-local contractor was used on at least one project, angering residents over the idea that unemployed locals may have thus missed out on employment opportunities; they were further outraged when they learned that at least one general

contractor left town without paying over $10,000 owed to local businesses (Kreatz and Shanks 2009).

Economic Development

A total of 36 articles, or 13 percent of all articles analyzed for Red Lodge, focus on issues related to economic development (Table 6-11). When considering the individual constituents of economic development, the most discussed topic was economic development, accounting for 21 percent of all economic development-related references (Table 6-15). While categorized as tourism and recreation, and not economic development, the Beartooth Pass (10 percent of tourism-related quotes) and the Beartooth (Motorcycle) Rally (19 percent of tourism-related quotes) were included in the discussion of economic development as they are directly related to the economic well-being of the community. Economic development is critical in rural communities, especially those that fall well short of national averages in per capita income, median household income, and average earnings per job—all of which describe Red Lodge. Nationally, the per capita earnings average was $29,469, while in Red Lodge it was only $19,090, with median household income over $10,000 short of the national average. Earnings per job were also lower than the national average, and had declined more than $8,000 since the 1970s (CCN 2004a).

In 2003, the Beartooth Resource and Conservation and Development Council was established to increase economic activity in Red Lodge. One of the Council's primary objectives was to establish a Community Resource Assessment Team to facilitate economic development planning through input received from the business community. Specifically, the Community Resource Assessment Team would determine the goals and priorities of the business community, and development planning mechanisms to fulfill them. Although the initiative would require an initial investment of $100,000 from the community over four years, those funds would be matched by the USDA Rural Development Program (Beaumont 2003)

In 2004, the Comprehensive Economic Development Strategy was initiated to prioritize goals for the Red Lodge economy through the year 2014. The group developed "situation assessments" that documented community strengths, weaknesses, and opportunities based on surveys and interviews of decision makers, including business

Table 6-15 *Carbon County News*: Economic Development References

Economic Development	Number of References	Percent of All References	Percent of Category
Agriculture	9	3.1	23.08
Economic Development	8	2.8	20.51
Taxes	7	2.4	17.95
Air Travel	5	1.7	12.82
Resort Tax	5	1.7	12.82
Business Owners	3	1.0	7.69
Economic Diversification	1	0.3	2.56
Wealth	1	0.3	2.56

leaders, city and county officials, and property owners. The CEDS found that strengths included an abundance of potentially developable land, strong schools, parks and other public facilities, and abundant natural amenities such as mild climate, scenery, and recreational opportunities. Weaknesses included a higher than average crime rate for rural communities, and below average income potential (CCN 2004a).

The USDA Rural Development Program provided the Beartooth Resource and Conservation Development Council with a 30-year, $750,000 loan in 2004 to expand their Regional Revolving Loan Fund. The fund was established to provide economic incentives and start-up money to new businesses in Carbon County. As Robert Leigland of the USDA Rural Development Program stated,

> The expansion of the Regional Revolving Loan Fund will save or create close to 120 jobs in the Beartooth RC&D coverage area…Many of the businesses that will utilize the loan fund are value-added agriculture producers. Rural Development's partnership with Beartooth RC&D gives these agriculture entrepreneurs a better opportunity to grow and prosper (CCN 2004b).

While the community was continually attempting to entice new businesses into the region, they were cognizant of how new businesses might disrupt the community's character. For example, in 2004, Town Pump, a Butte, Montana, based corporation applied to construct a 7,800-square foot gas station and convenience store on the northern boundary of town. More than 80 residents attended a four-hour public hearing on the application where the results of two public petitions were presented. The 184 signatures

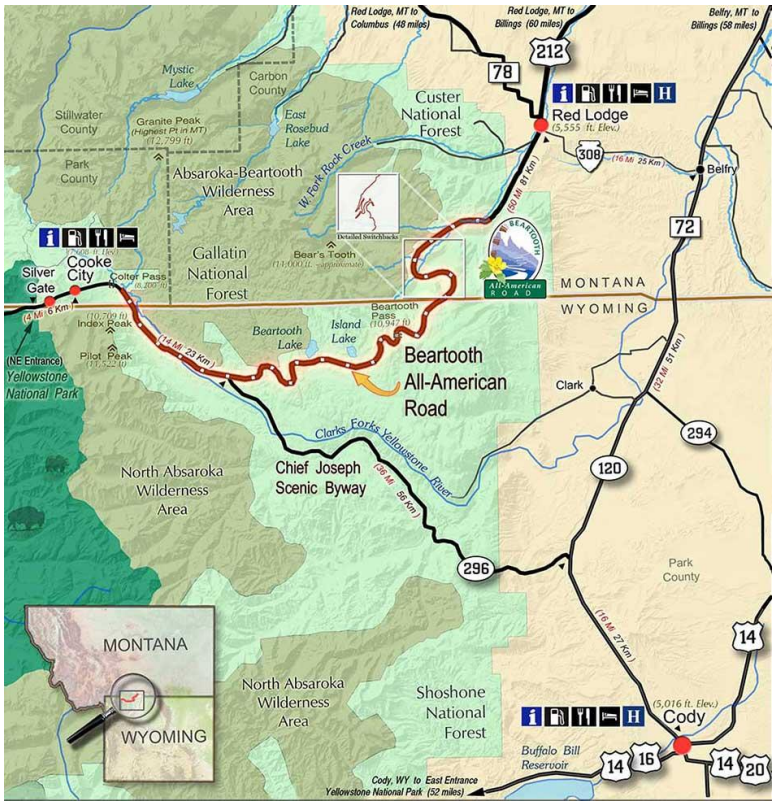
in favor of the facility cited the addition of 26 jobs to the local community, an increased tax base, and increases to resort tax revenues as benefits of the proposal. The 186 opposed to the plan cited increased traffic and crime, urban sprawl, and concerns over the proposed casino and liquor license attached to the proposal as negatively influencing the community. The city council ultimately rejected the proposal in a five to two vote (Beaumont 2004d).

Other potential businesses were applauded by the community, including the purchase and remodeling of a neglected building on the north end of town that once served as a brewery and pea cannery (Wallace 2006). Included in the content analysis for Red Lodge was the small town of Bridger, just east of Red Lodge, where the Elk River Corporation purchased a previously unoccupied building to start a wood manufacturing and processing company. The facility would employ up to 20 people, which was welcome news in a community of 750. Further, the company, who planned to build custom log homes, moldings, and other wood-related products, agreed to use only locally harvested products. Joe Bowen, the company's president was excited about the prospect of doing business in Bridger, stating that the company would "bring a lot of commerce in that normally wasn't here, and getting this building back to where it's working now," with mayor Ken Gomer adding "it will be excellent…it doesn't get much better" (Hedges 2008).

Beartooth Pass and the Beartooth Motorcycle Rally

Tourism is perhaps the largest economic driver in Red Lodge, largely because of its proximity to Yellowstone National Park and the Beartooth Highway (Figure 6-1). As Montana Senator Max Baucus stated in 2007, "The Beartooth [Highway] is not only a national treasure, it is also an economic lifeline for the folks in Red Lodge, Cooke City, and the surrounding areas" (CCN 2007). The importance of that economic lifeline was not fully appreciated by the community until 2005. Heavy rains caused 13 mudslides along the highway on May 20, closing the road indefinitely while Department of Transportation crews worked to repair the damaged sections. Initial estimates suggested the project would cost over $20 million, and may not be completed prior to the 2006 travel season (Wallace 2005e). However, on October 05, 2005 (and $6 million under budget), the road reopened. Led by Governor Brian Schweitzer, over 100 locals and state

Figure 6-1 The Beartooth Highway (source: Friends of the Beartooth All-American Road 2011).



and federal dignitaries attempted to cross the 10,955 foot pass and reach Cooke City, Montana, but were turned back by high snowdrifts in Wyoming (Wallace 2005f). While the road was closed prior to Memorial Day, and the beginning of the tourist season, and only reopened for ten days in October, local business owners were pleased with tourist spending, especially over the fourth of July weekend (Wallace 2005d). Carbon County Commissioner John Prinkki was equally impressed with the resiliency of the business community. At the opening ceremony he said that the way the "Red Lodge community and the chamber of commerce and business owners came together to change marketing plan to make Red Lodge a destination instead of a pass through, I think it is going to be beneficial to Red Lodge tourism for years to come" (Wallace 2005g).

The tourist season in Red Lodge, and other gateway communities to Yellowstone, begins on Memorial Day and ends on Labor Day. Very few events during the tourist season bring as much intense debate as the Beartooth Rally held the third week in July

each year. The rally is a three-day motorcycle rally similar to the Sturgis, South Dakota, event, but on a smaller scale. Beginning in 1995, with an estimated 90 bikers, the event has grown to between 5,000 and 10,000 bikers who generate an additional $10 million in revenue over the course of the weekend (Kemmick 2008). Although a high proportion of letters to the editor suggest that the residents of Red Lodge are opposed to, or at the very least concerned with, the impacts of the rally, community forums have seen widespread support for the event. Beginning in 2006, Mayor Brian Roat began to solicit public input on the rally because he felt the community was heading towards "serious confrontation between" those that support the rally and those who oppose it (Roat 2007). He concluded that "input from the public regarding the rally clearly indicates strong support for preserving the economic benefit it brings (Roat 2006). As the rally approached in 2007, he stated,

> I have made my position clear on visiting riders. All are welcome here. All are expected to conduct themselves in a courteous manner in regard to both action and noise. Red Lodge will be proactive in protecting the safety and tranquility of our citizens, no matter who the visitors are (Roat 2007).

A community meeting sponsored by the Beartooth Front Community Forum was held in March of 2008, in the hope that the motorcycle rally could be addressed proactively. The goal of the forum was to determine the "areas of significant difference in perceptions, experiences, and issues" related to motorcycle tourism (CCN 2008). Mayor Betsy Scanlin suggested that the forum was an "effort to improve the event experience for residents, city personnel, business owners, and participants…to the betterment of the town." However, residents were upset to find that while Mayor Scanlin required the town council to attend the forum, she did not. As one resident suggested, "what bothers me is that we had a beautiful town meeting…and she doesn't show up. It was a wonderful change to hear from all sides about the issues. It was very positive" (Baker 2008c). Other residents were not as positive, with Andrew Daniel (2008) suggesting that,

> despite the cash infusion this rally brings into town, it also brings its share of riff raff, noise and air pollution. Local businesses and the tax collector may support this rally due to the disposable incomes these motorcycle riders bring to Red Lodge, but let us not forget the equal number of

> outdoor enthusiasts, eco-tourists, and others out there who also have money to spend and are searching for a summer vacation destination in Montana but will ultimately choose a more serene and quieter setting.

More importantly to Daniel, than the economic benefits of the Beartooth Rally is the possibility that the quality of life that Red Lodge residents have come to enjoy would be diminished by the rally, and that the integrity of the GYE might also be impacted:

> I am concerned that with this event we will not only will we be losing the quality of life and the reputation of our mountain town, most importantly, we will be losing the peaceful serenity of the greater Yellowstone ecosystem; the very essence of what makes Red Lodge and the greater Yellowstone ecosystem one of the most special places in the world. And preserving that would seem to be a much more noble pursuit and lasting endeavor than the short term gains brought in to local merchants by a motorcycle rally (Daniel 2008).

This sentiment was echoed by another resident, who posed the question of

> How much "economic boost" is a life worth? So you are at a crossroads Red Lodge. Which way do you want to go? It is your life. Your life as a small western town that have people who love it (Aaker 2008).

Gretchen Nolan, while recognizing the economic importance of the rally, felt that the rally's "noise, congestion, safety problems…" were a detriment to the community (Nolan 2008). To address many of the public concerns voiced at the Beartooth Front Community Forum, the Citizens Preserving Quality of Life in Red Lodge was formed in 2009. The group has five primary objectives:

1. To monitor and address noise levels in Red Lodge
2. To address public safety issues associated with large events
3. To determine the actual costs incurred by the city's taxpayers during large events
4. To monitor resort tax collections, particularly from transient vendors
5. To assist the Mayor and Chief of Police in the development of a practical enforcement procedure of Montana's Noise Legislation

By the end of 2009, only one of these objectives had been reached, that of determining noise level in Red Lodge. The group monitored noise levels on three weekends in July, before, during, and after the Beartooth Rally. Results suggested that peak noise levels

during the rally were 106 decibels, while the peak noise level the week prior to the event was 101 decibels, suggesting that at least one of the public's concerns was unfounded (Herzberg et al. 2009).

Jackson Hole News and Guide

A total of 333 articles published in the Jackson Hole News and Guide between January 1, 2000, and December 31, 2009, were analyzed. A total of 129 articles, or 39 percent of all analyzed articles, focus at least partially on issues related to natural resources. This was followed by growth and development (32 percent), community development, and government (Table 6-16). A total of 222 references, or 67 percent of all analyzed references, focus at least partially on topics related to natural resources (Table 6-17). This is followed by growth and development (42 percent), community development (26 percent), government (24 percent), sustainability and conservation (15 percent), tourism and recreation (14 percent), and economic development (12 percent). The analysis and discussion of individual sub-categories are based on their preponderance in the given sustainable development category, and community priorities based on key informant interviews.

Community Development

A total of 73 articles, or 22 percent of all analyzed articles for Jackson, focus on topics related to community development (Table 6-16). The most common topic related to community development is medical services, accounting for 20 percent of all category references (Table 6-18). This was followed by the community's comprehensive plan, accounting for 17 percent of all community development-related references. The comprehensive plan process will be discussed below in conjunction with growth and development.

Like other communities in the GYE, one of the most prevalent concerns in Jackson and its surroundings is access to reliable health care. Although Teton Valley, Idaho,

Table 6-16 *Jackson Hole News and Guide*: Articles by Category

Category	Number of Articles	Percent
Natural Resources	129	38.7
Growth	105	31.5
Community Development	73	21.9
Government	66	19.8
Economic Development	47	14.1
Tourism and Recreation	43	12.9
Sustainability	42	12.6

Table 6-17 *Jackson Hole News and Guide*: Quotes by Category

Category	Number of References	Percent
Natural Resources	222	66.67
Growth	139	41.74
Community Development	85	25.53
Government	79	23.72
Sustainability and Conservation	51	15.32
Tourism and Recreation	48	14.41
Economic Development	40	12.01

has a 13-bed hospital, Sublette County, Wyoming, has two medical clinics, and Lincoln County, Wyoming, has Star Valley Medical Center, most residents of the tri-county area rely heavily on St. John's Medical Center in Jackson. St. John's was originally established through local tax dollars to serve local residents. However, in recent decades the facility has grown into a regional hospital that serves over 30,000 residents, with only 48 percent of its revenue coming from Teton County (Froedge 2006a).

One of the most controversial issues regarding health care was the proposal by the Teton Community Hospital to the St. John's Medical Center board to transfer the facility from a public non-profit to a private non-profit organization (Schechter 2008). Part of this transition would entail leasing the facility for 45 years from the city to the medical

Table 6-18 *Jackson Hole News and Guide*: Community Development References

Community Development	Number of References	Percent of All References	Percent of Category
Medical	17	5.1	20.0
Comprehensive Plan	14	4.2	16.5
Community Development	9	2.7	10.6
Non-Profits	9	2.7	10.6
Education - Public	8	2.4	9.4
Quality of Life	4	1.2	4.7
Community Center	3	0.9	3.5
Drug and Alcohol Use	3	0.9	3.5
Uniqueness	3	0.9	3.5
Attachment to Place	2	0.6	2.4
Community Image	2	0.6	2.4
Community Involvement	2	0.6	2.4
Education	2	0.6	2.4
Immigration	2	0.6	2.4
Education - Community	1	0.3	1.2
Gateway Communities	1	0.3	1.2
Historic Society	1	0.3	1.2
Historical District	1	0.3	1.2
Volunteering	1	0.3	1.2

center, and would allow an appointed board to run the hospital, while elected officials would oversee the use of public tax money. Currently, the facility is governed by a seven-person elected board that is directly accountable to taxpayers (Dayton 2008a; Dayton 2008b). The measure was defeated by the hospital board, with members concerned that the transition to a private organization would "destroy any sense of transparency" and that it "goes totally against the grain of what this community is about" (Miller 2008).

In addition to St. John's Medical Center, the community has two organizations that service low-income groups, the Teton County Public Health Department, and the Teton Free Clinic. These organizations are largely funded through state initiatives and private donations. The Teton County Public Health Department was awarded a $10,000 grant from the Wyoming Community Foundation to provide prenatal care to women

without health insurance (Angel 2008). An additional $20,000 grant from the Community Foundation of Jackson Hole was given to the Teton Free Clinic to help defer costs for "additional medication, diabetes and lab testing supplies, office supplies, and an automated external defibrillator." The clinic provides free health care services each Tuesday, including x-rays, exams, and medication, to uninsured residents of the region. In addition to the Free Clinic grant, the Community Foundation has raised nearly $200,000 to help other local social service organizations (Huelsmann 2009d).

Government

A total of 66 articles, or 20 percent of all analyzed articles for the Jackson area, are focused on topics related to government services (Table 6-16). In this category, the most discussed topic was transportation, accounting for 22 percent of all government-related references (Table 6-19). This was followed by politics (20 percent), and the US Forest Service (USFS) (17 percent).

In 2006, the town of Jackson initiated a plan that was applauded by residents and business owners alike. The Pathways program was designed to manage the existing 25 miles of biking and walking paths within the city, as well as the proposed 75 to 80 mile expansion that would extend the network from Hoback Junction, south of town, to Grand Teton National Park to the north, connecting the Bridger-Teton National Forest and the park. In order to provide backing for the program, it was written into the city's comprehensive plan. As Pathways Task Force Chairman Brian Schilling suggested, "When it is adopted it carries a little more weight with the town and county" (Reed 2006). The project will be funded through a specific purpose excise tax that generates approximately $11 million annually, and is charged on all goods and services other than food. The excise tax would also fund a transit facility for the START (Southern Teton Area Rapid Transit) bus program (Froedge 2008f). The program offers public transportation for the residents of Teton County, including service between the town and Teton Village (Jackson Hole Ski Resort), and commuter routes to Star Valley, Wyoming, and Teton County, Idaho, where many service industry workers currently reside (START 2011).

Table 6-19 *Jackson Hole News & Guide*: Government References

Government	Number of References	Percent of All References	Percent of Category
Transportation	17	5.1	21.5
Politics	16	4.8	20.3
Forest Service	13	3.9	16.5
Pathways	9	2.7	11.4
Infrastructure	8	2.4	10.1
Law Enforcement	7	2.1	8.9
Library	3	0.9	3.8
Public Transportation	3	0.9	3.8
Water and Sewer	2	0.6	2.5
Emergency Management	1	0.3	1.3

Growth

A total of 105 articles, or 32 percent of all *Jackson News* analyzed articles, focus on topics related to growth and development (Table 6-16). The most frequently referenced growth and development topic is affordable housing, accounting for 30 percent of all growth-related quotes (Table 6-20). This is followed by residential development (24 percent), and overall growth (12 percent).

Residential Development and Growth

Teton County gained more residents since 1980, than it did over the entire 20th century. This has led to questions of whether the community of Jackson (or Teton County) is adequately prepared to manage such growth (Schechter 2006), especially when one considers that the comprehensive plan had been developed in 1994. (It has since been revised, but for much of the time frame of analysis, the 1994 version was the focus of published comments.) It was suggested that the catalyst for the rapid growth in Teton County stems from the region's environmental quality and the corresponding quality of life it affords, as well as technological innovations (e.g., the internet) that allow telecommuting in the once remote community (Schechter 2007a). As Schechter (2007a) suggested, until the 1970s, Teton County was relatively impoverished due to its remote

Table 6-20 J*ackson Hole News and Guide:* Growth and Development References

Growth	Number of References	Percent of All References	Percent of Category
Affordable Housing	41	12.3	29.5
Residential Development	33	9.9	23.7
Growth	17	5.1	12.2
Zoning and Planning	13	3.9	9.4
Mixed Use Development	7	2.1	5.0
Amenity-Migrants	6	1.8	4.3
Commercial Development	6	1.8	4.3
Land Value	5	1.5	3.6
Real Estate Market	4	1.2	2.9
Private Property Rights	3	0.9	2.2
Foreclosure	2	0.6	1.4
Gravel Pit	1	0.3	0.7
Home Values	1	0.3	0.7

location and relative isolation from the outside world, and its dependence on agriculture and, later, tourism. This resulted in a land-rich, cash-poor populace who sought to develop land regardless of environmental implications. This mentality is slowly shifting, but for many, concern over continued growth in the county prevails.

To gain a better understanding of growth and development issues in the county, and in preparation for revisions to the Jackson/Teton County Comprehensive Plan, county officials conducted a telephone survey in 2008. The comprehensive plan is a land-use document that guides development in the town and the county (Brenner 2007e). Specifically, the comprehensive plan is designed to guide growth by determining the most appropriate places for development based on what lands should remain undeveloped (Froedge 2009b). Jeff Daugherty, county planning director, suggested that the goal of the survey was to "encourage those contacted to spend a few minutes to help make a big difference in their community" (Froedge 2008a). As Councilor Melissa Turley stated, "that is why there is time for the community to express their views. We were elected by you." Council Bob Lenz added, "What we do today is going to determine how the town will look in 30 years" (Brenner 2007e). Comments from the telephone survey, public meetings, and a web site devoted to growth and development all suggested that the public

was concerned about the potential impact growth would have on "wildlife, traffic, infrastructure, and government services (Huelsmann 2009b).

The 2008 comprehensive plan was a revision to the 1994 document, as opposed to a complete re-write as some in the community feared. As Armond Acri, director of Save Historic Jackson Hole, noted at the time,

> [The 1994 plan] is what we have lived under, and I think that is what people wanted to know. What did we try to do in 1994 and how well did we accomplish it? The question going forward is how will the new plan correct those things that didn't happen before (Brenner 2009).

While some aspects of the 2008 revision were only modifications based on terminology, others were directed towards fundamental shifts in strategies and policies. For example, the 1994 plan stated that environmental goals included recognizing the community's responsibility to protect wildlife habitat and scenic resources, while the 2008 revision proposed the goal of promoting "stewardship of wildlife habitat and environmentally sensitive areas." This suggests that the community recognizes the importance of the natural environment and is shifting toward the promotion of its sustainability. Modifications that are more significant occurred in the economics portions of the document. In 1994 the goal was to "preserve economic vitality by maintaining unique environment and community character," while in 2008 the plan stated that the goal was to "maintain a vital retail/mixed-use core in Jackson" (Brenner 2009). This completely removed the embedded nature of the local economy in the natural environment, and in the process limited the community's ability to sustain the environment and the economy simultaneously. In July of 2009, further modifications to the comprehensive plan occurred, including a insertion of a statement that the top priority of the community and the county is the stewardship of the natural environment and wildlife. Larry Hamilton, chairman of the comprehensive plan committee suggested that

> These [conditions] reflect the public concerns and the public will to have the plan be more specific. They meet the needs and concerns everybody has for maintaining this ecosystem and maintaining the lifestyle that we all value in living in the most beautiful place in the world (Froedge 2009b).

Although the city/county comprehensive plan garnered considerable attention during the study period, one of the most discussed topics was residential, resort, and mixed-use development, further reflecting the growing concern over uncontrolled growth in the region. In 2007, developer Jamie Mackay became the first private developer to attempt to build affordable housing in the county. Mackay's proposal would convert the former KOA Campground (15 acres) into 44 affordable housing units and 44 free-market units, with seven of the free-market homes restricted for local employees only. However, the proposal was denied due to it exceeding the county's density regulations. As Commissioner Andy Schwartz suggested, "I don't think this is an inappropriate location for some affordable housing, but the density is too great" (Brenner 2007c). By the end of the year, Mackay reduced his proposal to 72 residents, 38 affordable housing, and 34 free-market, with six free-market homes available only to the local workforce (Froedge 2007b). Another major subdivision that was proposed was the Snake River Associates (SRA) development, which sits on 164 acres near Teton Village. The project, which included 100 single-family homes, 12 townhomes, and over 30 golf cabins, was approved by the planning commission in 2005 (Froedge 2006b). In 2006, SRA attempted to place 1,300 acres of the property under conservation easement, but with the stipulation that 59 free-market homes, 59 affordable housing homes, commercial use, and unlimited agricultural and gravel operations be included in the property. This proposal was quickly revised by removing the 90-acre commercial development clauses, and reduced affordable housing from 59 units to 25 due to public outcry (Froedge 2006c).

One of the largest and most controversial developments proposed in recent years was the Teton Meadows Ranch, a 500-home neighborhood located on 336 acres in an area locally known as South Park (Froedge 2007a). Developers envisioned one of the last large parcels of land near Jackson as providing the opportunity for "teachers, ski patrollers and police officers" to buy into "Jackson's crazy real estate market." Those in opposition saw "an idyllic piece of land, one of the last large scenic parcels in the area" they hoped would remain open space when they purchased their own properties that adjoin the parcel. In essence, the proposal pitted affordable housing advocates against those who feel affordable housing will negatively impact community character. The debate reached such a fevered pitch that county commissioner Andy Schwartz suggested

that an outside mediator was required before the proposal could move forward. As another county commission suggested,

> I would say this is easily the biggest community issue that we've had. In a sense it's a selfish thing. People are much more concerned over issues that affect them directly. In this instance, people feel that it really, really affects their lives in a direct, personal, daily manner (Froedge 2008c).

The proposal called for 500 new homes, 400 of which would be deed restricted for valley workers, and designated affordable housing, with the remaining 100 available for the open market. In addition, 50 percent of the 336 acres would be maintained as open-space, with each neighborhood containing its own park, playground, and associated pathways. However, those in opposition wanted to see only 50 homes built on the property or for it to remain in its current undeveloped condition (Froedge 2008c).

County planning commissioners considered a moratorium on all new subdivisions over 20 acres and zoning changes in 2008, when proposals for over 1,000 new homes in the South Park area were filed in addition to the 500 homes at the Teton Meadows property. Justification for the moratorium was that these new applications occurred while the county was attempting to re-write the city/county comprehensive plan (Froedge 2008b). While the moratorium was approved in May, two developers, Teton Meadows and Sequoia, were quick to file petitions in the Ninth District Court to overturn it. The filing asked the court to "review the moratorium and decide whether the board's decision was arbitrary, capricious, an abuse of discretion and not in accordance with law or support by substantial evidence" (Froedge 2008e). When Teton Meadows and Sequoia withdrew their subdivision proposals soon after the moratorium was initiated, the Wyoming Supreme Court ordered the dismissal of the case (Froedge 2009).

Although local residents, developers, and planners may have extensively debated the merits and consequences of unbridled growth, one of the major concerns for local residents involving recent growth was the impact that an increased real estate market had on home and property taxes. In 2008, Teton County assessors updated property values to reflect the current real estate market, and some residents were shocked by triple digit increases in taxes, including Marian Butler who experienced an increase of over $3,000, although she lived on a fixed budget of $1,000 a month from Social Security. As Butler

suggested, “I’m being taxed out of my home. When half of my money every month goes to taxes, how am I going to live?” (Froedge 2008g).

Affordable Housing

The Ellingwood Development was one of the first designated affordable housing neighborhoods in Teton County. The 36-home development was built by Three Creek Ranch as part of the developments housing mitigation program. By the end of 2006 over 60 applications had been submitted to the Teton County Housing Authority by residents hoping to purchase homes in the Ellingwood neighborhood (Froedge 2006d), a clear signal of affordable housing needs. The affordable housing mitigation program is based on the amount of deed-restricted (affordable) houses that must be constructed in new subdivisions. In 2007, the town considered raising that rate from 15 percent to 25 percent, although this was criticized by some resident’s, including a local business owner who suggested, “that is total socialism, communism, and I think it’s stealing. However, city consultants suggested that the mitigation rate should actually be raised to 40 percent to ensure the protection of valley workers while real estate prices increase rapidly (Brenner 2007g).

County commissioners also actively pursued affordable housing for government employees by implementing legislation that required all new government developments to provide worker housing for 25 percent of its employees. It was suggested that to meet the objectives, the county would need to provide 52 dwelling units at a cost of $45 million. Worker housing would be distributed based on pay schedules. Those earning below $35,000 annually would be housed in studio apartments, one-bedroom apartments, or condominiums, at a cost of nearly $6 million. Locals earning on average between $35,000 and $70,000 would be able to rent (or buy) one of 28 multi-bedroom homes valued at $26 million, while those earning above $70,000 would be housed in single-family homes or have the option of share-appreciation mortgages (Froedge 2009 a).

In 2008, the affordable housing debate became the most pressing issue facing the eight candidates running for county commissioner and the nine candidates running for town council. Claire Fuller suggested she would “never be able to stay if local government doesn’t make home ownership more affordable,” while Dennis Triano felt that rent controls and housing subsidizes were the answer. The catalyst for the growing

concern over affordable housing stemmed from the county's escalating real estate prices, and the fact that over 1,400 families had signed up for affordable housing (Froedge 2008d).

Sustainability and Conservation

A total of 42 articles, or 13 percent of all analyzed articles, were categorized as focusing on topics related to sustainability and conservation (Table 6-16). When considering the individual constituents of sustainability and conservation (Table 6-21), the most discussed topic was environmental protection, account for 37 percent of all sustainability-related quotes. This was followed by open space initiatives, account for 26 percent of all sustainability-related articles.

Environmental Protection

In further recognition of the importance of sustaining the natural environment in order to sustain the community's quality of life and community character (Schechter 2007), Jackson refocused efforts on environmental issues in the revision of its comprehensive plan. Initiatives included the preservation of open space and the protection of wildlife, among others (Brenner 2007e). Projects such as the Craig Thomas Snake Headwaters Legacy Act were initiated at the state level, but focused specifically on the regional environment. The Act protects 87 miles of rivers and streams along the Snake River corridor, and was designed to prohibit energy leasing on 1.2 million acres in the Wyoming, Salt River, and Commissary Ridge Mountain Ranges. The oil and gas reserves could have provided the country with 25 days of natural gas, and one day of oil reserves, but as one non-government organization questioned,

> Is it worth the permanent degradation of world-class big-game and fisheries habitat for 25 days of natural-gas consumption? Wyoming has done its fair share to meet the energy needs of this country. We ought to get this in return (Hatch 2009a).

The bill was named after the late Senator Craig Thomas who "envisioned his bill not only as a legacy that would protect some of Wyoming's most special places for future generations, but also as a tool that Wyoming outfitters, business owners and our state's tourism industry could use to attract visitors from around the world" (Hatch 2009b). The

Table 6-21 *Jackson Hole News & Guide*: Sustainability and Conservation Quotes

Sustainability and Conservation	Number of References	Percent of All References	Percent of Category
Environmental Protection	19	2.9	37.3
Open Space	13	2.0	25.5
Conservation Easements	7	1.1	13.7
Sustainability	4	0.6	7.8
Water Use	2	0.3	3.9
Alternative Fuels	1	0.2	2.0
Environment as Economics	1	0.2	2.0
Green	1	0.2	2.0
Multi-Generational	1	0.2	2.0
Recycling	1	0.2	2.0
Renewable Energy	1	0.2	2.0

bill was lauded for its ability to bring together such a wide array of decision makers from disparate backgrounds. As Senator Mike Enzi (WY) suggested,

> I think it's a testament to the incredibly broad-based coalition of business owners, local government officials, outfitters, sportsmen's groups, landowners and the congressional delegation who have supported this effort from the beginning that the bill is in the promising position that it is today (Hatch 2009a).

Energy Efficiency

With tourism becoming increasingly competitive, there were many in Jackson who were looking at ways to diversify or enhance the existing economy. The critical challenge facing Jackson in this regard was how to distinguish the town from other amenity-driven resort communities. It was suggested that becoming the first certified green resort community in the world might be a diversification strategy that would strengthen the local economy. One obstacle to this realization was that while certification programs exist for individual buildings, there is no such program for entire communities. Although many sustainability initiatives already existed in the community, such as recycling, conservation programs, and land use planning, the primary concern was the natural environment. As one resident suggested, "the health of the natural world will most certainly continue to degrade. As it does, the better we can preserve our

environmental quality, the greater our competitive advantage will be" (Schechter 2009). Community projects, such as the 170 kilowatt solar panel system at the town water and sewage plant, the Jackson Energy Sustainability Project, "a community-wide effort to cut energy consumption and improve energy efficiency" (Huelsmann 2009c), and the Jackson 10x10 Initiative to reduce electricity and fossil fuel use 10 percent by 2010, convinced some that the town was well-equipped to attempt the "green" certification process (Huelsmann 2009d). The community also applied for, and received, $1.8 million in funds from the American Recovery and Reinvestment Act to improve energy efficiency in town buildings (Rank 2009). The grant, known as the Energy Efficiency and Conservation Block Grant, was designed to be used by communities to

> Develop energy efficiency and conservation plans, conduct energy audits, establish incentive programs to promote energy efficiency, retrofit government buildings, expand recycling programs, develop transportation programs, reduce greenhouse gases and install renewable energy technology such as wind or solar power (Huelsmann 2009a).

Natural Resources

For Jackson, a total of 129 articles, or 39 percent of all analyzed articles, focus on topics related to natural resources (Table 6-16). When considering the individual constituents of natural resources, the most discussed topic was wildlife, accounting for 22 percent of all natural resource-related references (Table 6-22) (Appendix I). This was followed by oil and gas development, accounting for 10 percent, wolf reintroduction and management (6 percent), and the National Elk Refuge (5 percent).

Oil and Gas Leasing

Oil and gas leasing is big business in the GYE. Sublette County, Wyoming, the heart of oil and gas development, saw tax collections grow nearly 50 percent between 2006 and 2007, representing an additional $69 million in tax revenues. This trend was also witnessed in Carbon County and Sweetwater County, Montana (22 and 20 percent, respectively), over the same period (Dewell 2007). Mineral extraction, most notably oil and gas leasing, dominates the landscape in southern portions of the GYE, and while the issue does not garner the same level of litigation as other issues, such as winter access and bison management, it remains a highly contentious problem. Residents,

Table 6-22 *Jackson Hole News and Guide*: Natural Resource References

Natural Resources	Number of References	Percent of All References	Percent of Category
Wildlife	48	14.4	21.6
Oil and Gas	22	6.6	9.9
Wolves	14	4.2	6.3
Endangered Species Act	12	3.6	5.4
Elk	11	3.3	5.0
National Elk Refuge	10	3.0	4.5
Brucellosis	9	2.7	4.1
Climate Change	8	2.4	3.6
Bears	7	2.1	3.2
GTNP	7	2.1	3.2
Environmental Impacts	6	1.8	2.7
Invasive Species	6	1.8	2.7
Energy Use	5	1.5	2.3
Forest Fires	5	1.5	2.3
Waterways	5	1.5	2.3

conservationists, and recreationalists have made it their mission to slow or halt oil and gas leasing, especially in the Bridger-Teton National Forest. As Wyoming Governor Dave Freudenthal suggested in 2006,

> I believe BLM should take note of the added number of people objecting to these lease sales. These concerned citizens come to the Bridger-Teton National Forest to escape life's pressures and to fish, hunt, camp, hike, ride horses, snowmobile and ski. These people are being wedged out of other areas and are finding the Bridger-Teton their only option - now that option is at risk (Dewell 2007).

One of the most contentious aspects of the issue stemmed from the USFS identifying nearly 2 million acres of land which were suggested as suitable for oil and gas drilling, in addition to the 200,000 acres of land that are already in fossil fuel extraction in the Bridger-Teton National Forest (Brenner 2006b). Conservation groups felt that Wyoming's congressional representation was out of tune with residents' perceptions of oil and gas. Wyoming Representative Barbara Cubin countered that,

> Like most Wyomingites, I believe that it is important to decrease our dependency on foreign sources of energy by producing additional domestic resources in an environmentally sound manner… I believe in the Western tradition of multiple use policies on public lands and less federal government influence on private industry," she said. "I stand by my voting record and by the people of Wyoming" (Thuermere 2006).

Conservationists and sportsmen were worried that drilling activities on the Jonah and Pinedale Anticline would negatively impact crucial big-game winter habitat (Brenner 2006c). In particular, mule deer populations in Sublette County declined to the point where Wyoming Game and Fish officials suggested that they were below population targets. Addressing concerns of declining deer populations on BLM lands, Governor Freudenthal noted, "by allowing oil and gas development in the Wyoming Range, we may further affect a herd that may be already feeling the impact of oil and gas development on its winter range" (Brenner 2006). Further, the Sagebrush Sea Campaign, sponsored by Grouse Inc., attempted to outline a blueprint that would increase sage grouse populations 33 percent by 2015, and their distribution 20 percent by 2030. These numbers were based on the contention that populations had declined over 90 percent due to development, and that nearly three-quarters of the species' habitat was found on public lands that were under increasing demands due to oil and gas leasing (Hatch 2006a).

Environmental and sportsman groups also began an aggressive media campaign in 2007 to halt oil and gas leasing in the Wyoming Range. The Sportsmen for the Wyoming Range, which includes Trout Unlimited, the Wyoming Outfitters and Guides Association, the National Outdoor Leadership School, the Wyoming Game Wardens Association, and others, placed billboards across the state which read "We're Mother Nature's Bodyguards. And yes, we are heavily armed" (Hatch 2007d). The group was supported by newly elected Senator John Barrasso, who hoped to protect private property rights while protecting the Wyoming Range. He stated, "I strongly believe in multiple use of public lands, but I also believe some places are so special that they deserve an extra measure of protection" (Brenner 2007a). These sentiments were put into action in October 2007, when Governor Freudenthal requested that the federal government cancel 44,000 acres of energy leases in the Wyoming Range. Senator Barrasso drafted legislation that would "prohibit further leasing in portions of the range (Wyoming) and

allow for a private buy-back program" which would allow leases to be permanently protected through mechanisms such as conservation easements (Brenner 2007f).

However, there were those who felt that, while oil and gas leasing may pose a threat to wildlife species and the environment in general, the industry is making significant progress towards mitigating negative impacts on the environment. US Secretary of the Interior Dirk Kempthorne suggested:

> We have two world-class assets here – we have world-class wildlife habitat and a world-class energy source below it. They (industry) are reducing significantly the amount of their footprint and the weight of their footprint. This is the direction we have to be going.

One of the mitigation methods employed by the oil and gas industry is the replacement of gravel drilling pads, which permanently impact the site, to wooden mats which recover quicker than seed restoration (Brenner 2006c).

Mitigation funds from energy companies to offset environmental impacts were also used for the first time in 2008 to place the 1,042-acre Cottonwood Ranch under conservation easement. The ranch itself was donated by the Botur family, who in conjunction with the Wyoming Wildlife and Natural Resources Trust and the Nature Conservancy, and a grant from the Doris Duke Charitable Foundation, permanently protected critical sage grouse habitat. Luke Lynch of the Conservation Fund praised the effort, stating, "this is a model of collaborative conservation, and we thank the Botur family, Cottonwood Ranches, the JIO (Jonah Interagency Office) and the numerous funders for the opportunity to work with them to positively benefit sage grouse and other wildlife and to protect working ranch lands in a voluntary manner" (Thuermer 2008).

In January 2011, the Bridger-Teton National Forest issued a Record of Discussion that withdrew nearly 50,000 acres of the Wyoming Range from oil and gas leasing. Although the ROD was applauded by environmental and sportsmen's groups, it was quickly rescinded in May, with Forest Supervisor Jacque Buchanan stating that the ROD was inconsistent with several federal laws, and that a more thorough examination of potential impacts was needed (Royster 2011). The withdrawal of the Record of Decision is yet another example of the propensity of decision makers to make decisions based on litigation, and underscores the complexity of the EIS and Record of Decision process.

Wildlife

On January 11, 2006, Wyoming Game and Fish officials began artificially feeding elk on the 25,000-acre National Elk Refuge north of Jackson to prevent comingling of elk and cattle, which might result in the transmission of brucellosis to cattle. As in West Yellowstone, brucellosis is a highly contentious issue in the Teton Valley. Although bison remain a concern to livestock producers, the largest worry is over transmission between elk and cattle near the National Elk Refuge. As one local producer noted, "what I'm mainly concerned about is the safety of my animals." Beginning in November 2003, two cattle herds in the valley tested positive for brucellosis, which resulted in all herds in the valley being subject to mandatory testing prior to out of state shipment (Huntington 2006).

After a particularly harsh winter in 2005, with approximately three percent of the National Elk Refuge herd killed through starvation, wolf predation, and disease, the Sportsmen for Fish and Wildlife (a pro-hunting group) donated bales of certified hay to the refuge: sportsmen were concerned that the current feed source, alfalfa pellets, were not sufficiently nutritious. However, Refuge manager, Barry Reiswig stated that:

> We did extensive research on the pelleted feed in the '70s…We found that elk that were fed pelleted alfalfa did as well as elk that were fed long hay or elk that were fed a combination of long hay or alfalfa. To say that pelletized feed doesn't work is totally ignoring reality.

Representatives of the hunting group countered, suggesting "If you're just giving them pellets, the pellets are really protein but it doesn't provide the roughage that they need…that's something the hay will do" (Hatch 2006d).

The valley is also home to domesticated elk, traditionally used on private hunting reserves. In August 2006, nearly 200 domestic elk escaped from the Chief Joseph Hunter's Reserve 10 miles outside Yellowstone NP. Although brucellosis was a concern for Game and Fish officials, the larger concern was the herd's genetic purity and the potential risk that they could breed with native elk, resulting in forage habitat modification, habitat competition, and increased disease susceptibility, a reality one official suggested would be "quite disastrous" (Hatch 2006c).

In addition to elk, the National Elk Refuge is also home to the largest herd of bison (800) in the National Wildlife Refuge System, further complicating management efforts. To control the herd's population, bison hunts were common prior to a lawsuit filed by the Fund for Animals in 1998. That lawsuit was overturned in 2006 when the Jackson Bison and Elk Management Plan were completed. The plan called for a reduction in the bison herd from 1,200 animals to 500, and the elk herd from 7,500 to 5,000 (Hatch 2007c), to prevent disease and protect habitat. Groups such as the Animal Welfare Institute and the Buffalo Field Campaign planned to file a lawsuit against the refuge as they felt that the hunt was unethical:

> These are animals that have, for the most part, been protected…Most of them have never had reason to fear people from the day they were born. It raises serious questions about whether this can be a fair-chase hunt (Hatch 2007f).

Refuge officials countered that the bison herd had effectively destroyed their natural forage due to overpopulation, and that by reducing the herd size natural vegetation would be reestablished. As a result, officials felt that supplemental elk feeding could be curtailed, as the elk would not be competing with bison for forage on a large scale (Hatch 2007f). While reduced bison and elk herds at the refuge might improve habitat conditions, some residents were concerned by the decision's impact on the local economy:

> I find it hard to believe that they think they can reduce all of that without having an economic impact to the county and the town of Jackson…If you have less wildlife to experience that is going to lead to less people wanting to do those things (Hatch 2007c).

It was estimated that herd reductions would reduce the local economy by $334,200 per year, and eliminate up to 16 employment opportunities (Hatch 2007c).

Although hunting bison and elk on the National Elk Refuge is controversial, the refuge itself has often come under criticism as well. Wyoming Governor Dave Freudenthal suggested, "If you get rid of the feed grounds, you are only going to push elk onto private property and spread the disease (brucellosis)". Further, he contended that Wyoming's 23 elk feeding grounds were "the only resources available to the state as long

(as) there is a reservoir of brucellosis in the national parks…unless we are able to get access to large portions of habitat that is not currently available." Conservation groups counter that it is actually overcrowding in the feedgrounds that is perpetuating the disease in the region, and that feeding grounds should be phased out and eventually eliminated (Brenner 2007c). They also suggest that ample habitat exists in the region although it was underutilized by elk due to the feeding:

> We're fortunate that (the Gros Ventre) region of the ecosystem is still very much intact…By phasing out elk feeding in this region, we can capitalize on the natural bounty that exists, essentially for free, which ensures healthy wildlife and healthy habitat (Hatch 2008b).

In addition, residents and environmental groups were also concerned that the Jackson Brucellosis Management Action Plan that regulated the management of the elk was initiated without public involvement (Hatch 2007f). In 2008, Bridger-Teton National Forest Supervisor, Kniffy Hamilton, reauthorized the Dog Creek and Fish Creek feeding grounds in Teton County, and the Fall Creek, Muddy Creek, and Green River Lakes feedgrounds in Sublette County (Hatch 2008c). However, three feeding grounds in the Gros Ventre Mountain Range (Alkali, Patrol Cabin, and Fish Creek) remained closed for the first time in 33 years in 2009, as Wyoming Game and Fish officials determined that favorable conditions existed for elk to survive on natural forage (Hatch 2009b).

Wolf Management

Although bison management issues dominated wildlife conversations in West Yellowstone and other gateway communities to the north, to the south they were dominated by the wolf. Published statements are based on not only the reintroduction of the gray wolf into the GYE, but more importantly how they should be managed. Arguments pitted conservationists, land managers, outfitters, livestock producers, and the public at large against one another. Like other highly contentious issues in the GYE, wolf management is often affected by litigation. In 2006, Wyoming Game and Fish released its wolf management plan to the US Fish and Wildlife Service, which immediately rejected the document. This resulted in the wolf remaining on the endangered species list, as the USFWS could not delist the animal until the state provided an acceptable management plan, as had occurred in both Idaho and Montana. A revised

management plan was sent to USFWS in December 2006 for approval. One of the roadblocks to the previous plan was the inclusion of a movable boundary between trophy and predator areas that could be adjusted by Game and Fish officials depending on population size. The new plan called for two separate management areas, one where the species is managed as trophy game and could be harvested only by hunters, and another where it would be managed as a predator and could be killed without regulation (Hatch 2006e). In 2007, the USFWS approved the management plan, stating:

> After careful review and consideration, we determined that the 2007 Plan will provide adequate regulatory mechanisms for conserving a recovered wolf population in Wyoming after delisting and meets the requirements of the Endangered Species Act (JHNG 2007).

However, conservationists continued to argue that the management plan did not provide "adequate protection for wolves," and would ultimately undermine the recovery process. Franz Camenzind, director of the Jackson Hole Conservation Alliance, suggested two of the primary issues or roadblocks regarding the wolf management issue when he stated, "it clearly shows that politics not science is running this process. It's too bad that the only recourse that conservation has may well be a lawsuit" (JHNG 2007).

With the passage of Wyoming's Wolf Management Plan, the USFWS moved forward with its plan to remove the gray wolf from Endangered Species Act (ESA) protection. For a period of five years, the USFWS would monitor population numbers, and if they dropped below recovery objectives, the species would be placed back on the endangered species list (Hatch 2007b). Scientists from nearly every state responded with a letter to the USFWS which stated that current recovery goals were not based on sound science, and that sustaining the population at current recovery objectives (300 wolves and 30 breeding pairs across three states), would "dramatically increase the wolf's risk of extinction by reducing genetic variability and isolating individual animals" which could lead to "inbreeding and the reduction of overall fitness" of the species (Hatch 2007e).

After a 60-day public comment period, the USFWS removed the gray wolf from the protected list, but this was soon followed by litigation brought forward by conservation groups, including the Sierra Club, Defenders of Wildlife, Natural Resources Defense Council, and the Jackson Hole Conservation Alliance (Hatch 2008a). The

litigation, while predicted prior to the removal, was frustrating to many involved, including the executive director of the Sportsmen for Fish and Wildlife who stated:

> I'm frustrated that the environmental groups want to continue to litigate everything. It's up to the environmental groups; they can either show that the Endangered Species Act works or they can continue to show that they have another agenda besides species restoration. It marginalizes the environmental movement (Hatch 2008a).

Recognizing the potential setbacks further litigation could entail, the Jackson Hole Conservation Alliance said, "a lawsuit is not the way to resolve issues, be we felt there is too much at stake here. We fear the rhetoric that we've heard…we fear the Wyoming plan could push wolves back toward extirpation" (Hatch 2008a). Further litigation was brought by the Greater Yellowstone Coalition and Earth Justice in 2009 (JHNG 2009) ensuring that the wolf management debate would remain open. However, similar to the winter access plan in Yellowstone NP, the wolf management plan has resulted in confusion and frustration for all parties involved, and reflects another instance where extra-local decisions are having profound impacts on local communities in the GYE.

Content Analysis by Content Type

Newspaper articles were also coded based on content type (news article, editorial, or letter to the editor) and categorical theme (community development, growth, etc.) to provide a broader understanding of what community residents prioritized, and whether they differed from those of community newspapers.

West Yellowstone

A total of 193 articles were analyzed in the *West Yellowstone News*, with 83 percent categorized as news articles, 11 percent as letters to the editor, and 6 percent as editorials (Table 6-23). News articles related to economic development were the most prevalent during the study period, accounting for 25 percent of all analyzed articles, and 30 percent of all news stories. This was followed by government, community development, and natural resource-related articles (Table 6-24).

Table 6-23 Newspapers by Content Type

Content Type	West Yellowstone News	Percent	Carbon County News	Percent	Jackson Hole News & Guide	Percent
News Article	160	82.9	250	87.1	333	100
Editorial	12	6.2	1	0.3	0	0
Letter to the Editor	21	10.9	36	12.5	0	0
Total	193		287		333	

Table 6-24 *West Yellowstone News*: Content Type and Category

Category	Letters to the Editor	Percent of all articles	Percent of letters to the editor	News Articles	Percent of all articles	Percent of all news articles	Editorials	Percent of all articles	Percent of editorials
Community Development	4	2.1	19.0	44	22.8	27.5	1	0.5	8.3
Economic Development	3	1.6	14.3	48	24.9	30.0	3	1.6	25.0
Government	4	2.1	19.0	45	23.3	28.1	1	0.5	8.3
Growth	1	0.5	4.8	19	9.8	11.9	0	0.0	0.0
Natural Resources	14	7.3	66.7	43	22.3	26.9	0	0.0	0.0
Sustainability	5	2.6	23.8	22	11.4	13.8	0	0.0	0.0
Tourism and Recreation	0	0.0	0.0	23	11.9	14.4	0	0.0	0.0
Total	31			244			5		

Among editorials, priority was placed on economic development, accounting for two percent of all analyzed articles and 25 percent of all editorials. This was followed by community development, and government, with each accounting for less than one percent of all analyzed articles and eight percent of all *West Yellowstone News* editorials. Editorials categorized as economic development were focused solely on winter access to Yellowstone NP, while those categorized as community development or government

were focused on the community library. Among letters to the editor, the highest priority was natural resources, accounting for seven percent of all analyzed articles, and 67 percent of all letters to the editor, with the majority of articles focusing on bison management in the GYE. This was followed by sustainability and conservation, community development, government, and economic development.

While editorials and news articles focused on issues related to economic development, community development, and government, letters to the editor focused on natural resources, sustainability and conservation, community development and the government, although a focus on natural resources was also important in news articles. Issues related to sustainability and conservation, however, constituted nearly a quarter of all letters to the editor, and suggests that the issue is underrepresented in news articles.

Red Lodge

A total of 287 articles were analyzed in the *Carbon County News*, with 87 percent categorized as news articles, 13 percent as letters to the editor, and less than one percent as editorials (Table 6-25). News articles related to community development were the most prevalent sustainable development category during the study period, accounting for 30 percent of all analyzed articles, and 36 percent of all news stories. This was followed by articles related to the government, tourism and recreation, growth, and natural resources. The sole editorial was focused on community development, specifically an update and overview of education in the community. Among letters to the editor, the highest priority was community development, accounting for six percent of all analyzed articles, and 44 percent of all letters to the editor, with a majority of articles focusing on education in the community. This was followed by government, economic development, growth, and natural resources, with all other categories accounting for approximately one percent of all analyzed articles.

While editorials, news articles, and letters to the editor were highly correlated in Red Lodge (see Chapter 5), letters to the editor focused on economic development to a higher degree than news articles. In contrast, articles focused on tourism and recreation were more prevalent in news articles than they were in letters to the editor. This suggests that while residents, in their writing of letters to the editor, and the newspaper both placed

Table 6-25 *Carbon County News*: Content Type and Category

Category	Letters to the Editor	Percent of all articles	Percent of letters to the editor	News Articles	Percent of all articles	Percent of all news articles	Editorials	Percent of all articles	Percent of editorials
Community Development	16	5.6	44.4	87	30.3	35.8	1	0.3	100
Economic Development	8	2.8	22.2	28	9.8	11.5	0	0	0
Government	9	3.1	25.0	53	18.5	21.8	0	0	0
Growth	7	2.4	19.4	33	11.5	13.6	0	0	0
Natural Resources	7	2.4	19.4	29	10.1	11.9	0	0	0
Sustainability	3	1.0	8.3	21	7.3	8.6	0	0	0
Tourism and Recreation	3	1.0	8.3	38	13.2	15.6	0	0	0
Total	53			289			1		

community development and government as a top priority, residents believed that economic development was a higher priority than tourism and recreation, and thus the topic was underrepresented in news articles.

Jackson, Wyoming

While letters to the editor and editorials appear in the print copy of the *Jackson Hole News and Guide*, they were not accessible at the newspapers online archive. Due to a lack of accessibility, they were not included in analyses here.

Chapter Six Summary

The content analysis of local newspapers was used to investigate decision maker and stakeholder priorities for the local and regional environment, economy, and communities, and to determine what actions had been taken to promote sustainability. A total of 193 articles from *West Yellowstone News* between January 01, 2000, and December 31, 2009, were analyzed. The most discussed topics in West Yellowstone during this time were focused on natural resources, economic development, community development, sustainability and conservation, and growth and development. Articles

related to natural resources focused on the Interagency Bison Management Plan (IBMP), and the spread of brucellosis. Because of the polarizing nature of the brucellosis debate, bison management is one of the largest concerns facing the community of West Yellowstone. Articles related to economic development also were focused on a highly polarizing debate, winter access to Yellowstone National Park. The winter access debate was directly tied to articles related to community development that focused on strategic planning and visioning. Regardless of what side of the debate local residents were on, it was agreed that a long-term diversification of the local economy was needed to ensure the community's success. Articles related to sustainability and conservation were focused on the Greater Yellowstone Coalition, a non-governmental group that had on-going litigation with the National Park Service to keep snowmobiles out of Yellowstone National Park. In addition, several articles focused on the "Green Up West Yellowstone" Program supporting a community recycling program. Lastly, articles related to growth and development were focused primarily on affordable housing. Although the community is surrounded by federal lands and does not have the ability to grow outward, concern existed over a lack of affordable housing for year-round residents.

A total of 287 articles from *Carbon County News* were analyzed, dating between 2000 and 2009. The most discussed topics for Red Lodge were community development, government services, tourism and recreation, and growth and development. Articles related to community development were focused on the construction of a new high school, the consolidation of rural schools, and a shift toward a four-day school week. Articles related to government services were focused on the maintenance and upgrade of existing city infrastructure, most notably water and sewer services. In addition, debate over the installation of a solar powered array to provide power to a new water treatment plant was met with criticism from those who were concerned about payment for the installation. The primary focus of growth and development articles was the lack of county-wide planning and zoning policies that had allowed unrestricted development near town, including large-lot subdivisions and a gravel processing plant. A concern over the diversification of the primarily tourism-based economy also was evident in Red Lodge during the study period. Economic development and tourism/recreation related articles were focused on the Beartooth Highway and the annual Beartooth motorcycle rally.

Because the Beartooth Highway is not open year round, is susceptible to closures due to landslides, and the fact that it is the community's main tourism attraction, many in the community wanted to diversify beyond tourism to ensure a year-round economy.

A total of 333 articles from *Jackson Hole News & Guide* were analyzed for the study period. The most commonly discussed topics in Jackson were natural resources, growth and development, community development, and government services. One of the primary concerns related to community development was the access to reliable health care. Although many rural residents around Jackson had access to health care facilities, there was growing concern over the heavy reliance on the St. John's Medical Center in Jackson, and its ability to keep pace with demands. Articles related to government services were focused on transportation, including the recently initiated Pathways Program that connected the city and Grand Teton National Park with walking and biking paths, and the START bus program that provided low-cost public transportation to the city and surrounding rural communities. Like West Yellowstone and Red Lodge, growth and development also were of concern in Jackson, with the majority of the articles focused on the lack of affordable housing in the affluent community. Because of the rapid growth experienced within the community over the past several decades, longtime residents and service workers were being priced out of the housing market, with many moving to nearby Driggs, Idaho, for affordable housing. However, developers and the city itself were taking steps to provide additional low income housing, although amenity migrants were concerned about how this might impact their housing values and the character of the community. Lastly, articles related to natural resources were focused on oil and gas leasing and wildlife. Like bison management and winter access to Yellowstone National Park, the extraction of oil and natural gas and their impacts on the natural environment, primarily in the Bridger-Teton National Forest, were highly contentious issues for amenity migrants and longtime residents alike. In addition, there was on-going debate over the feeding of elk on the National Elk Refuge during the winter months, as well as the impact to ranchers from the reintroduction of the gray wolf to the Greater Yellowstone Ecosystem.

Chapter 7 - Results: Key Informant Interviews

A total of 32 key informant interviews were conducted with decision makers in the three study communities—West Yellowstone and Red Lodge, Montana, and Jackson, Wyoming—in the Greater Yellowstone Ecosystem, May-August 2010 (Table 7-1). Three key informant interviews were conducted via email as per the request of the informants, and two were conducted with non-government organizations in Red Lodge, and one with a regional NGO in Ennis, Montana. Although outside the study communities, the NGO from Ennis, Montana was included because it is representative of a citizen-supported group that promotes open-space, wildlife protection, and private property rights. In addition, two in-person key informant interviews were conducted with regional land trusts based in Bozeman, Montana (indicated as "other" in table 7-1). Key informant interviews allowed for an increased understanding of local perceptions, priorities, goals, and challenges related to sustainability, as well as the power structures and influences that most affect a transition toward sustainability. Key informant interviews addressed research questions 1.1-1.4 and 2.1-2.2. Results of key informant interviews are discussed below based on interview questions and emergent themes, with each of the three study communities discussed separately. A synthesis of results can be found in the discussion section of this document (Chapter 8).

Defining Sustainability

Key informants were first asked if they had a working definition of what constituted sustainability or sustainable development. A total of 24 responses, or 75 percent of all interviews conducted, were obtained. Definitions differed based on the key informant's community, his or her role in the community, and time in residence in the community. When considering all study communities collectively (Table 7-2)(Figure 7-1), 46 percent of respondents focused on the environment in their definition, 42

Table 7-1 Key Informant Interview Data

	Business Owner	City Official	NGO		Male	Female		Average Time in Residence		Total
West Yellowstone	6	2	2		8	2		34		10
Red Lodge	2	4	4		7	3		19		10
Jackson	0	7	2		6	3		16		9
Other	0	0	3		2	1		18		3
Total	8	13	11		23	9		22		32

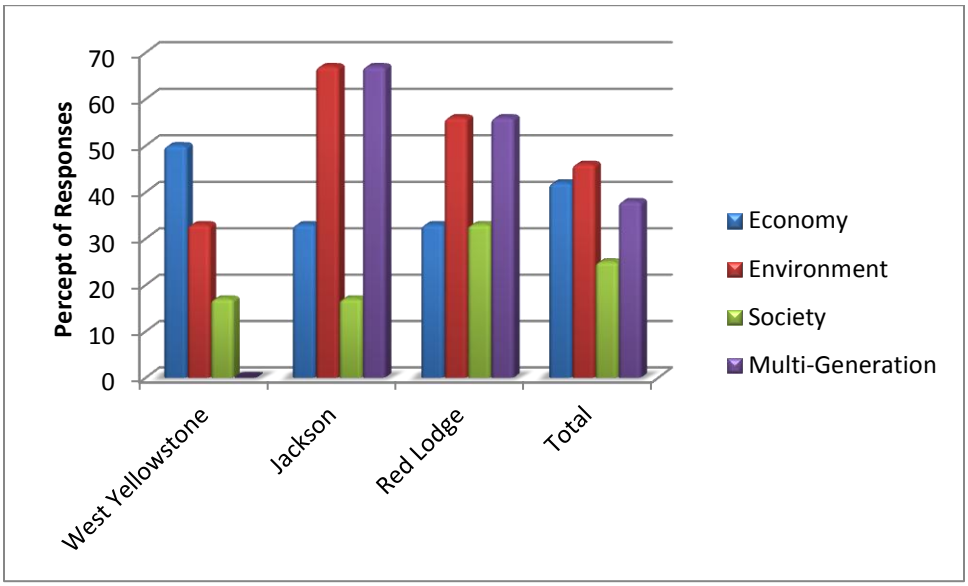
Table 7-2 Regional Sustainability Definitions

Theme	**Percent**
Environment	46
Economy	42
Multi-Generational	38
Society	25
Quality of Life	17
Development/Growth	13
Sustainable Initiatives	13
Self-Sufficiency	13
Yellowstone National Park	8
Tourism	4

percent on economics, 38 percent on multi-generational thinking, and 25 percent on societal concerns[4]. For the region as a whole, a definition focused on the environment acknowledged recognition on the respondents parts of the importance of the natural environment to their livelihoods and ways of life. As one city officially noted, "I think fundamentally people understand that, you know, our economy is our ecology."

[4] Totals add to more than 100 percent because respondents sometimes expressed multiple sustainable development foci.

Figure 7-1 Defining Sustainability[5]



Role in the Community

Key informant responses differed based on the respondent's role in the community. Business owners defined sustainability in terms of economics (80 percent), followed by the environment (60 percent). Themes related to society (40 percent) or the community, as well as development (40 percent) and growth were also present. The high level of focus on issues related to economics by GYE business owners results from their dependence upon tourism, primarily National Park visitation, for their livelihoods. As one business owner suggested,

> My definition of sustainability is one that where, that we have, we're aware that our actions, how do I say this, that we recognize our responsibility to think multi-generational. That we have the obligation as leaders and stewards of this community to look at the long term implications of the decisions that we make today, and to appreciate that. That we will not benefit from the shade of the trees that we plant, so it's multi-generational. It's recognizing that multi-generational, that decisions made today have long term impacts and that we want to give this place to our grandchildren in at least as good shape or better than we received it. Because you, you pay it forward…

[5] Figure 7-1 depicts key informant responses to the question, "How do you define sustainability?" Hash marks on the X and Y axis represent percent of responses (in 10 percent intervals) for a particular response.

It is also likely that economics were on the forefronts of business owners' minds due to the recent downturns in the national and global economy. Most business owners felt that the economic downturn occurred later in GYE communities than in other regions of the country. It was speculated that this was due to their isolated nature and their dependence on tourism and the NPS. Extra-local influences, such as national and global economic conditions, were a consistent concern of decision makers in study communities. As one business owner noted, "So the global economy has an influence on what's happening locally, and that's not necessarily within our control. So we have to adapt to changes that may be external."

City officials in study communities defined sustainability primarily in terms of thinking multi-generationally (50 percent). The term multi-generational is used in this context to refer to the recognition on that actions and decisions have long-term implications for future generations. Multi-generational thinking was primarily evident in Jackson. This focus was present in interviews from members of the city council, to town planners and local land trusts. As the community was in the process of reviewing its comprehensive plan, the high preponderance of multi-generational responses likely was a product of the planning process, and language and sentiments expressed in that document. For example, a town planner defined sustainability as "recognizing…that decisions made today have long term impacts and that we want to give this place to our grandchildren in at least as good as shape or better than we received it."

Non-governmental organizations, both within and outside the study communities, defined sustainability in terms of the environment (64 percent), thinking multi-generationally (45 percent), and economics (45 percent). As all NGOs outside the study area, and several within, were environmentally oriented, a focus on the environment is natural. Because land trusts focus on long-term planning, the inclusion of multi-generational thinking was also to be expected. As one land trust confirmed,

> We work, as a land trust; we work with agreements that are perpetual. They run with the land, and that's a really long time frame to be thinking about. So I think we tend to think about sustainability differently than most people because we are thinking about things in very long time scales.

Time in Residence

Those who had lived in the GYE for less than ten years defined sustainability in terms of multi-generational thinking (13 percent) or quality of life (13 percent). Most of the respondents who fell into this category had recently moved to the region for reasons of quality of life and environmental or social amenities. Because newcomers are amenity-driven, it is likely that they would be inclined to think multi-generationally, and to want to maintain the qualities that initially brought them to the region.

Some respondents, however, expressed concerns that amenity-migrants in some instances may arrive with preconceived expectations of the region that may prove difficult to fulfill, and result in a disconnect between long-time residents and newcomers. For example, one NGO official, in reference to newly arrived amenity migrants, said

> I think there is still a very romantic concept of what it means to live in the West and what it means to live especially in the GYE. There are these charismatic wildlife and we have these beautiful landscapes and a lot of the people who are newcomers don't understand some of the cultural identity here including things like, just sort of the way that neighbors work together. The way that we conserve resources, the way that land managers understand a landscape. I think we work with a lot of new landowners who may not always be able to take that long view and really see the interaction. They may not understand the cultural connection between people and the land.

Those who had lived in the region between 10 and 20 years defined sustainability in terms of economics (13 percent), the environment (13 percent), and thinking multi-generationally (13 percent). Expressions of these residents began to shift away from quality of life themes, and instead began to focus more on the longevity of their residence. This was seen in their focus on economics and quality of life. Most mid-term residents, primarily business owners, recognized their relation to and dependence on the environment, but felt that without viable economic opportunities they could not continue to live in the region. Those who had lived in the GYE for longer than 20 years defined sustainability in terms of the environment (29 percent), followed by economics (21 percent), with societal concerns and multi-generational thinking present to a lesser extent. Long-term residents recognized the relationship between the environment, the local economy, and their quality of life. By maintaining the natural environment, long-term

residents were, in fact, sustaining their way of life, as well as their descendants' opportunities with respect to the environment.

West Yellowstone as a Whole

When taken as a whole, respondents from West Yellowstone defined sustainability in terms of economics (50 percent)(Figure 7-1). Themes of the environment (33 percent), sustainable initiatives at the community level (33 percent), Yellowstone National Park (33 percent), social concerns (17 percent), and self-sufficiency (17 percent) were also present. One of the largest concerns in the community related to sustainability was the ongoing litigation between environmental groups and the NPS involving winter access to Yellowstone National Park. Nearly all business owners interviewed suggested that the current limitations, which reduced snowmobile access, and the potential that all snowmobile access would be stopped in 2011, had a negative impact on not only the local economy, but also on the community as a whole. A business owner reflected on the changes winter access has had on sustaining the community when he stated that a major concern is

> economic sustainability, which we've had a problem with here in West Yellowstone because of the impact of the continual decrease in the numbers of snowmobiles that are allowed into the park. So we used to take through the West Gate 1300, 1400, 1500 snowmobiles a day. This last year we were limited to 160.

Most West Yellowstone interviewees felt that a reduction or elimination of snowmobiles from the park, the community would shift from a two season (winter and summer) to a one season town (summer), with a dramatic impact on the town's viability. One interviewee went so far as to say that there was nothing in the town to sustain because the town was in fact dead if the 2011 exclusion held, admitting, "you know this town is not sustaining anything, it's dying. It's becoming or has become a one season community." Most in the community however, did not blame the NPS for its decision, but rather NGOs who have tied the snowmobile issue up in state and federal courts for over a decade. As one business owner suggested, "the outside force is mainly the environmental groups that are continuing, continually suing the park service no matter what their decision is. They have sued them over everything, and they'll continue to."

With little confidence in environmentally progressive organizations, it was difficult for the town of West Yellowstone to put forth truly meaningful sustainability initiatives, although most in the community were cognizant that they should be.

West Yellowstone by Role

All business owners interviewed in West Yellowstone defined sustainability in terms of economics, while half also defined it in terms of the environment or society. The importance of the community's dependence on the National Park and the two million visitors that pass through the town each year cannot be understated. All business owners interviewed spoke at length about their dependence on tourism and the national park. Most also recognized their reliance on the natural environment for their livelihoods, and most believed that in order to sustain the community over the long-term the natural environment must be protected. A recognition of dependence on the natural environment was expressed by a business owner when he admitted,

> We all impact the park, the resource, and to develop our business in an economically sustainable fashion you got to give a little bit more back. I use Yellowstone as a huge resource. I use every one of these rivers and I thought, you know…so you got to give back more.

These sentiments were echoed by another business owner who stated, "We can't keep abusing the hell out of everything we have."

Half of the city officials in West Yellowstone defined sustainability in terms of sustainable initiatives at the city level, their relation to YNP, and self-sufficiency. This is largely the result of a strong push by city officials for their "Green-Up West Yellowstone" program. The program consists of citizens, businesses, and local and regional organizations promoting and educating the public on recycling and sustainable, eco-friendly projects. The inclusion of Yellowstone NP in their definition, as well as self-sufficiency, is tied to the community's heavy reliance on the park for economic vitality. These sentiments were expressed well by one city official, who declared,

> In the purist sense [sustainability] means you can shut your gates and live. That's not realistic here, we've got to have people coming in. I guess, when I think of sustainability I think in large part of self-sufficiency, you know. We are a pretty self-sufficient community you know, we take care of ourselves. We have to because we are too far from the county seat for

> anyone to really give a damn about us. But I think that, we've got to start to implement, whether it's actually laws and policies with the town, or we have to adopt an approach in the private sector, that's, that's not just a media campaign, it's got to be an actual, it has to be actual on the ground tangible changes to the way we, we can't just say oh green up, we have a green up face book page so, come on, you know and then they roll into town, this is the same old West Yellowstone with some sham marketing. I think we got to make some changes, some real changes about the way we do business, especially with regard to resources.

One of the two NGO representatives interviewed in West Yellowstone defined sustainability in terms of the economy, environment, sustainable initiatives, and their relation to Yellowstone National Park. Because the two interviews with an NGO in West Yellowstone were conducted with local Chamber of Commerce representatives, their inclusion of economics in a definition of sustainability is tied to their pro-business mission. Both respondents recognized the connection between the natural environment (specifically Yellowstone NP) and the local economy, and thus the importance of sustainability initiatives underway in the community. Specifically, one claimed that,

> I don't think that there is a business, I don't think that there is person who lives in west Yellowstone who doesn't appreciate A) where we are…how we interact with our surrounding environment, it sustains our economics and in return the economics has to sustain the golden goose, I mean. We have to take care of what is out there in order to keep it going.

Further, it was the Chamber of Commerce respondents' belief that by promoting such initiatives they were educating tourists, and this would draw more tourists who see the community as environmentally responsible.

Red Lodge as a Whole

In Red Lodge, definitions were focused on the environment (56 percent of respondents) and multi-generational thinking (56 percent), with themes of economics (33 percent), society (33 percent), and self-sufficiency (33 percent) also present (Figure 7-1). Definitions of sustainability focused on the environment, multi-generational thinking, and self-sufficiency in Red Lodge can be seen as a reflection of the community's reliance on the natural environment for its economic vitality. Although the community is located only 60 miles from the largest city in the region, Billings, Montana, for much of the year

the community is highly isolated due to the closure of the Beartooth Highway during the winter months. The importance of the Beartooth Highway was witnessed on May 19th when the highway was closed for the remainder of the season due to rock slides. Nearly all key informants indicated that this was one of the first instances when the community realized its economic dependence on the highway as tourism decreased sharply in the aftermath of the slides. The effect of decreased tourism on the local economy was also felt in the summer of 2008 when wildfires filled the town with smoke for much of the tourist season. The importance of the environment in this context was repeated throughout interviews in the community, with nearly all key informants understanding that without a pristine natural environment with which to draw tourists, the town could not survive. Numerous organizations and individuals in the community also felt strongly that it was their duty as a gateway to the world's first national park to be not only an advocate of environmentalism but, more importantly, an educator to the hundreds of thousands who travel through the community each year. This is seen in both the city and numerous businesses using alternative energy sources such as solar, as well as new construction seeking LEED (Leadership in Energy and Environmental Design) certification. Reflecting on the importance of education, one business owner reasoned,

> It is our obligation and we have to do it, and I really believe that. The natural history, the climate change, the environment, that's all our obligation to give back to the residents that come here. And because a lot of them are poor we need to, I think educate them why this is such an important biome not just for us as residents, but for them, even though they may live on the east coast. You know this environment here has huge ramifications for the entire world. It is unique ecosystem; I mean you've been to Yellowstone. You know how incredibly unique it is. Yeah, it is our obligation. Wholeheartedly without a doubt, and it's a big task. It's a big task for a lot of us in town, especially the Nature Center to make sure we get that education across. I know the Forest Service feels the same way, it's very important to get that information out there.

This vision of a sustainably educated tourist base was furthered by the same informant when he said,

> I want them to fly into Billings, and I want them to start here, learn everything they need to learn about the western rocky mountain. Then go out and enjoy the recreation and enjoy the recreation as sustainably and as carefully as they can. Understanding why they as individuals have an

> impact on the environment, regardless of what it is they do. I think in the future, I think that's where I would like to see Red Lodge be. Becoming a sustainable community that educates our tourists why this environment is such an important thing and how they individually can impact it by their everyday travels.

Red Lodge by Role

Sixty-seven percent of business owners interviewed in Red Lodge defined sustainability in terms of the environment, economics, and development or growth in the community, while 33 percent defined it in terms of society. Many business owners expressed concern over development and growth taking place throughout Carbon County, but most notably in and around Red Lodge. This concern was further bolstered by the recent acquisition of the local ski resort, Red Lodge Mountain, by JMA Ventures out of California. While the community as a whole had seen some success in limiting growth, especially in city boundaries, there were concerns that a lack of zoning at the county level would result in large-scale development.

Like other gateway communities, economics are directly connected to tourism in Red Lodge, and in order to achieve sustainability it was perceived that tourist visitation rates must be sustained. As one business owner confirmed,

> My definition for sustainability I guess would be first and foremost economic…How do we sustain tourism? Well, I think we…keep the things that bring the tourists here as pristine as possible. You know, it's what people expect to see when they come back to Red Lodge and that's how we sustain that.

There were also concerns from business owners that the recent level of growth in the county could not be sustained over the long-term, and that such growth may have negative implications for both the community and the natural environment. Speaking on this concern, a business owner said:

> You know we talk a lot about sustainability in terms of environmental reasons, but you also have sustainability in terms of economic reasons. Can the level growth, can the infrastructure that is being built, is it sustainable in terms of your ability to fund what your, your growth level is. And then what are the environmental impacts for that…that's sustainability.

This was furthered by another business owner who stated, "sustainability would be guiding growth so that you preserve the value of the area," and a third who added, "you can have growth, but you have to do it in a fashion that will maintain the integrity and the character of the place." All three of these quotes directly addressed the importance of maintaining the environmental quality of the region to ensure the longevity of the community.

Fifty percent of city officials interviewed in Red Lodge defined sustainability in terms of either multi-generational thinking, quality of life, or development and growth. City officials were largely concerned with the unhampered growth occurring outside city limits. As one official noted, "I think sustainability is the ability to maintain our quality of life that we have here in 2010 will be the same quality of life in 2110." It was believed that the county was the largest obstacle to the city's future, as significant differences in policies exist between the two. Further, because of the county's largely agricultural-based economy, decision makers were reluctant to enact policies that infringed on individual property owners' rights, including countywide zoning. The concern over future growth was expressed well by a city official, who asserted that

> There's going to be changes and it's not how we're going to grow or how we're going to development. It's not if we're going to grow, it's how we're going to grow. And if you don't grow conscientiously and make decisions about our growth, we will make decisions that will impair our growth and hurt the quality of life and hurt our economy and that all goes with it.

Speaking on the concerns of private property rights, another official added,

> Yeah, I think there's this resistance among the agricultural population to have restrictions put on their agricultural land. But I also think there is a lot of, In this area there's people with, there's people with money from outside who bought property who are reliant on the agricultural economy, that livelihood, and they still don't want restrictions put on their land. There's a population in the county who commute, work in billings, kind of work in the city, and live in the country and they have the same kind of mentality. I think people in cities they want rules, they want strict development codes, they want good fences so they have good neighbors. And the mentality in the rural parts is that it's my land I can do whatever I want with it.

The disconnect between rural agricultural landowners and city and county officials who hope to curb unregulated development has spurred debate. Although rural residents may not be subject to the impacts that development has on towns like Red Lodge, their actions, including the subdivision of their lands, is often the catalyst for such debates.

Three of four NGO interviewees in Red Lodge defined sustainability in terms of the environment or economics, while half of the respondents defined it in terms of society, thinking multi-generationally, quality of life, and development or growth. One NGO representatives interviewed in Red Lodge defined sustainability in terms of self-sufficiency or tourism. Self-sufficiency is a concern of many in the community, with recognition that they are largely dependent on the tourism industry. With downturns in the local and national economy, decreases in donations and support of NGOs correspondingly declined. This concerned organizations in Red Lodge because of the relatively high number of NGOs and their diverse objectives in the community. Most NGOs relayed their ongoing fear that while donations continue to occur, they are spread among a diverse set of organizations, and that any changes to the local economy might impact donations further. Representatives also felt that there are far too many NGOs in the community, and that what is needed is a unified coalition of organizations that could maximize donations for the betterment of the community. As one NGO representative observed,

> …I do think sustainability ultimately means you have streams of income and those don't necessarily have to be money, but generally you think of them that way. But streams of income or resources, maybe is the better word, to maintain a level of functionality I guess. So, in the community you would maintain standards of living or community resources or those types of things with streams of income or resources, or either within or without the community that you can count on, or use interchangeably.

Addressing the frustrations that arise from having a high number of NGOs in the community, a respondent asserted that

> …what you do is you get all these nonprofit groups vying for very limited resources. So the community will as a general rule rally around one of them for something, but then it's not sustainable because there's all these others tugging. And so they kind of move into, you know there's going to

> be the diehards who are always going to support that one group they support, but the tide moves around those. So, you get pieces, build Boys and Girls Club, then struggles to maintain and operate it.

Other NGO definitions focused almost exclusively on the environment, with recognition that economics and other activities should not negatively impair natural systems. One key informant was conscious of the normative nature of the term sustainability when she said,

> Ideally: sustainability for me means being able to continue an endeavor (business, recreational activity, agriculture, consumption, etc.) indefinitely into the future without either significant or long-term adverse consequences locally, regionally or globally. (Consequences could be environmental, economic, or social.) In reality: sustainability means doing what is realistic to reduce adverse consequences of existing endeavors and activities while avoiding creating additional consequences from new activities.

Jackson as a Whole

In Jackson, definitions were focused on the environment (67 percent) and on thinking multi-generationally (67 percent), with themes of economics (33 percent), society (17 percent), sustainable initiatives (17 percent), and quality of life (17 percent) also present (Figure 7-1).

The focus on themes of the environment in relation to sustainability in Jackson relate to the long history of environmental activism in the region. This environmental ethic began with the first settlers of valley, and continues to this day. From business owners to land trusts, to the mayor himself, all key informants in Jackson considered the environment to be their prized possession, and something that was worth not only fighting for, but more importantly, something that was ingrained in the very fabric of their everyday lives. As a city official stated, "How do we take what exists and be far more efficient and effective in impacting our environment far less?" A non-government representative added, "we feel that a truly sustainable community for one of these gateway communities means that you're paying attention to tour natural and scenic resources, and you're making sure that you're not depleting those or overly impacting them with people, etc." This environmental ethic extends to the amenity migrants, as well as to long-term residents.

Jackson by Role

Seventy-five percent of city officials (three of four) interviewed in Jackson defined sustainability in terms of multi-generational thinking, while 25 percent defined it in terms of the economy, the environment, or society. The preponderance of responses related to multi-generational thinking is a reflection of the community working through its comprehensive plan, and its inclusion of similar language. That so many city officials mentioned this term indicates that it is likely that it permeates government culture in the city and county, although this number certainly could be affected by recent city discussions. It was also likely that this sentiment was based on the long-held respect and protection of the natural environment that is present in the community. A city official noted that sustainability is "being able to basically live within your means so that you are not compromising the ability of future generations to also have a good quality of life and be able to do the things you are able to do." This was furthered with another official suggesting, "I think sustainability, in my mind, is doing what we can to keep this place at least as good as we found it, and hopefully make it better." The importance of economic sustainability was also evident from discussions with city officials, which one respondent observed had been less successful in recent years:

> And then I think economically, for economic sustainability, I guess that might be the leg of the stool that we might not be doing as well at because we do depend so much on the tourism and the sales tax. The budget for the town, our general fund, is funded sixty percent through sales tax.

Attracting not only tourists but also residents was important to some decision makers, and a critical part to the social dimension of sustainability. One key informant questioned, "How do we bring people here who are more concerned? How do we bring people here that really care about this place, and care about themselves and want to be a bit more spiritual. Instead of…driving through on their way to and from the park."

One respondent, or 50 percent of the two NGO representatives interviewed in Jackson defined sustainability in terms of either the environment, sustainable initiatives, multi-generational thinking, or quality of life. The inclusion of quality of life in NGO and city official interviews was prevalent. Residents of Jackson repeatedly recognized the uniqueness of their community and most felt that maintaining that uniqueness, both

environmentally and socially, was of utmost importance. Recognizing Jackson's uniqueness, a local land trust representative contended, "It's more about a livable community that for generations to come have the things that we are able to sustain the things we have value in this community so we are able to keep those things that make Jackson unique and special and livable."

External NGOs

For non-governmental organizations based outside the study area (Bozeman and Ennis) but heavily involved in the GYE, definitions of sustainability were focused on the environment (2 of 3 interviews; 67 percent), multi-generational thinking (67 percent), economics (33 percent), society (33 percent), and self-sufficiency (33 percent)[6]. Definitions focused on the environment are to be expected as all three organizations are primarily environmental. Multi-generational considerations were also present and reflect the long-term projects these organizations participate in on a regular basis. As was the case for NGOs in individual communities, these larger regional organizations also rely heavily on donations and support from the general public. Downturns in the economies of the entire region have had a negative impact on these organizations, and thus economics is of high importance for these organizations. Further, regional NGOs believed that gateway communities with sustainable economies, and recognition of the economic importance and dependence on the environment, would be more inclined to focus on projects related to a sustainable natural environment. Developing strong community and social ties was also of concern, as the relationships that these organizations foster with the region provide the impotence for change. Without strong communities with high attachment to place, regional NGOs believed that long-term planning would be difficult in the region.

[6] Although only three interviews were conducted with non-government organizations outside the GYE, it was believed their inclusion, while limited, was valuable to the study as these organizations were actively involved in perpetuating a transition toward sustainability.

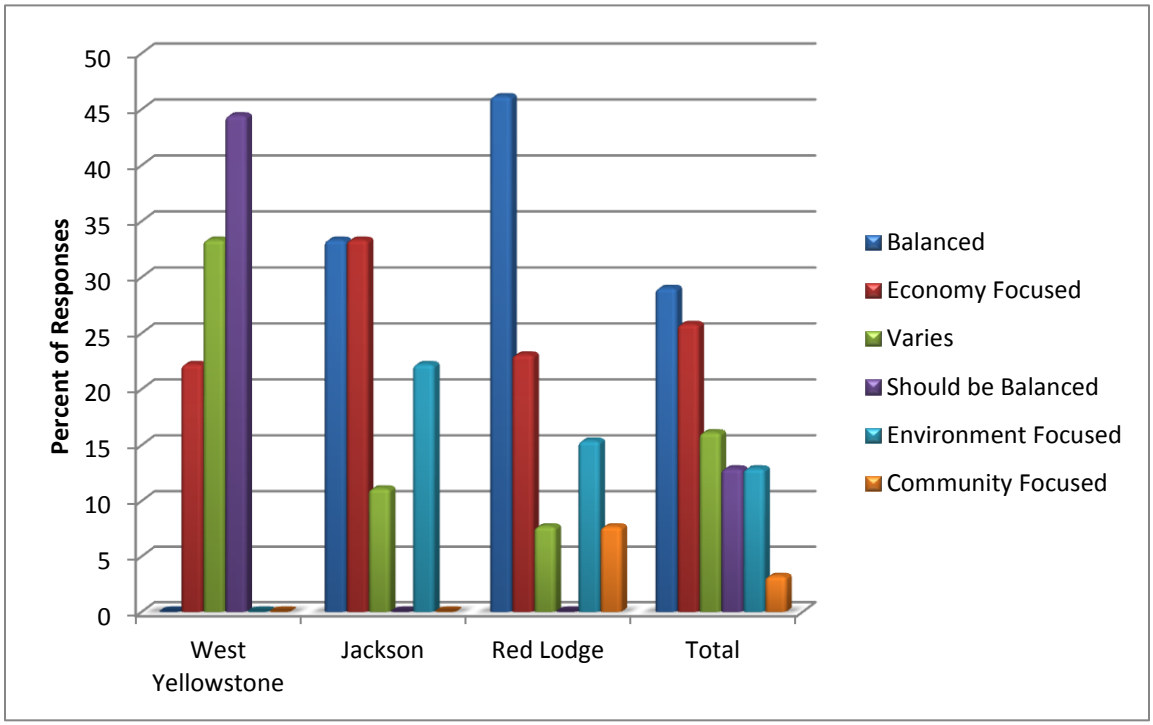
Sustainability versus Sustainable Development

When asked if sustainability differs from sustainable development, 75 percent of respondents felt that sustainable development is different from sustainability in that it dealt only with development or growth. Although no key informants answered this question in West Yellowstone, all business owners interviewed in both Jackson and Red Lodge felt the terms mean different things, while city officials and NGOs split in both communities. The three regional NGO representatives all felt that the terms are different. Of particular note was the difference in opinion when considering time in residence. Eighty percent of residents who had lived in the region for less than ten years suggested that sustainable development and sustainability were the same, while 83 percent of those who had lived in the region between 10 and 20 years felt the terms are different. Those who had lived in the region for more than 20 years were split. Residents who have lived in the region for less than ten years may believe the terms to be synonymous because of the ideals and beliefs brought with them. Further, it is possible that new residents believe that sustainability and development can occur simultaneously, while long-term residents have felt that recent development and growth have not occurred in a sustainable manner, and future growth imperils the region.

Balancing the Triple Bottom Line

When considering the three study communities collectively, 29 percent of respondents felt that the environment, economy, and community receive equal prioritization in their communities, reflecting a balanced triple-bottom-line (Figure 7-2). It also should be noted that respondents recognized that, not only do societies create economies, but both society and the economy exist within an environmental setting, reflecting the embedded nature of the triple bottom line components. However, 26 percent of respondents thought that the local economy is given the highest priority, while 13 percent felt it is the environment. Only three percent of respondents thought that local community development received the highest priority. Of particular note was the recognition (16 percent) that balance and prioritization varied. Variations in priorities were focused on two temporal scales, seasonal and annual. Annual variations were

Figure 7-2 Balancing the Triple Bottom Line[7]



largely the result of changing economic conditions at the national and global scales. Larger-scale economic conditions influence prioritization because of the dependence on tourism and recreation-based industries inherent in the study communities. Seasonal variations are the result of shoulder seasons (October to December and March to May), which are largely dictated by the closing of Yellowstone NP during the spring and fall. Because issues of sustainability vary spatially and temporally, it is critical to develop a better understanding of the goals, indicators, trends, and driving forces of changes on local scales (Parris and Kates 2003). When considering communities individually, patterns emerge in prioritizations that are closely aligned with local socio-economic conditions and dependence on tourism and recreation-based industries.

[7] Figure 7-2 depicts key informant responses to the question, "Is the triple bottom line balanced in your community, and if not, what sustainability sphere takes precedence?"

West Yellowstone, Montana

In West Yellowstone, which is almost entirely dependent on park visitation, 22 percent of respondents thought the top priority is the local economy, with an additional third of respondents agreeing that priorities shifted seasonally (Figure 7-2). Forty-four percent of respondents suggested that while priorities may shift seasonally, the local environment, economy, and community should be balanced. This recognition of equilibrium is significant as it furthers the idea that sustainability is a normative concept, based on what respondents believe 'should be.' A local government official expressed this idea well when he said,

> I would think the correct answer would be that they have to be given equal weight. But I think economy is always going to win out. If it's a matter of recycling or money or something like that money is always going to win out. And I'm not sure that's bad. As a town we have to make money, we have to take in money; we have to have a viable economy. If you don't have that then nothing makes any sense. You can recycle all you want, but if you don't have anything to recycle eventually you're nowhere. So the economy has to be a paramount factor, but you know there has to be a way to make it all work. I mean you know there's plenty of smart people out there that are doing it now. There has to be a way to make it all work.

While some decision makers felt that balance should exist, they also recognized that their dependence on Yellowstone for economic viability often results in a focus on economics. This recognition was noted by several decision makers, including a business owner who stated,

> In a community like West Yellowstone that is so totally impacted by federal land, our ability to exist is based on the fabulousness of Yellowstone National Park on one hand, and on the other hand the opportunities--the additional recreational opportunities--that are offered through the national forest. So, those are the… current and past cornerstones of the economics of the community.

Several key informants also noted the unique challenges present in communities that are dependent on tourism and recreation-based industries. A local business owner suggested,

> I think we are especially vulnerable to putting one above the other [environment, economy, community] We have to acknowledge that we make our living off the park. The park has to acknowledge that they use our services. I mean if 3 million people visit Yellowstone National Park, a

> lot of them are going to have to stay in the gateway communities. It's just the way it is.

It was believed that dependence on Yellowstone NP results in the lack of a year-round economy and causes prioritization of the triple-bottom-line components to vary seasonally. As a local business owner commented,

> There are dramatic differences in the weight given to those three factors [environment, economy, community], whether you are talking about winter, or whether you are talking about summer… I've been in a lot of resort communities, and I have yet to be in one that shows such a dramatic change from what we call warm season to cold season.

Red Lodge, Montana

For Red Lodge, nearly half of all respondents agreed that a balance of social, economic, and environmental sustainability concerns exists in their community (Figure 7-2). Twenty-three percent of respondents suggested that the economy is the top priority, while 15 percent of respondents believed that it is the environment.

Many decision makers in Red Lodge felt that the triple bottom line is currently balanced, although that balance differs both spatially and temporally. Spatially, it was perceived that a balance exists at the community level, while at the county level it does not. As one local government official noted, "I think that they are [balanced triple-bottom-line] in the city of Red Lodge, but I don't think at the county government level they are." A local business owner added,

> I think for the most part Red Lodge has…a good handle on those issues. The county, on the other hand, does not. I think the county [is] not as dedicated in guiding growth and maintaining what we have, the sustainability. Whereas the city over the last couple of decades has spent hundreds of thousands of dollars in studies and planning to take care of things within the city limits. But you get to the city limit and it's lost. So, you know there's county versus city when it comes to our region.

Temporally, balance has shifted through the community's history. One long-term business owner illustrated this point when he said,

> I would say 15 years ago, when I moved into this community, that the environment piece was there, but it wasn't talked about in the way that we talk about it now. That does come along with awareness and probably also with the kind of changing demographics, the kind of person who is

> making this community their home and participating in the life of this community. They've come here because of that natural amenity.

It was suggested that priorities would likely shift again as additional amenity migrants move to the area, and there are growing concerns about their impact on the environment. A local government official acknowledged that

> …the next 3-5 years are really going to test that. Because…the ski area sold three years ago, and I think from a growth standpoint it's the biggest thing to happen to this community in 30 years. And when the economy comes back and they start developing that ski area, that's when we are going to have that growth and it's going to test all three of those. The economy at that point is going to be much better because it is going to bring in business and developers and people spending money. But, boy, the environment, that's going to be a concern at that point in time as to what gets eaten up by development and what stays natural.

Balance was also perceived to be achieved on a longer-term scale (i.e., annually), but not on a daily basis. A local business owner felt that balance exists in the community on the large-scale, but it shifted, saying, "From a 20,000 foot view, yeah, I think there is [a balance] with really broad strokes," but that "there is a tradeoff there. It doesn't happen on a daily basis. So the balance isn't on a daily basis, the balance is on an annualized basis." Others felt that a balance does not exist; a local business owner said,

> I think Carbon County has a ways to go before they are balanced. So no, I don't think they are, in this area. I think they're getting there and I think people want it to happen. But I think Carbon County and the Red Lodge area has a ways to go before it's balanced, personally.

Finally, there was a growing recognition of the relationship between the local economy and the environment, and the community's dependence on a healthy and vibrant natural environment. A local NGO official illustrated this by stating,

> I think Red Lodge really knows, for the most part--most people really know--that whatever they are doing they depend on the environment for their income. So if they are ranchers, or farmers, or they depend on tourism, it's all based on the environment. So I think they are really aware of how things impact [sic].

Jackson

In Jackson, a third of respondents (three of nine interviewees) felt that balance exists in the community, while an additional third of respondents felt the local economy is the top priority (Figure 7-2). Lastly, 22 percent of respondents felt the environment is the highest priority. Those who felt that the economy was taking precedence believed that the primary driving force is the downturn in the national economy. One NGO official noted that when the community began its comprehensive planning process the economy was not a priority because the local economy was strong, but in recent years that had changed:

> We started that [comprehensive plan] over two or three years ago, and the economy… was in the back seat, and it was like, 'yeah it's important, but we're so strong, we're never worried about that.' Versus it has flipped upside down on its tail, and it is a big, big deal. The economy and business can stay here and be sustained; versus when we started the conversation, they were secondary.

Others recognized the importance of the tourism industry, and its related sales tax to the community's economy. The sales tax, also known as a visitor's tax, is a six percent sales tax placed on non-essential goods and services that, combined with a two percent lodging tax on hotel rooms, funds a majority of the community's services. As one government official stated,

> And then I think economically, for economic sustainability, I guess that might be the leg of the stool that we might not be doing as well at, because we do depend so much on the tourism and the sales tax. The budget for the town, our general fund, is funded 60 percent through sales tax. And so that makes it very difficult for us when tourism is down. And I think that that is always a balance that the community tries to look at is…like how many visitors do we sustain and how many are desirable, and where do we get to the point.

In addition to the tourism and recreation-based industries, some decision makers were concerned that downturns in the local economy would hamper amenity-based migration and second home purchases. One informant suggested,

> I think it depends on the year and the season. I think right now because Jackson's such a tourist community…that we were hit later during all these economic problems and maybe hit a little harder because so much of our economic growth is dependent on second homes. That's pretty much

> gone right now. So a lot of comments that you heard were not as accommodating for looking at environmental issues, it's more economic.

Other decision makers felt that the environment is the top priority of the community. Even when the environment was not seen as the top priority, many felt that the community has been successful in conserving the natural environment, especially considering the tremendous growth that has taken place since the 1970s. A local government official noted,

> I can't say that…all three are completely even. But I think for the environment that we have we've done a really good job of preserving our environment, and our natural resources, and our wildlife corridors, and our view sheds. In order to really do all that at 100 percent we wouldn't be here.

Other government officials noted that, while they felt the community balanced the economy, the environment, and community development well, the comprehensive plan has directed the community toward sustainability initiatives. One county official commented,

> I would say they are fairly balanced. I mean this is a fairly environmentally forward-thinking community. And if you look at the goals of the comprehensive plan, we speak accurately to mode shift. We have a sustainability chapter, we…have a working relationship, an agreement with the power company…to reduce energy consumption. We've reduced our energy consumption by ten percent in our internal organizations over the last couple years. Now we are going to a community wide [program].

This was furthered by the director of a local non-government organization who said,

> I think the environment gets…the priority. Definitely in terms…of the comments we hear, and also in terms of the action. I think when it comes down to a decision…we might have to make a trade off, protecting the environment takes the priority.

However, multiple respondents felt that while the community has done a good job of including the environment as a top priority in its comprehensive and growth plans, when it came to implementing that priority they had failed:

> I would say here we--our--over-arching community guideline is our natural resources: putting those first and foremost, on paper. You know

> we haven't had a lot of major changes in policy, but our community's commitment towards really going above and beyond, or taking the tough measures and implementing the ideals has definitely taken a back seat. Like, we backed off on some of our goals. Not necessarily still having those goals, but just implementing them.

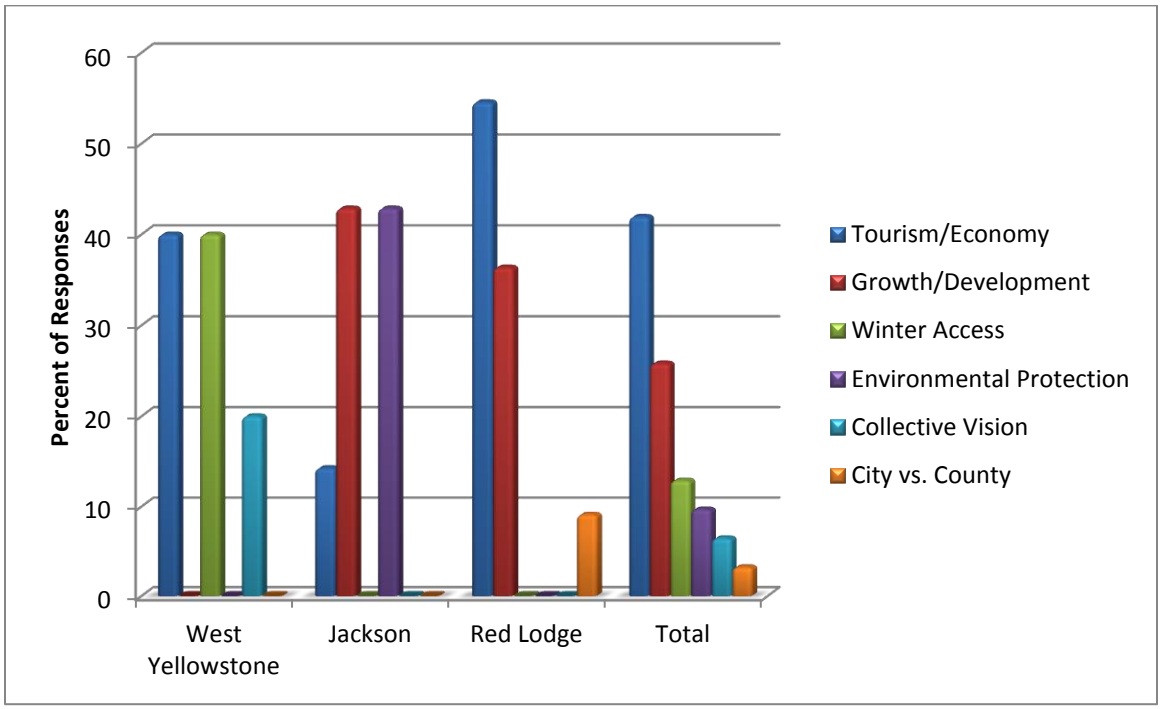
What is the biggest challenge your community faces?

Key informants were asked about the biggest challenge their community faces. A total of 31 responses were collected. Forty-two percent (from all locations) suggested that tourism and the economy are the largest challenge. This was followed by growth and development (26 percent), winter access to Yellowstone National Park (13 percent), and environmental protection (10 percent). Also receiving mention were a collective vision for the community (7 percent), and city versus county issues (3 percent). The high percentage of responses related to tourism and the economy is indicative of community dependence on the NPS and USFS for economic viability in gateway communities. The preponderance of responses related to growth and development is indicative of one of the fastest growing regions in the country.

West Yellowstone, Montana

The two primary perceived challenges in West Yellowstone are tourism and a year-round economy (40 percent of responses) and winter access (40 percent of responses) to Yellowstone National Park (Figure 7-3). It should be noted that respondents from no other community in the study perceived winter access as a challenge. This is primarily because West Yellowstone receives the highest percentage of winter visitors in the region. Although Jackson receives a small percentage of snowmobilers during the winter months, most usage is concentrated on National Forest lands, while in Red Lodge snowmobiling is virtually non-existent. Tied directly to the economy and winter access is the issue of a perceived lack of collective vision (20 percent of responses) in the community. Without a unified collective vision, there was the growing concern that the community would falter, especially in light of proposed changes to winter access regulations.

Figure 7-3 Challenges Toward a Sustainability Transition[8]



Collective Vision

One concern for long-time business owners is the high turn-over rates for new businesses and the potential impacts that might have on community dynamics. As one business owner confirmed,

> Unfortunately part of the problem here is businesses come in, a guy comes in and buys a business here for two years. He leaves…and you don't have a good, you know you don't have a solid community. There are a lot of people who have been here with a lot of history, and they tend to ignore people with a lot of history. They tend to be cliquish with the newcomers and then the newcomers leave and what are you left with?

[8] Figure 7-3 indicates responses to the question, "What is the biggest challenge your community faces?"

The same informant followed by saying that while problems exist with business turn-over, some in the community have stepped forward to be more receptive to the needs of new businesses. Specifically, it was noted that the town planner has

> worked his butt off trying to get this thing going, quietly, he's tried to bring all factions together which I know in this town is, it's a tough town to do that in, but with that said I think, I think we all have to work a little bit, we all have to agree to disagree.

Added to the growing concerns over new businesses was the on-going debate concerning the NPS and its relationship to the town. At least one business owner recognized that in order to move toward a sustainability transition, cooperation and collaboration are critical. He noted,

> Unfortunately there's so many issues in the park that the superintendent and the powers in the park don't get a chance to come here. Well a lot of times they come here and get yelled out of a meeting. Let's sit down. We all put our underwear on the same way, and we all use the park as a resource just like we do the forest. This may sound corny, let's get us together, let's try this again. Because the times, this is it, we don't have much more time to make this thing work, that's my opinion. With climate change and all these issue we've got to get this taken care of. But I'm the eternal optimist. I got hope for it, and we keep plodding along doing our thing and I see other people starting to get involved with these kinds of issues.

Related to these issues is the pace of change taking place in the community, and the diverse backgrounds that newcomers bring with them:

> It's very difficult, our community is changing really rapidly…and [the] out flux of older business owners that kind of came in with their own business backgrounds and their own way to doing things. To larger companies coming in or brands, or chains coming in, that have different ways of approaching business and different considerations.

Tied to the concern over differing business practices was the substantial issue the community faces in regard to an aging population, and the implications this might have for community cohesion and a collective vision. A Chamber of Commerce represented noted such difficulties when she asserted,

> those doers that you talk about, the leaders of the community, that are really starting to retire or have pass away. That had a vision of what they

> thought West Yellowstone was that has not necessarily transposed itself to the newer younger business owners. And because we, we've got such different interests, different perspectives, it is extremely hard for this community to agree on what, sometimes even what our strengths are.

The primary concern was how a community can cope with a rapidly changing and dynamic relationship with the national park, while continuing to support the local citizenry and attract tourists. This point was illustrated well by an informant when she stated,

> And again we talk about directionality, and I think that we spend a lot of time working through the process and sometimes because it takes us so long to try to get some levels of agreement on many things we get caught by change. Because you know, change is so dynamic. And by the time we've got done addressing one thing we are already confronted with a new issue. So, you know a perfect example is access to Yellowstone in the winter. You know when you spend years working really hard to build a business in a certain direction and then you have to respond to courts, and then you have to respond back to environmentalists, and then you have to switch. Now the possibility of plowing and what happens and you look at, nowhere else have I seen businesses that have to totally change how they think, operate, and market as much as they do in West Yellowstone.

Tourism and a Year-round Economy

One of the largest perceived challenges West Yellowstone faces, and one that "permeates most everything that happens in town, is the age old challenge that we have been wrestling with is the development of a year-round economy." The issue ties together not only a lack of collective vision in the community, but also the issue of winter access to Yellowstone National Park. How can a community survive on an economy that lasts 100 days at worst, and 120 days at best? As one business owner suggested, "the advent of the snowmobile and snow coach (industry) in the late 70s and early 80s took West Yellowstone from a one season town to a two season town; summer and winter. Fall and spring shoulder seasons have always been bad. Still are." Two issues were prevalent in relation to a year-round economy: a lack of shoulder-season employment opportunities and the retention of quality employees. The on-going winter access debate has exacerbated the issue, with one business owner noting, "the winter season continues to be doing worse…for many businesses in town. Over the last three or four or five

years, there are fewer and fewer businesses open in the wintertime. We've gone backwards," toward a one-season town. A one-season town where people are on food stamps for two to four months out of the year, and building a revenue reserve for the lean months, is increasingly difficult for individuals and businesses alike.

It was suggested that the best defense against transitioning back to a one-season town was customer service. Numerous business owners agreed, with one suggesting, "it turns out that we have to provide good service to our visitors…we can't take these tourists for granted." Directly tied to providing good customer experiences was the ability to attract the right type of employee "so that people really do want to come back here as soon as the gate reopens in December because they love West Yellowstone." A primary concern was attracting employees "who are in tune enough, or care enough" to ensure the customers have the best experience possible and who will not only return themselves, but tell others about their experiences in the community. A business owner summed it up well when he said, "whether we like it or not, [West Yellowstone] is in the business of customer service," because tourists have "four other entries they can choose to enter the park" from. Speaking on the issue of a stable economy, one business owner succinctly stated, "if you want (to) have a stable economy you pretty much need to be year-round, and we're going backwards as fast as we can possibly paddle." This sentiment was expressed repeated in West Yellowstone key informant interviews.

Winter Access to Yellowstone National Park

"There's a long history. Fifteen years we've been going on this snowmobile thing and there's an awful lot of water that has come under the bridge." The on-going snowmobile debate has resulted not only in decreased revenues for the community, but more importantly has degraded the fabric of the entire community. Speaking of the economic impact of snowmobiles, a city official suggested that

> ten years ago our winters were almost as good as our summers…they were right there and that made things wonderful and kept more motels open year round, more people employed year round. Now that we don't have that half the town or maybe more is closed down in the winter time.

Replacing the snowmobile with other tourist or recreation-based activities was perceived as being "really hard." The community and businesses have talked about

activities such as snowshoeing, hiking trails, photography, and cross-country skiers. While it is believed that "none of those are bad ideas," they just do not "carry the same impact as snowmobiles." While groups such as the GYC suggest that cross-country skiing can save the town and provide it with the economic boost it needs during the winter months, business owners and city officials are not entirely convinced. Both groups perceived a large economic discrepancy between snowmobiles and skiers. This was illustrated by a city official, who said

> Skiers are not, we always say that one good snowmobile family from Minnesota is the equivalent of a whole lot of skiers because those people eat and drink, party and they enjoy themselves, and that's what we want. You know it's nice to say we have some nice skiers who come to town and they are lovely people…they bring their children and lovely families. But they are not hanging out at the bars spending money, they are not going downtown. They will go to the free dinner that we offer; but they are not going downtown and spending $300 for dinner. Which is all right, but you still have got that economic problem. So it's really difficult to make up the snowmobile situation. You know we have like 600 skiers here for an event, which is great, awesome. They are right here; right out there, a ton of the skiers. You can't get a parking space on this street for the whole weekend. People in the grocery stores, convenience stores, 'did we have a race this weekend?' Are there skiers in town?

The issue has also made it nearly impossible for businesses or families to survive in the fickle tourist economy. "At one time we could, you and your family, could move here and maybe not make a great living, but you could work year round and be in this area and make a living year round. But now that's pretty tough." Decreased visitation rates in the winter months has also resulted in a declining population-base, that has translated into decreased community service such as medical services that cannot afford to stay open year-round, as well as declining school enrollment numbers which has negatively impacted the school district. An informant noted, "Well, the problems that come from that, whether you're at church, or you're at school, or you're at the city offices…we've gone backwards." The frustration over a declining economy and a community perceived to be on the verge of extinction was expressed well by a business owner when he admitted, "it's a vicious cycle, and you know it is."

When key informants were asked if they felt that the challenges facing West Yellowstone were unique to the community, and not representative of the region as a

whole, the resounding answer was yes. The most cited response was that West Yellowstone and the challenges it faces are unique because of its dependency on Yellowstone National Park. "We are the hub, so to speak, of Yellowstone…we've achieved the popularity as one of the main gates." The metaphor of closing or removing the tourist-based attractions was used by one non-government official to suggest the uniqueness of West Yellowstone:

> You could close the Beartooth Highway tomorrow, and while that's a segment of Red Lodge marketing, they could still get away with marketing all the other things there is to do. If you close access to Grand Teton…[that] would affect Jackson in the summer, but they still have the ski resorts and an airport and they could literally supply a lot of activities without even requiring the parks. If you closed our access to Yellowstone, it would be a whole different kind of dynamic here.

The community is also perceived to be unique in that it relies solely on tourism and the NPS for its economic viability, as well as providing the infrastructure and service that local residents and 2 million visitors per year depend upon:

> West Yellowstone is also unique in that it is surrounded on all sides by public lands. We cannot expand unless there is; we have done it a couple of times through land grants or land exchanges. So there's not a lot of population around to support the infrastructure and consequently, again it's a double-edged sword. We built this place to be a nice place so more people come. There's about 2 million people that go through here and yet there is no population base to support all the police and fire and of that stuff. So we have to rely on tourism and the resort tax. We have to be innovating in these other types of things in order to make a go. There is nobody else like that.

Although most respondents felt that West Yellowstone was unique, a small group recognized the similarities to other gateway communities in the region, including dealing with the shoulder season, and providing goods and services to tourists. However, even these respondents felt that issues such as winter access to Yellowstone National Park, and the on-going bison and wolf debates, make the challenges the community faces much more pressing and affect their community far more than other communities.

Red Lodge, Montana

In Red Lodge, the largest perceived challenge was tourism and the economy (55 percent of respondents), followed by growth and development (36 percent of respondents)(Figure 7-3). One of the potential reasons for a high proportion of responses related to the economy was the recent downturn in national and global economies. As one business owner suggested, "you know, tourists will come here and have for decades. It's just the national and international economy right now is…holding it back." This respondent recognized that when economic conditions improve, the challenge will then shift to "how to keep them longer in Red Lodge." Compounding larger regional and national economic issues is a flat job market. As one business owner noted regarding employment opportunities,

> When the economy was good a few years ago you couldn't find an employee to work for you. That's when we started working with the international exchange program…Now where I couldn't get an application from anywhere three years, I have a box full of applications. When the economy gets better my box will be empty.

Like West Yellowstone, community economics are driven by tourist visitation and spending in Red Lodge, and because of this, "you see businesses struggle." This is especially true during the winter months. "We need to draw more people regionally to our areas because winter is not that successful of a season." One business owner stated that 60 percent of the gross sales for Red Lodge, "the businesses downtown, the little shops and restaurants downtown…happens between Memorial Day and Labor Day." Hence, for ten weeks local businesses conduct strong business, saving revenues, and then spend "42 (weeks) spending it because the money that comes in winter does not sustain the businesses." Another business owner noted, "getting that dollar is Red Lodge's biggest problem. I hate to say that, I wish that wasn't the case…in order to keep stores on Main Street…the dollar has to come in".

Like West Yellowstone, it was suggested that one of the other primary issues related to tourism and economics was a lack of collective vision for the community. However, some argued that even with a collective vision, the community would still suffer economically because of its close proximity to Billings. This was expressed by a business owner who was also actively involved in community planning:

> That's the challenge for communities like Red Lodge when you are so close to the largest business center in the region, which is Billings, you're just not going to redevelop your downtown to where you…meet all the community needs within the city limits. That's not going to happen. And there are dreamers out there who are not business people, who think it's just a matter of getting the right mix and it will all come together. I go to the meetings. I participate in the discussion and tell them over and over and over again that you are never going to see that happen again in small town Montana.

Further, it was suggested that the community struggles to support the existing businesses in town and is not in a position to add more businesses to fill niche markets.

> We have the different groups within the community that want it to be, you know, an all-inclusive where you can get anything you need right here and you don't have to go to Billings. The reality of that is that the people don't support the businesses that can provide those services and so they've gone away.

Some business owners also felt that large events (e.g., the Beartooth Rally) were benefiting a small portion of the business community at the expense of the larger community. It was suggested that

> Local business owners whose livelihoods depends on the three months of summer and tourism feel, some of them feel, like they lose a week of business during that week because your typical…bike rally attendees aren't typically there to browse the stores, the souvenir store and things like that. It really, there's so many bikes that come into town that it tends to take up parking so people who might have stopped roll on through and then street dances. Streets are closed for dances and the business owners on those streets feel like their customers don't even have a shot getting into them.

The other primary challenge in Red Lodge was growth and development, and involved three primary issues: supporting the existing quality of life, the impact of amenity migrants, and the implication of large-scale developers purchasing land around the community. Most current residents were drawn to Red Lodge for its unique quality of life, and not its economic potential. The challenge, however, was perceived to be how to "enjoy what we have while sharing it with others." It was suggested that through sustainable planning, most notably reducing sprawl, and protecting scenic and wild land values, this should be possible. Noting a trend in recent years of increasing numbers of

10 to 20 acre lots, one business owner said, "We need to take those 20 acre ranchettes and make them into small lot subdivisions…where you can get as many people into an area…and preserve those things that are valuable." "Small town. What's the word…small town being" was an expression used more than once to describe the uniqueness and the quality of life in Red Lodge. The problem associated with that phrase was that many, including many long-time residents, wanted no growth at all. Responding to the no-growthers, a city official stated, "They don't understand that growth is inevitable, it's going to happen. We can't stop it, but we have to control it." Controlling growth was seen as a fundamental obstacle in the community, primarily because Carbon County does not have planning or zoning ordinances, while the city of Red Lodge does. As one city official perceived the city vs. county issue, "the city has really worked hard, I believe, in keeping what we have…but still I don't believe the county—I don't think they are on top of their game." Further, by the county having a "hands-off" approach local residents are

> starting to lose what they value the most. Recreational opportunities are disappearing because big companies, big business people are coming in and they are buying up ranches and they are closing off those recreational opportunities. Fishing, hunting, no trespassing on the gate, they would have one individual from essentially from Red Lodge to Roscoe, all up against the mountain

One business owner felt the problem is a "failure to really look at the consequences of our decision making process…and what the long-term outcome of that decision making process is." The concern was also that, as a small community, Red Lodge could become "…victimized, but it doesn't quite capture what I want to say." That victimization would likely come from a large-scale developer, who might take advantage of limitations inherent in small communities. As expressed by a business owner,

> I think it's easier for a sizeable developer, someone with deep pockets to really come in here and do things in a way that would not have the kind of resistance they would have in a community like Jackson.

While the community has been reluctant to let large-scale developers "have their way," it was perceived that they "don't have the ammunition to really stand up." As a result, the

community is "more reactive than proactive." In contrast, some in the community felt that large-scale development, especially in regard to Red Lodge Mountain Resort, is a good thing because "they [big corporations] are used to working in mountain towns all over the Rocky Mountain West, and their track record is really strong." This group also recognized the potential pitfalls of big corporations having a stake in local development. One of the main fears was that big corporations "might choose to make an investment in Red Lodge because they valued the kind of character of this community. But they are not tied to that character, and they're not invested the same way that people who live, work, and play here are." To help guide the community through the potential pitfalls of rapid and unregulated growth, city officials, and the public at large, look to nearby communities such as Bozeman and Jackson for guidance. As one business owner noted,

> At some levels we are fortunate that those communities have kind of gone before us and we can learn from them and I think that people in our community that are really on, in that kind of realm, are sensitive to that and are trying their hardest to get us out front of that.

One of the other fundamental concerns from respondents is the influence that recent amenity migrants are having the community. Of particular concern is a lack of community attachment and involvement by newcomers that often translates into a desire for goods and services that had not traditionally been available in the community. A city official speaking on this issue noted his frustration:

> We don't have a Walmart; we don't want one. You know, you're going to pay more, your quality of food is maybe not going to be as good at the grocery store, we're at the end of the line kind of thing. You are going to pay more for gas. So don't start trying to change it and make it what you left, because pretty soon it's going to be the same thing you left and then it's why did you leave there anyway? If that's what you wanted, why did you leave?

When asked if the challenges facing Red Lodge are unique to the community, one business owner summarized the feelings of most respondents when he asserted that

> I would say other communities; every community that borders the park has the same challenge. They are just at different points on that time line or continuum, and on a different scale. And then the political climate is different. Wyoming is different than Montana politically, so what goes on in Cody, for example—our closest gateway community, it's amazing how

> different we are as communities. We are only 60 miles apart yet we're very, very different. It's funny people down in Cody look longingly at the things we have going on, and our people look longingly at the things that they have going on, so there's a lot of mutual envy, but yet neither community would say 'I would want to be like that.'

Others again looked to Jackson and other nearby communities as examples of what not to do in relation to planning and growth. "You know I think they probably face similar problems and unfortunately I think for both of them (Jackson and Bozeman) it's too late. I don't think they did their job," one business owner explained.

Jackson

The largest perceived challenge according to key informants in Jackson was growth and development (43 percent of all responses), and environmental protection (43 percent), followed by tourism and the economy (Figure 7-3). In the minds of most respondents, environmental protection and growth and development issues go hand in hand, as do tourism and the economy. This is largely because the economy is driven by tourists, who are brought to the community for its unique natural setting. The natural environment also has driven development and growth and thus, in order to sustain the local economy and its tourist base, the natural environment must be protected. One method to ensure environmental protection and the maintenance of the community's tourism base was the city's comprehensive plan that was in the process of being re-written. Reflecting on this process, a city official declared

> I think that as we worked on the comprehensive plan we have moved away from a, the idea of a straight balance of the triple bottom line, to the idea that we want the social equity, and we want this strong economy, both of those thing when you look at them are dependent on the ecology of the area. So keeping that open space, keeping the wildlife, it is our economy, it is why people move here, it does bring all the people together so it is our society as well, and I think that is, the one thing I would add to that personally, I think it has to be a bigger, a bigger picture discussion. You can't ship your impacts over the pass down the canyon, and think that they go away and you're protecting the ecosystem, because they are an ecosystem too.

A town planner suggested, "I do think that trying to preserve the large intact open spaces and wildlife habitat, you know we're unique in the lower 48 (states) that no one

else can really say that they've got a lot of what we've got." A city official echoed a question and concern for many when she said, "everybody has a strong connection to this place and we all want to protect it, and we all think it's beautiful. But we also want to live here…so how do you find a way?"

Others felt that while many acknowledge the importance of the natural environment, few have stepped forward to protect it. A local land trust suggested that while 3 million people travel to the community each summer for its wildlife and natural splendor, few in the community have made the "leap that we have to take care of this." A second land trust representative added

> I think in the broadest sense I think the biggest challenge for Jackson is to find the balance between where do we want our open space and where do we want our density. And the comprehensive plan has run smack dab into the middle of that and it's a train wreck right now. Because you politically, everyone says they want open space. Politically everyone stands up and says, our natural resources, our habitat is the most important thing… but it isn't, there is nothing actually promoting open space. These things are all nice so open space; you have to say you love open space, you're just not going to get elected if you don't.

Some recalled the frustration that city and county officials were not doing their part to protect the uniqueness of the area, with one stating that officials are "nibbling away at those regulations that would protect those resources", and that it is part "lack of awareness on some people, and a lack of willingness politically on others." However, one land trust representative was optimistic that the problem stems from a lack of education and not a deeper, fundamental problem, stating

> …to me that feels manageable [education] and that we can get at it. I like to think that if people come here and then they have an appreciation, and then they get the education, and then they go, oh, I am just someone visiting here, you know. I own land, but I can do damage for generations to come and I don't want to do that. You know I don't want that on my conscience.

A great deal of frustration regarding open space and development stemmed from recent amenity migrants to the area that are perceived at times to have a limited attachment to place. One informant sympathized with amenity migrants when she stated, "you can't fault them for this, but when they come to Jackson they don't necessarily want

to become embroiled in the political scene for the six weeks or the two months that they are here. They want to enjoy what's here." However, this same informant was concerned that "as it becomes harder and harder to live here, we're going to see that…the community value base sort of erode." The concern that living in Jackson for most long term residents is difficult and has potential long-term implications was highlighted in the comments of a city official who said:

> Just the cost of living here is high and … it is very, very difficult to come here as a young person and then make a living to the point where you can afford to stay here long-term. And without that progression of people who were coming into the community and investing in it personally with their time and energy, and able to live here it will suffer a lot in the long term. Because eventually…it's just going to degrade to a either a tourist only, or a seasonal resident only environment, and that is when I think you really do start to erode your base of people who make it a good place to live, and who have the values that can form those long term themed decisions and get you…focusing on more than just your this season's bottom economic line.

Although the debate about no growth, slow growth, and smart growth continues in Jackson, many feel that the community and the county are at least partially taking steps to correct perceived errors of the past. Most of these changes in the decision making process have become known as the community prepares its forthcoming comprehensive plan. A city official speaking on growth stated

> I think there are very few people in Teton County who would tell you they are pro-growth. I don't know that any of us really want this place to get any bigger, but I think…what I would strive for is responsible growth, and balanced development. I think we do it such a dis-service to say we don't want to growth and we're not going to plan for it because we know that is not the way it works.

When asked if the challenges that face Jackson are unique in the GYE, most responded felt that they were not. However, most felt that while communities are similar in the challenges that they face, challenges in Jackson are greater because of the rate and extent of recent growth in the community, and because of the economic disparities between Jackson and the other communities. As a city planner suggested, "I think that all the different communities are in a different spot economically and in a different spot in

their growth. We do have the luxury of more than any of those other communities to already be established and have the wealth." An NGO representative said,

> I think they have the same problem. I think they don't have it to the degree we do. I'm not sure that they have experienced the kind of growth, especially in second home ownership that we have seen. I mean, look at West Yellowstone and it's still pretty tiny. It's doesn't have 10,000 square foot homes, to the extent that we do. So I think, I think, I would probably guess that they recognize it. And if they had the opportunity to go all out and develop they would do it.

Regional Non-Governmental Organizations

Regional NGOs perceived two separate challenges as facing the region: climate change and growth. As a regional land trust representative acknowledged,

> … I think really that the growth and this scale of unplanned or poorly planned growth is one the biggest threats to the region. And that's, I do think that's improving. I do think we are getting some traction especially in the GYE with that, but it's going to be, it is a cultural shift to have regulations, to have restrictions on how people can use their land. How people can subdivide their land and we probably can't, this landscape probably can't support as many people who want to live here. There's not the resources, there's not water, there's not infrastructure, and where, how does that evolve over time, how do we draw those lines, how do we be intentional about the way we grow. Those are the big questions that we face.

Climate change is perceived as a fundamental threat to the region, especially considering the high dependence on the natural environment found in most gateway communities. It was emphasized that,

> In Greater Yellowstone, the economy is largely funded by the public lands so we are increasingly being dominated by a regional economy that is a mix of leisure living and recreation and natural resource management. It's quite unique. There are probably only two or three other places in the West on the scale where they exist. Glacier to a smaller degree maybe, and maybe I don't know where else it might be on this scale. Maybe the Colorado Plateau? But we're going through a significant shift.

When asked if the Greater Yellowstone Ecosystem was unique, a regional NGO responded,

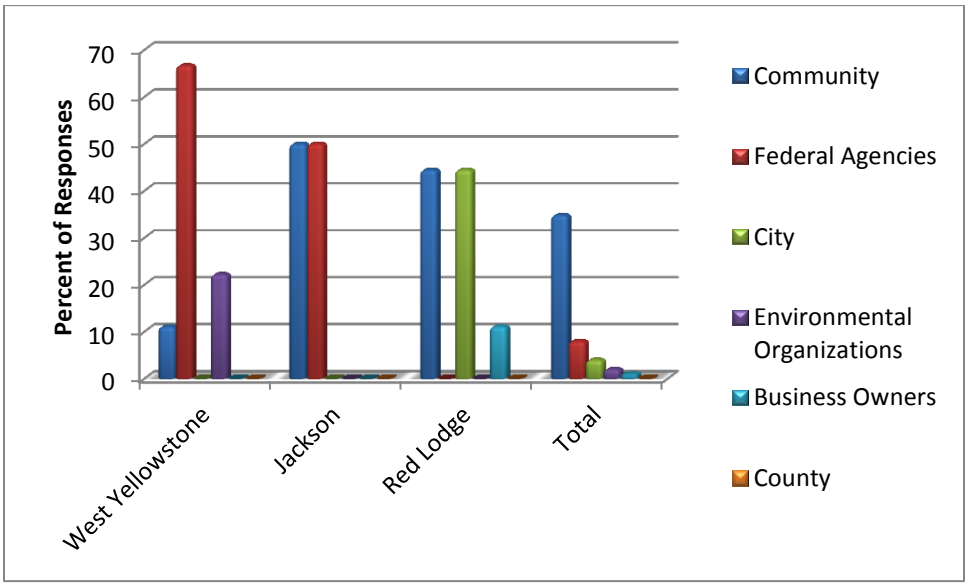
> First of all the Greater Yellowstone is under a microscope all the time. It's this sort of national experiment and also a national leader in some

environmental policy. There are more non-profit environmental organizations in Bozeman for instance than anywhere in the West. So, there's this incredible focus on this region, so I think that makes us unique in some ways. The influence of tourism and the influence of what I would call recreational buyers, people who come in who want to own a little piece of this landscape that is unique in places like the Greater Yellowstone Ecosystems. There are few other places in the Rocky Mountain West that have that kind of culture.

Who controls change?

Respondents were asked how much local control exists over the changes and challenges that their respective communities face, and if local control does not exist, who controls change. Twenty-three, or 72 percent, of key informants responded to this question, with 34 percent suggesting that the federal government controls change, and 30 percent of respondents suggesting it is the local community. Other institutions of control included city government (17 percent), environmental groups (nine percent), the county (four percent), and business owners (four percent each)(Figure 7-4).

Figure 7-4 Control Over Changes in the Community[9]



[9] Figure 7-4 depicts key informant responses to the question, "Who controls change in your community?"

West Yellowstone

In West Yellowstone, 67 percent of respondents felt that the federal government has the largest control over challenges and changes that are taking place in the community. This was followed by environmental groups (22 percent), and the community (11 percent)(Figure 7-4).

It was perceived by many that the National Park Service is controlling change in the community through its winter access plan. However, many also recognized that the perceived control by the NPS was in reality dictated by on-going litigation from NGOs, such as the Greater Yellowstone Coalition. It was suggested that "the outside force is mainly the environmental groups that are…continually suing the Park Service no matter what their decision is." Frustration also stemmed from a perceived lack of compassion for the community, with one informant suggesting, "I think that's part of the fear, that GYC is running the show in a very back-handed kind of way. They are a little bit oblivious of the impacts of some of their lobbying movements." This was echoed by a business owner who noted, "Between the Park Service and the environmental groups essentially shutting down Yellowstone Park in the winter," the community is "not growing at all, it's shrinking." Speaking on the fate of West Yellowstone and the challenges of having policies dictated by environment groups, one respondent suggested,

> If a group with enough money and enough lawyers can shape the federal policy coming out of the park, that is a big threat. You can go at them in court, but you're not going to have the resources. So…their fate [West Yellowstone's] is a little bit beyond them unless come up with a non-snowmobile deal.

Frustration also existed because some respondents felt that groups like the GYC make the community out to be "a bunch of greedy businessmen who are just trying to rape and pillage the park for our benefit and our gain." It was suggested that if such interest groups realized the dynamic relationship that gateway communities have with the NPS, their opinions might change. Speaking to this fact an informant asserted that

> gateway communities are partners with the park and protecting the park. Because if it weren't for the gateway communities, West Yellowstone being the prime example, all these people [tourists] would be in there [Yellowstone National Park] overnight and plundering around. If there was no facilities [*sic*] here, no facilities around the gateway communities, they would have to be in the park.

One frustrated business owner stated, "the park is supposed to know what they are doing. They are supposed to know how to manage the park. You'd think that people would say, or would agree, that…they're the professionals, let them run it. Let them manage it." A business owner who felt the community was at the mercy of the NPS insisted,

> We have to adapt our management and our businesses to what the park rule change will be…we have to listen to what they are saying. We embrace the philosophy of protecting the environment and the park is the cash cow. We've got to make sure that we take care of this, our businesses, our business relationships with the park, are in line with the park. We have to be. We cannot be radical, like 'you don't know what you're doing.' We can't say that.

Others felt that while the NPS might be business partners with the community and were grateful to transfer degradation inside the park elsewhere, there is a culture in the NPS that is anti-tourist, which runs counter to the mission of the community. In conversations with Park Service employees, one business owner reflected,

> When the park closes in the spring for the 6 months…that is a wonderful time for the park employees. They really look forward to that time. They are still employed…but they don't have to deal with the idiot tourists. Out here we're dying on the vine because we don't have any of those idiot tourists to deal with and so…the outcome that we would like to see…is not necessarily the same outcome as the park service would like to see.

Further, because of the high profile nature of Yellowstone, it was felt by some key informants that control extends even beyond the NPS to the entire country, and the world at large.

> Yellowstone gets a runny nose and we get a cold…The fact that Yellowstone is a national park, however, we then are effected not just by what we might think, or the gateways communities might think about how Yellowstone should be managed, but how the greater world thinks Yellowstone should be managed. Because it…is a huge icon, and a lot of people are concerned about it.

One key informant perceived a lack of control from city officials. Instead, power and influence in the community stems from two organizations, the West Yellowstone

Chamber of Commerce, and West Yellowstone Economic Development Council (WYED). As the key informant contended,

> So you have a city council that, who spends almost all their efforts on maintaining the infrastructure. They don't look at marketing, they don't look at selling, they don't look at visioning from that standpoint. They look at tactically how we get through another year of snowplowing and sewer systems and things like that. So, they impact those tactical changes on daily basis because whether they plow or not can have a big impact on tourism.

By neglecting tourism altogether, the city was actually ignoring the sole funding source for those services and infrastructure as they were provided almost exclusively through the resort tax. As a result, the city was perceived as not playing an active role in drawing tourists, which has frustrated groups such as the Chamber and WYED, who felt it is solely their responsibility to draw tourists and sustain the community. These responsibilities were separated even further, with WYED focusing on "tourism development," while the Chamber focuses on marketing of tourism and business development to the outside world. As a Chamber representative noted, "so everything revolves around, can we get those people to stay overnight in our town, or stop and shop," with the Chamber and WYED taking leadership roles, while the city waits for revenues from the resort tax.

Red Lodge

In Red Lodge, respondents felt that control over change largely stems from inside the community, with 44 percent of the nine respondents suggesting it stems from the community itself, city officials (44 percent), or business owners (11 percent)(Figure 7-4). One of the comments that was often repeated in key informant interviews was that city officials are receptive to public input. A city official noted this when he said, "the government is open minded enough to realize that they have to have that input but I still don't think the county is open-minded in allowing that." This was furthered by a business owner who recognized that citizen input was unique to Red Lodge,

> I think one of the things that makes Red Lodge unique compared to some of the other gateway communities is the fact that the local citizenry has probably a bigger say in this community than your average town. I think

> the bigger the community gets, the harder it is for the individual to feel like they can be a participant in the process, and their voice will matter.

The ability for the public to actively engage in the decision making process was thought of as instilling "power in the people," and seen by many as one of the most positive aspects of living in the community. While residents understood that decision making ultimately rests in the hands of city officials, they spoke positively of their role in the process. This included a business owner, who stated,

> So I think it starts with the citizen, and then ultimately the major decisions are made through the city council. But citizens do have a big say here, and again I do value that. I think it's an important aspect of the town of Red Lodge. I think being so small, such a tight knit community, everybody knows everybody, that is helpful for us, for the citizen that we can make a change if we need or want to.

One of the perceived challenges of such a tight-knit community was that a "small group of ad-hoc people…come together to rally around specific projects and then typically fall apart." This was perceived as a major diving force of change because, while residents would get excited about a specific project or decision at the city-level, they are "not so good at maintaining that project." This was the perceived result of amenity migrants, who may not have close ties to the community. The influx of amenity driven migrants was also a concern when such migrants find positions of power in the community, because it is perceived that they do not have the experience or a long-term connection with the community. A business owner reflected on this concern and said,

> I think that when you look at who is on the city councils, and who is on the committees, and who are the employees on the planning board…they are not… born and raised here. They are not necessarily born and raised in Montana. Looking at what happened over the last 30 years in the community, I would have to say whether they like it or not, that the locals are not driving the planning for the future because one, lack of experience and two, lack of involvement, and three would be as the old people die out, the new people coming in and replacing them, they are not from the families that were here before. They are new people drawn here for other reasons.

Collaboration among the city, the county, and both new and long-term residents is essential to the overall sustainability of the community. It was noted that "without the

support of the community residents and the City of Red Lodge, as well as all of the local organizations working together as a team, we will not be able to be fully functional and move forward together for the betterment of the whole."

Jackson

Although the community was perceived as having the largest control over change in Jackson (50 percent)(Figure 7-4), it was also perceived that that power is based in a small handful of individuals: those with the "loudest voice." A local non-government official noted, "whoever has the strongest emotional cry is the one that's gonna…motivate the rest of the population." Control stemming from the loudest individuals or the most emotionally attached to the issues was perceived to be a product of time. Specifically, one informant suggested, "if you are willing to give it the time you can have a voice…if you will take the time and if you are that passionate about it you can have a voice." However, this also drew frustration from some who felt those with the loudest voice may not always have the community's best interest in mind. As one informant suggested, while it was beneficial and important to have the level of public input that existed in Jackson,

> I don't always think that they are acting on behalf…of the whole community. They are for their one and intended purpose. They will scream and yell about whatever it is that is their cause, their passion, whatever. Sometimes I worry that we're not balanced because they are loud, they are obnoxious and they have the time. Time is a huge part of this, and there are some people who are very bored here. So, it is good that a community can have a voice and a community can shape things. But, on the flip side, I worry at times that it will be a little bit of…the plan, or what comes out of it, will not be as thoughtful as it could be. And that's kind of sad; it's kind of disconcerting at times.

Although some informants felt that the town has a large portion of control in the community, there were those who also felt that "you can't underestimate the impact of the Park's decisions and the Forest Service." This sentiment was not nearly as strong or repeated as it was in West Yellowstone, but it certainly represents the idea that at times extra-local institutions have a hand in the everyday life of Jackson residents.

Future Prospects of the Greater Yellowstone Ecosystem

Key informants were asked to discuss their perceptions on the future prospects for their respective communities. While the majority of comments were positive across all three study communities, there were some who felt that if current trends in the region continued unabated; the future for the Greater Yellowstone Ecosystem is in doubt.

West Yellowstone

Overwhelmingly, the response in West Yellowstone was positive, although at least two respondents were concerned over the community's future. In addition, while most were positive concerning the future, they also felt that change is inevitable and that the community needs to be proactive in managing change.

Negative sentiments were largely driven by the perceived threat of reductions in winter access to Yellowstone NP and the return to a one-season economy. "Under the current way it's going I envision being the hell out here because it's gonna die," one business owner stated. This perception was based on the ongoing litigation by environmental groups in relation to snowmobiles, and its long-term impacts on the economic viability of the community. As he reflected,

> …we've got the environmentalist trying to close down the last of snowmobiling outside the park. They've pretty well killed it off inside the park. You've got shoulder seasons that don't' do hardly anything and you've got a 3 month season. Today's world, making a years living in 3 to 4 months doesn't happen anymore. Used to be able to do it, can't do it anymore.

Although the respondent believed the community's future is hampered by extra-local policies and local litigation, he also felt that plowing the Park during the winter months is a potential solution that might return the community to at least a two-season economy. Another key informant felt that, unless the younger generation aspired to "drive a bread truck or be a fishing guide," something that was not currently occurring, the future looks less than promising. He also suggested that, "unless the family owns a significant amount of property in town and their business plan allows them to operate…so that they can live on a 120 day tourist season; I truly see very little future." The informant had lived in the community for over 30 years, and he and his wife advised

their children, "don't ever, ever, ever think about coming back. We always have a guest bedroom and you're more than welcome to come and visit. Don't you ever think about coming back here unless it's retirement."

Others were more positive regarding the community's future, although for some this was not always the case. As one business owner related, "a couple years ago I would have said this place is going to sink. I've got some real faith in this place right now." This faith was the result of the owner's perception that the community was finally starting to see the larger picture, especially as it relates to economic sustainability. As he noted, "this place is so resilient." Community resiliency was perceived to be improving because the community is slowly understanding their place and role in the GYE. "I think…our niche has been…always will be, doorstep to Yellowstone Park…I think it's always going to be tourism-based." A city official reiterated this sentiment and added,

> We cannot sit here and piss and moan about the old days, about how nobody pays any attention. We've got to get moving…every other entrance town is using all their resources to pull people to their gate…and we have to do the same.

Part of the positive perceptions of the community stemmed from its uniqueness, and the public's interest in its unique character. "It has its own special character. From our trashy trailers to our old funky buildings, and people from the outside world absolutely love that…I think that West Yellowstone is going to come into its own because of that very different character."

Others were equally positive because of the perception that city officials were taking positive steps to improving the economic climate of the community. Two such projects were the Marketing and Promotion (MAP) fund, and the Tourism Business Improvement District (TBID) that, in addition to the three percent resort tax, would help market and promote West Yellowstone. Economic diversification also includes an educational facility for researchers in YNP, a bid to host cross-country skiing trials for the U.S. Olympic team, and other seasonal recreation activities. It was suggested, "You are always going to be tied to what you have, and what do you have? You've got a lot of snow; you're next to the park, a lot of beautiful land, a lot of great fishing, a lot of great

hunting." If the community did not adapt, and learn how to diversify its economy, it was suggested that it is "going to be more of a ghost town that they already are."

Red Lodge

The majority of respondents in Red Lodge felt that little, if any, change would occur in the coming decades. As one business owner noted, "people always complain about empty storefronts. You know, when I moved here 15 years ago there were empty storefronts." This was largely due to the perception that the positive changes that had taken place in the past are not accelerating, nor would they, as the town is perceived to be geographically isolated. While some growth had occurred, and the community had recently built a new high school and medical center,

> I don't anticipate they change the character of the community at all. You know I guess if you were to really get into some kind of sprawl development piece's that could change the character of the community. I just don't see that as being a realistic thing. One of it is, is that we're not economically viable for, especially sprawl commercial development; you know we just don't have the economic base here to support a Walmart or a Target or, you know, even a McDonald's.

In addition, "because of the national economy, we are not seeing the boom that we had a few years ago." However, it was suggested that when the economy does rebound, boom-times and accelerated growth may return. A large component of the perceived current stagnation of the community is the escalating real estate market and land values. "Buildings in Red Lodge are half a million dollars," a business owner stated. He added,

> we've reached that point where businesses can't afford the buildings and be sustainable. The residents can't afford the houses and pay for them with jobs that are available. So really, sustainability in Red Lodge is in danger at this point…the only way we can create sustainability now is to get higher visitation. And that's the challenge because there are people in the community who don't want higher visitation because they know what that brings. There is a group that wants higher visitation because they know the opportunities it will provide. But we're at a crossroads. We really are.

The current trend in real estate values was only expected to grow in coming years, especially with an improved national economy, and investment in the local ski resort,

Red Lodge Mountain by an out-of-state buyer. A real estate operator stated, "I think the real estate values are going to double in the next five years …we are going to have quite a bit of growth…because JMA will develop the mountain and it's going to stimulate us." The concern, however, is that development activity might lead to sprawl. A business owner was concerned that if groups like as JMA succeed, and the business community begins to cooperate with a unified collective vision, "they could turn it [the community] into a Jackson Hole overnight" because of the dependence on "out of community money coming in to provide the jobs and pay the bills." A local business owner, however, came to the community specifically because of the perceived benefits of an expanded ski resort. He noted, "when I moved here I have to admit, I came here because the ski hill was a mom and pop organization, and when it sells I want to be a part of it…I positioned myself so that when that happens I…can cash in on it."

While many respondents were concerned with potential future growth and its impacts on the community, others were focused on the economic and societal benefits provided by new migrants, especially those "unique people who have special skills that are valuable outside the community." Further, instead of "IBM building a 50,000 office building complex, you're going to see them maybe have…a 400 office complex." Lone eagles and telecommuting by large corporations are perceived as a real possibility because of the environmental and cultural amenities the community provided, and such growth is seen as positive because migrants "move here for the right reasons and contribute right away." An increase in amenity migrants is also perceived by some to benefit the transition toward a sustainable community. "I have no doubt that we will become a sustainable community…that utilizes the best environmental, sustainable actions that it can." In the end, most were confident that, regardless of the level of growth that occurs in the coming decades, Red Lodge will prosper in the future, and "benefit from having maintained the environmental quality here."

Jackson

Overall, key informants were positive in relation to the future prospects of Jackson, provided the community can continue to draw the right type of migrants and continue to be a positive place to raise a family. It was agreed that growth would continue in Teton County, but there was optimism that the current iteration of the

comprehensive plan would guide responsible future growth. Speaking about attracting quality migrants, a city official noted, "I think it gets back to being able to attract and keep people who are invested in their neighborhoods, and the town and the county as a whole," and who "understand the values that the community holds and they actively try to contribute to maintaining those." The same official suggested that she hoped the community was still a good place to raise a family, noting that "Anyone who has tried to make it here, that is one of the main reasons for staying…it has so many wonderful things to do and has a very high quality of life." In contrast to positive views, there also are concerns about amenity migrants; they can be perceived to be "unattached to the local economy. They don't care about a lot of the issues that if you're tied to the local economy you care about." A city official recalled an example of this from a conversation with a recent amenity migrant:

> I had a guy tell me one time he didn't give a damn about affordable housing, all he wanted was to be able to get a table at the Snake River Grill. I had to explain to him that without affordable housing he was going to be waiting on himself. And that's the other thing that impacts us is we see a lot of second home development. More so than Aspen and Vail because we incense second home development here by virtue of not having state income tax or a real estate transfer tax. So a guy is going to spend, he is going to build his McMansion. What he'll likely do is look at property in Aspen, and Telluride, and Steamboat, and Crested Butte, and Jackson. They're all nice mountain towns, they all have their unique things. They are all close to airports so he can fly his G4 in from New York, you know, and he'll be on Thunder [ski lift at Jackson Hole Resort] by 2 [pm] if he's a skier. And then he looks and goes, oh I can move there [Jackson] and declare my residence there and now I don't have to pay my New York state income tax. So we provide an incentive for second home development. So I think you will see that continue.

Others recognized that the next several years are critical to the future of Jackson, especially related to changes to the city's comprehensive plan. An NGO official suggested this when she said, "I think that we have a pivotal…next five to ten years." It was suggested that this is because key land holdings in the valley are going to become available during this time, as the economy improves and traditional ranching families pass properties to the next generation. The informant noted, "I think that those pieces [of land] will come and they are going to come with a huge price tag and huge controversy," especially if they "were developed in a manner that wasn't very thoughtful."

Regional Non-governmental Organizations

Regional NGO officials all agreed that the Greater Yellowstone Ecosystem would continue to see growth well into the future, and that growth would put "significant strain on our natural resources." What is needed most is "some structure that would help the region have an identity, and have a plan for how to grow." It was suggested that the layers of bureaucracy and political boundaries inherent in the GYE are a fundamental challenge to the region, but that "what we can hope for is that it (GYE) will be a refuge…a unique and distinct part of the world."

Chapter Seven Summary

A total of 35 semi-structured interviews were conducted with key informants in study communities during the summer of 2010. Interview questions focused on defining the term sustainability, determining economic, environmental, and social priorities, the largest challenge study communities faced on their transition toward sustainability, who was seen to control change, and the long-term prospects for individual communities. Definitions of sustainability differed based on the key informant's community, role in the community, and length of residence in the community. Overall, definitions of sustainability focused on the environment, the economy, and multi-generational or long-term thinking. The prioritization of the economy, environment, and society also differed based on community; however, there was overall recognition that each community was dependent upon the natural environment for economic vitality, and that both the economy and the community existed within an environmental setting, reflecting the embedded nature of recognized components of sustainable development or sustainability.

Key informants were also asked about the biggest challenge the community faced on their transition toward sustainability. Over half of all respondents believed that tourism and the economy were the largest challenges faced by their respective community, followed by growth and development. These results are indicative of not only community dependence on the tourism and recreation industry, but also of the high levels of growth experienced in the Greater Yellowstone Ecosystem over the past 30 years. In West Yellowstone, the ongoing debate over winter access to Yellowstone National Park and the lack of a year-round economy were seen as major challenges to

achieving sustainability goals. In Red Lodge, economic concerns, primarily driven by national and global trends, growth and development were perceived to be the largest challenges. Like Red Lodge interviewees, Jackson informants perceived growth and development to be a major obstacle, however there was also concern over the protection of the natural environment that not only attracted tourists to the region but also residents. Key informants were asked how much local control existed over the changes and challenges that their community faced and, if local control did not exist, who then controls change. Over half of all respondents believed that control over change stemmed from inside the community itself (residents, city or county officials, or business owners), while a third believed it is based in either the federal government or environmental groups. In West Yellowstone, nearly 70 percent of respondents felt change was controlled by extra-local entities such as the federal government or environmental groups through their on-going winter access litigation. In both Red Lodge and Jackson, control over change was believed to stem from within the community itself, although both communities were concerned over the growing influence that amenity-driven migrants were having on their community. Lastly, key informants were asked to discuss their perception of the long-term prospects for their community. While the majority of respondents were enthusiastic about their community's future, there were those who felt that the future of the Greater Yellowstone Ecosystem is in doubt as a result of the numerous challenges they face and the perception of a lack of control over change.

Chapter 8 - Discussion

In the quest toward a sustainability transition in the Greater Yellowstone Ecosystem, definitions of what constitutes sustainability are based on the individual and collective challenges that each community faces. Challenges are often exacerbated through the influence of the agencies, organizations, groups, or individuals that are perceived to control change in the communities themselves. Both the challenges that communities face, and the level of perceived control over those challenges, inform the prioritization of various elements of the triple bottom line. The varying levels of success with balancing the three main components of sustainable development—environmental, social, and economic—and moving toward a sustainability transition in turn affect decision maker and stakeholder perceptions of their community's future, and that of the region. Although it may be argued that in certain instances the process of balancing the triple bottom line might change, the high level of extra-local influence from agencies and institutions results in the perception of lack of local control, which magnifies community challenges and influences definitions and success transitioning toward sustainability.

On-going modifications to the winter access plan and objection towards bison management in West Yellowstone, the high level of influence at the county level and recent land acquisitions by out of state development firms around Red Lodge, and uncontrolled growth and the disparity between low and high income housing in Jackson, have all contributed to the perceptions, priorities, and goals of these communities as they relate to a sustainability transition. Although the perceptions, priorities, and goals of each community are unique and reflect their individual socio-economic conditions, dependence on tourism-related industries, attachment of place, and proximity to Yellowstone and Grand Teton National Parks, similarities also exist. These similarities can be the starting point for collaboration among gateway communities and the long-term sustainability of their individual communities and the collective resource upon which they all depend, the Greater Yellowstone Ecosystem.

West Yellowstone, Montana

While community members of West Yellowstone are cognizant of their relationship to, and dependence upon the natural environment, on-going concerns over winter access to Yellowstone National Park and bison management permeate nearly all considerations of a transition toward sustainability. Definitions of sustainability, the balancing of the triple bottom line, the biggest challenges faced by the community, the community's ability to enact change, and the community's future, are all perceived as being tied to winter access and the ability of the community to sustain a year-round economy.

Key to a year-round economy is a diversified winter and shoulder-season tourist market. Diversification initiatives such as cross-country skiing, snowshoeing, and other winter recreation activities were perceived to improve only moderately off-season economic conditions. What was needed was a consistent winter access plan from the NPS and the removal of litigation from environmental groups. Not only had on-going litigation tarnished the community's reputation as a winter destination, but also ever-changing visitation quotas through the parks West Entrance resulted in a confused and oftentimes alienated tourist base. Because these concerns were extra-local in nature, many in the community felt that is was the National Park Service and environmental groups, and not the community itself that held control over change in the community.

Definitions of sustainability by city officials were based on sustainability initiatives such as the "Green-Up West Yellowstone Program," and the community's intermittent recycling program. A fundamental challenge to implementing such programs is the city's ability (or inability) to educate long-term residents on the benefits of such programs. Definitions from business owners and non-government organizations were based solely on tourism, a year-round economy, and dependence on Yellowstone National Park. Similarly, decision makers and stakeholders in the community perceived the economy as receiving the highest priority when considering a balanced triple bottom line, but were also aware that in order to maintain the community's high quality of life, the triple bottom line should be balanced. Because of the seasonal nature of the community's economy, it was perceived that priorities shift both seasonally and annually. This results in the lack of a unified vision for the community and an over-compensation

of priorities toward the economy once decision makers and stakeholders returned in the spring. Annually, priorities are perceived to shift based on extra-local decisions, such as those by the National Park Service. Because the community is constantly adjusting to outside policies, the priorities are constantly in flux, and long-term initiatives often fail as the community attempts to remain resilient and adapt to changes; it appears to be trapped in a reactive position rather than finding means to become proactive. External policies affecting the economy of West Yellowstone have resulted in a lack of community cohesion and collective vision. The challenge is how to reach equilibrium in a community that makes the majority of its annual profits during a five-month period.

Because of the highly dynamic nature of a tourism-based economy, many in the community felt that the community is in decline. This was evidenced through decreases in resort tax revenues, school and church attendance, and the inability to maintain new businesses in the community. Because of the ongoing winter access debate, new business owners are hesitant to invest in their businesses or develop long term ties to the community. This results in not only a lack of community cohesion, but also a declining tourist experience because service employees have migrate out of the community searching for other employment opportunities, or the level of service declined due to economic conditions. In turn, high employee turn-over rates have forced business owners to continually search for new employees that are more difficult to obtain due to the seasonal nature of the economy.

West Yellowstone as a community is geographically constrained due to its enclosure by federal lands; it is unable to grow except through the acquisition of lands from federal agencies. Due to geographic isolation and constraints, a lack of affordable and employee housing is seen as a fundamental challenge to retaining businesses and employees. Although the acquisition of land from the US Forest Service is seen as a positive step toward the community's future and potential growth, limited interest in supplying affordable housing options and prices of existing real estate further have prevented in-migration. Maintaining critical community services and infrastructure, such as year-round medical services and the plowing of roads during winter months, were also perceived as threatened due to the seasonal nature of the economy. Because the community relies heavily on resort tax revenues to sustain such services, a decline in

tourist visitation rates would result in a decline in services funded through tourist expenditures. Although many long-time residents originally settled in the community due to its remote character and lack of services, fulfilling tourist needs through new services resulted in the adoption of such services by the community and creates additional burdens. This is especially evident in the construction of a medical facility, which will become increasingly important in the future if the population continues to age.

The Interagency Bison Management Plan was also perceived as being detrimental to a stable year-round economy and further complicates the transition toward sustainability. Business owners, city officials, NGO representatives, and the opinion pieces and letters to the editor in the *West Yellowstone News* all cited on-going frustration with the IBMP. The hazing, capturing, and slaughter of bison are perceived as being negative to the community's image and to its economy. Because the community is entirely dependent upon the tourist industry for its economic well-being, many respondents and community members are concerned that negative publicity surrounding the bison management issue would tarnish the community's image and tourists may choose to spend their time and money in one of the other four gateway communities to the park.

When residents did attempt to control change through the acquisition of lands such as Horse Butte, which would allow bison to roam freely, private property rights of individuals were infringed upon for the larger good of the cattle industry. While local residents were conscious of the ramifications of the state losing its "Brucellosis Free" status, they were frustrated because they felt their voices and well-being were not being taken into consideration. As was the case with the winter access debate, the community of West Yellowstone felt constrained by extra-local decisions. Many expressed concern that because Yellowstone National Park was often under a global microscope in terms of policy, decisions were made to appease economic interests (e.g., those of the Montana Stockman's Association) or political interests (e.g, those of the Greater Yellowstone Coalition), and not the well-being and longevity of the community.

Both the winter access and bison management debates have left many in West Yellowstone frustrated with the NPS. Frustration stems from the park's reliance on gateway communities such as West Yellowstone, which serve as bedroom communities

for the 3.3 million tourists who visit the park annually, and further complicates the challenge of how to manage the GYE for the enjoyment of all while simultaneously protecting it from overexploitation. West Yellowstone has recognized, with varying degrees of success, the challenges it faces as a gateway community to Yellowstone National Park, and the implications of having an economy that is dependent on the tourism industry. This recognition was manifested in the early 2000s through the implementation of a strategic plan for the community. However, in a community that is so heavily dependent upon a national park, and is economically viable for only a small portion of the year, there continues to be concern over the community's future. More than any other community in this study, West Yellowstone has the clearest understanding of their economic dependence upon the natural environment. The challenge and frustration, however, is that the community has had a difficult time acting upon that recognition in a meaningful manner due to extra-local forces and an economy that is limited to a 100-day capture period, both of which result in a focus on adaptation to change, and not true sustainability.

Red Lodge, Montana

Like West Yellowstone, the community of Red Lodge is cognizant of its relationship to, and dependence upon, the natural environment. Although highly polarizing debates such as winter access and bison management were absent from the sustainability discourse in the community, challenges do exist in their transition toward sustainability. The overwhelming majority of decision makers and stakeholders in Red Lodge believed that the triple bottom line is balanced in the community; however, there were those who also felt that at times priorities vary. These variations are based on the seasonal nature of a tourism-based economy in the city and the agriculture-based economy of the larger county, and the implications of continued growth in residential development and the prospects of larger resort development firms influencing the quality of life residents have come to enjoy.

Definitions of sustainability for all decision makers were based on the community's reliance on the natural environment to sustain Red Lodge's current level of tourist visitation rates. A healthy natural environment combined with the community's

vibrant cultural heritage provided an ideal backdrop to entice tourists to visit the area. When either of these factors was diminished, as was the case during the wildfires in 2009, or the closing of the Beartooth Highway in 2007, tourism, the economy, and quality of life all declined as well. To mitigate such declines, the community has attempted to diversify its tourism economy with events like the Festival of Nations and the Home of Champions Rodeo that do not solely rely upon the natural environment to draw tourists. Because the primary attraction to the region is the Beartooth Highway, with its moniker as the "most beautiful drive in America," closure of the road during the winter months and due to landslides heavily affects the community. The national/global economic downturn has also influenced events like the Beartooth Rally, which saw decreases in visitors in 2011, although the rodeo had increased visitation. In this regard, the balancing of the triple bottom line and a transition towards sustainability is perceived to be possible only with an increased level of self-sufficiency, most notably through a diversification of the local economy beyond tourism.

Also critical to a successful sustainability transition is a collective vision for the community and county. While the economic mainstay of the community has been tourism for at least a generation, some wondered whether the impacts of tourism were degrading the community's quality of life. In particular, the Beartooth Rally is seen as an event that provides high levels of economic input over a short period, with relatively little environmental degradation. Because of this, there is a growing movement to expand the event and bring it more in line with the Sturgis motorcycle rally in South Dakota. However, others in the community think that the rally, and the prospects of an expanded rally, focus economic gains on a limited number of businesses, while simultaneously excluding tourists from enjoying the community during the event.

In order to sustain a viable year-round economy, business owners and Red Lodge officials believe that collaboration among businesses is needed, most notably a collective vision of what services and experiences should be provided. Without a collective vision, some feel that the community will remain stagnant, with opposing factions pulling or pushing the community in different directions that will hinder economic opportunities. In addition, there is concern that proper expectations by newly arrived residents and business owners is lacking, and results in high turnover rates and decreased community

cohesion. By properly educating new migrants to the realities of succeeding in a community that thrives for 100 days out of the year, it is hoped that a stronger community will result. This education extends beyond setting proper expectations for local business owners to include the community itself. With a limited selection of goods and services provided by the tourist-focused community, many residents conduct the majority of their business in Billings, resulting in a decline in local business (especially during the winter months and shoulder seasons, when such business is critical to local sustainability).

Many decision makers and stakeholders were drawn to the community not only because of its unique natural environment, but also because of the community itself. A strong cultural identify, attachment to place, the willingness on the part of city officials to heed public input, and community involvement are all seen as pull factors when considering migration. However, some Red Lodge respondents are concerned that the high number of non-profit groups are fracturing the community and pitting long-time allies against each other as they compete for limited resources. What is needed most is a collective vision among such groups, and recognition that not all projects can be simultaneously successful. With a collective vision of the community, there would be an opportunity to build upon the community's strengths and improve its weaknesses through a unified effort that sees all parties benefit. Projects like the building of the new high school are perceived as examples of successful collaboration. Improvements to the city's water and sewer system are also perceived to be an instance of successful collaboration, as it benefited the entire community, although the installation of a solar array is perceived by some to be a project that was initiated without considering its impact on the community, largely due to its long-term costs.

Lastly, a successful transition toward sustainability is predicated upon a collective vision of how the community should grow. Decision makers and stakeholders in the community wish to convey a sense of multi-generational thinking when considering growth and development, although such a vision perhaps does not exist at the county level where many decisions are made. The county is seen as reluctant to initiate planning and zoning regulations that could direct growth because of the desire to maintain historic agricultural roots, and instead focuses development near the town of Red Lodge and the

Beartooth Front. The debate over growth often pits long-time residents of the county against new migrants to amenity-driven communities. While both groups want to maintain and protect the natural environment and cultural identity of the region, they differ in how best to accomplish that task. In the meantime, large development firms like JMA Ventures, which had purchased Red Lodge Resort, are left virtually unimpaired to develop as they see fit, as no county-level regulations limit them. This is perceived to be an obstacle for the future of the community as large-scale development would impair the fragile natural environment, potentially creating a community with little attachment to place and resulting in a decline in community cohesion. Within city limits, the Red Lodge is able to play an active role in determining the level of growth deemed appropriate by community members. Such was the case when it declined an outside company the permits to build a gas station, liquor store, and casino; as decision makers felt it clashed with community goals and values. Just outside of city limits, however, a historic red barn was converted to an automobile dealership, marring the viewshed and enraging many locals. Planning and zoning issues will only be exacerbated in the future as amenity migrants continue to build in the region and seek goods and services that are not currently available.

The future of Red Lodge and Carbon County, and a successful transition towards sustainability was not directly linked to extra-local policies by respondents, as was the case in West Yellowstone, but rather in a unified and collective vision of what the region should be. The community of Red Lodge recognizes its relationships with, and dependence on, tourism and the natural environment, and is attempting to mitigate impacts, but there is a growing concern about disparities in the community itself, and that county-level decision makers would ultimately dictate whether such a transition is possible.

Jackson, Wyoming

Jackson faces similar challenges to a transition toward sustainability as West Yellowstone and Red Lodge, although they are being manifested differently due to demographic and economic conditions of the community. While Jackson is firmly focused on the tourism and recreation industry, it is not so dependent upon it as the other

two communities. Rapid growth in recent decades, with an influx of affluent amenity migrants due to abundant land and a lack of income tax, has allowed the community as a whole to grow beyond a traditional gateway to Grand Teton and Yellowstone National Parks. Whereas in Red Lodge and West Yellowstone the fundamental challenge of providing a year-round economy has stymied efforts on their transition toward sustainability, in Jackson, a year-round economy was maintained through the success of Jackson Hole Ski Resort and other winter recreation operations in the area. The addition of financial, professional, and service industries in recent decades has also allowed Jackson to develop a stand-alone economy that is not solely dependent upon tourism. These factors have allowed the community to focus its attention on issues related to sustainability more so than in West Yellowstone or Red Lodge, although challenges still exist.

Definitions of sustainability in the community are focused on the economic viability of a tourism-based economy, but prioritization of the triple bottom line focuses more heavily on the natural environment, maintaining a high quality of life, and multi-generational thinking. The focus on sustaining the natural environment is largely a product of who controls change in the community. Although the federal government has limited power, most notably through management decisions at the National Elk Refuge, and Grand Teton National Park, rarely do their decisions directly affect the community or its economy. When the US Forest Service began talks to move its regional headquarters out of the community, the primary concern was not related to a perceived lack of employment opportunities, but rather what would become of the highly valued property itself. Instead of extra-local sources of control such as the federal government or the county, change in Jackson was most often dictated by the community itself through public input, although this too poses its own unique challenges. Decision makers and stakeholders both agreed that the opportunity for public input and action resulted in a strong sense of community pride. However, concern existed that while input was beneficial, only a select portion of the community were being represented, those with the loudest voice. That those with the loudest voices have the most influence in the decision making process is not unique, however, when the goals or beliefs of the loudest voices are not consistent with the community as a whole, conflict arises. It was suggested that in

Jackson the loudest voices came from amenity-migrants who may only reside in the community for a brief period each year, and did not have a realistic vision of the challenges the community faced.

Current economic conditions also allowed the community to focus more heavily upon community development initiatives than other communities in the region. While West Yellowstone and Red Lodge were struggling to maintain existing infrastructure and services, Jackson was focusing its attention on projects such as the Pathways Program that connected Bridger-Teton National Forest, the community, and Grand Teton National Park through a series of bike trails. Economic conditions also allowed the community to establish a public transportation network. The Southern Teton Area Rapid Transit (START) service provided low-cost or free public transportation in the community of Jackson, the Star Valley of Wyoming, and Teton County, Idaho. The bus service not only provided the opportunity for residents and tourists to move about freely and cheaply in the community, but also provided the opportunity for service workers who resided in Idaho due to its lower real estate values to get to and from their place of employment effectively.

Driven by the natural environment and the uniqueness of the Teton Valley, residential growth is perceived as a major threat to sustainability. Telecommuting, lone eagles, and a lack of income tax have all conspired to make Teton County one of the fastest growing counties in the country. With its heavy focus on the natural environment, the challenge is how to maintain the open spaces, large tracts of land, and high quality of life that have been the catalyst for its growing population, while simultaneously improving attachment to place and providing for moderate-income service-workers. One method by which to accomplish these tasks is through a revision of the community's comprehensive plan, last updated in 1994 during the height of the amenity migration boom. The 2009 revision states that the top priority of the community is the stewardship of the natural environment and the region's wildlife. Although this was only a slight modification to the 1994 plan, alterations that were more significant occurred to other portions of the document. Foremost among them was a change from preserving economic vitality through the maintenance of the environment and community character, to maintaining a vital retail/mixed-use economy in the community. This revision

completely decouples the local economy from the natural environment, and in the process limits the community's ability to sustain the environment and the economy simultaneously, even though it is Jackson's stated top priority. These modifications are a concern to some decision makers and stakeholders as it is seen as a fundamental shift away the protection of the region's most valuable asset, the natural environment. However, other projects, such as the Snake Headwaters Legacy Act (protecting 1.2 million acres and an 87-mile corridor along the Snake River), the Jackson 10x10 initiative, an effort to reduce electricity and fossil fuel consumption 10 percent by 2010, and the Jackson Energy Sustainability Project, that aimed to make the community a leader in sustainability, are seen as victories for both the natural environment and the community. Jackson's desire to further diversify beyond a tourist-based economy through an effort to certify the entire community as "green" was yet another example of how the community is more thoroughly involved in the process of moving toward sustainability.

Because of high real estate values in the county, a primary concern to many decision makers and stakeholders is the availability of affordable housing opportunities for those employed in and around Jackson. One of the most contentious issues regarding affordable housing was the Teton Meadows Development, which was intended to provide affordable housing opportunities for service workers and other valley residents who otherwise might be forced to move across the Targhee Pass to Idaho due to high housing values in Jackson. While the development never materialized, those in favor of the project saw it as an opportunity to allow workers to live in town, which would boost community cohesion. Those opposed believed it was potentially detrimental to community character and a blight on viewsheds (especially for those who lived adjacent to the proposed development site), or did not believe that the development would provide adequate affordable housing opportunities.

While the city and the county have planning and zoning regulations in place, there is growing concern that the future of the community and a successful transition toward sustainability is dependent upon the development of critical pieces of property in the future. Of particular concern is the community's ability to secure and protect large parcels of land that act as open space, and are the primary driving force behind tourist

visitation, migrant relocation, and quality of life in the area. Finally, there is concern in Jackson and its surroundings of how best to continue to attract residents that shared a common vision for the community and the region, and how best to maintain current residents despite soaring real estate prices and a lack of affordable housing.

Like West Yellowstone and Red Lodge, Jackson has many challenges as it transitions towards sustainability. While the community is not under the same level of external control by extra-local forces as the other two communities, balancing the protection of the natural environment and maintaining a high quality of life is a very real challenge. Because of Jackson's economic conditions it has the ability to focus more attention on balancing the triple bottom line than other communities in the region. However, its success and rapid growth have resulted in a suite of challenges that other communities do not face. How best to manage for the enjoyment of all while protecting what makes Jackson unique will remain a challenge to a successful sustainability transition.

As Daily (1997b) suggested, unless current trends in the depletion and degradation of ecosystem services is curtailed, human society has the capability to fundamentally and permanently impair the goods and services ecosystems provide. The communities in this study have shown that they are cognizant of not only their dependence on the natural environment for economic survival, but more importantly that their actions have detrimental impacts on the natural environment and ecosystem services. Human impacts on the environment are most pronounced in the Greater Yellowstone Ecosystem in relation to direct drivers such as the subdividing of agricultural land (Gosnell and Travis 2002); mineral extraction, most notably through oil and gas leasing (Stoughton and Marcus 2000); and tourism and recreation activities (Johnson unpublished manuscript). The environmental impacts associated with direct drivers of change are the result of indirect drivers, such as rapid population growth (Gude et al. 2005), extra-local land use policies (Yochim 1999), and a lack of unified planning and zoning policies for the region (Compas 2007).

The study communities have shown that they are cognizant of their vulnerability to both direct and indirect drivers of change in the GYE, and have taken steps to adapt to the perturbations induced through human-environment interactions. Adaptation

techniques have included institutional mechanisms, such comprehensive and visioning plans, the modification of societal behaviors through programs such as Green Up West Yellowstone and the Jackson 10x10 initiative; and improvements in technology, such as LEED certification on new construction in Red Lodge. These coping mechanisms, as well as the desires of study communities to participate in social and environmental decision-making, have shown not only a strong attachment to place, but more importantly the capacity of citizens to contribute to the long-term sustainability of the GYE.

A successful transition toward sustainability for study communities will require additional changes in values, attitudes, and behaviors. Diversification of local economies, increased self-sufficiency, and a reduced dependence on NPS management decisions will also would provide the incentive to turn existing beliefs and behaviors into sustainability-driven actions. In addition, a reduction in structural barriers, such as extra-local laws, regulations, and influence over decision making processes would enhance sustainable behavior (Leiserowitz et al. 2006). While the challenges each community faces toward a sustainability transition may be unique based on its individual milieu, the similarities expressed in this paper have shown that common ground exists. The challenge that remains for West Yellowstone, Red Lodge, and Jackson is the recognition that while collective visions and comprehensive plans are beneficial to each community individually, a broader vision for the Greater Yellowstone Ecosystem will ensure not only the sustainability of local communities, but more importantly the sustainability of the entire ecosystem which is of such importance to them.

Chapter 9 - Conclusions

This study is based on the theory that in order to successfully transition toward sustainability, a better understanding of coupled human and natural systems is critical, and because of the close couplings between human and natural systems in the Greater Yellowstone Ecosystem, and because of the unique challenges and conflicts present in the region, the GYE is an ideal location to study human-environment interactions. The use-inspired orientation of sustainability science aims to provide tangible, real-world, and place-based understanding of a transition toward sustainability. The contribution of this study to the field of sustainability science is the understanding that, while sustainability visions, goals, and objectives may be similar across a region, consideration of local contexts affecting goals and perceptions provides valuable insights that may inform sustainability pathways at local scales and, as a result, provide deeper understanding of global sustainability. One of these insights is that communities that seemingly have much in common due to their shared region, physical environmental surroundings, and history, the specific concerns to ensure place-based sustainability can show variability. Another important point from this research is that, while most depictions of sustainability (e.g., the triple bottom line) are focused on three elements—the economy, society, and the environment—individuals also key in on multigenerational concerns.

Driven by human activities, the current magnitude and rate of change in Earth systems have exceeded their natural variability, resulting in a non-analog state (Steffen et al. 2004). The concepts of vulnerability, adaptive capacity, and resiliency have been examined to understand better the long-term maintenance of natural and social system in the face of non-linear and uncertain system changes (Harrington 2005; Smit and Wandel 2006; Liu et al. 2007b). The non-linear and uncertain nature of change is especially true at the ecosystem scale, where human alteration of the structure and function of ecosystem services has resulted in species extinctions and the loss of genetic variability (Vitousek et al. 1997). Human modification of earth systems to satisfy societal demands, perceived or real, has forced humanity to question the future of natural systems, and their ability to sustain life. As Kates et al. (1990) suggested, these human dimensions of global change have become an active and fundamental part of scholarly research. The fields of

sustainability science and coupled human and natural systems (CHANS) have emerged to answer questions related to the complex interaction between human and natural systems, as well as how society can successfully transition toward sustainability of both natural and human systems (Clark and Dickson 2003; Parris and Kates 2003; Clark 2007; Liu et al. 2007; Carpenter et al. 2009; Kates 2010; Alberti 2011).

Because solutions to a sustainable transition are often based on the values, attitudes, and behavior of individuals or groups, sustainability science attempts to identify and analyze these traits as well as the causes, consequences, processes, and action related to a sustainability transition (Kates 2010). While human-environment interactions primarily occurred at local scales in the past, today, they have emerged at multiple scales and with increased intensity. The CHANS concept focuses on the hierarchical coupling of human and natural systems across spatial and temporal scales, with recognition that local actions must be understood in the context of local, regional, national, and global factors (Liu et al. 2007b).

Scale matters, and a better understanding of specific localities (Wilbanks and Kates 1999) and the integration of agency (decisions or initiating actions) and social structures (local context) (Kates et al. 1990) can be beneficial when studying global change. Because changes at local scales influence change at larger scales, it is important to understand how local contributions to change evolve over time, the driving forces and control mechanisms for such change, and the successfulness of locally adopted mitigation and adaptation techniques to change (Kates and Torrie 1998). Furthermore, public awareness of localized change leads to perceptions and behaviors related to that change, and while socio-economic conditions may complicate perceptions and behaviors, a better understanding of awareness, perceptions, and behavior may influence both institutional and individual responses to change (Kates et al. 1990), as placed-based research and comparative analyses may improve understanding of the causes of change and modes of interaction between causes within fragile ecosystems (Lambin et al., 2003).

This study has pursued the goals of sustainability science and CHANS work, in that it sought to connect and create knowledge of sustainability and a transition toward sustainability with the hopes of moving that knowledge into action (Kates et al., 2001; Kates 2010). As a result, this work contributes to better understanding of the coupled and

complex relationship between the natural environment and society in an amenity-based mountain area. Specifically, this study improves understanding of how residents of amenity-driven communities and regional and local decision-makers in the GYE perceive the concept of sustainability, how those perceptions inform local and extra-local policies and are subsequently acted upon, and how institutions and agencies influence sustainability goals. The understanding gained can be linked to questions of power, social and institutional interactions, and land use/land cover change, and are particularly relevant for regions in which public land management agencies play important roles in determining resource management and land use. This study also can help to inform scholars' understanding of human-environment relations in a mountain region of the 'global North,' where such studies have been traditionally few in number (Ives and Messerli 1990; Smethurst 2000), as well as through the development of a replicable model for future studies. It is hoped that decision makers and stakeholders in the GYE will use the knowledge presented in this dissertation to facilitate future action related to a successful transition toward sustainability.

One of the fundamental concerns regarding the vision of sustainability today is the inability of researchers, institutions, agencies, and the public to agree upon a universal definition of the concept as the result of the differing objectives, contexts, goals, and scales employed by such groups (Vos 2007; Parris and Kates 2003). Conceptualizations of widely used but broad terms like 'sustainability' and 'sustainable development' are directly influenced by individual and collective perceptions (see, e.g., Seagall et al. 1968). To facilitate decisions focused on multi-dimensional sustainability-oriented objectives, it is critical to have a clear understanding of the various conceptualizations of sustainability; ambiguity, multiple visions for the future, and the normative nature of the concept may lead to differing goals, prioritizations, and outcomes, creating a need for understanding (Parris and Kates 2003). A better understanding of conceptualizations will result in the ability of decision makers and stakeholders to accelerate trends that favor a transition toward sustainability and curtail those that impede it (NRC 1999).

As a region, definitions of sustainability and sustainable development in the GYE were focused primarily on the environment, the economy, and multi-generational thinking. In West Yellowstone, definitions were focused primarily on the economy and

the environment, while in Red Lodge and Jackson definitions focused on the environment and multi-generational thinking. Multi-generational thinking refers to the recognition that actions and decisions made today have long-term implications for future generations. Multi-generational thinking also reflects the hierarchical and embedded reality of nature-society couplings in that the rates, magnitude, and spatial extent of human impacts on the environment, as well as the uncertain nature of time lags and legacy effects of such couplings have the potential to hinder future generations (Liu et al. 2007a: Liu et al. 2007b). While the concept of multi-generational thinking has been present in definitions of the concept of sustainability since the Brundtland Report (NRC 1999), is included in conceptual models of sustainability such as Meadows' Pyramid (Meadows 1998), and has been a basis for the valuation of ecosystem services (Costanza et al. 1991; Ropke 2005; and Quental et al. 2010), very little research has focused on societal conceptualizations of this idea.

For all three communities, definitions focused on the environment and the economy reflect the tourism and recreation-based economies of these communities, as well as their dependence on the natural environment (especially Yellowstone and Grand Teton national parks). Definitions focused on multi-generational thinking were most prevalent in Jackson and Red Lodge. A lack of definitions focused on multi-generational thinking in West Yellowstone may be grounded in their perception that control over change emanates from outside the community, most notably environmental groups and federal land managers. The lack of control over change at the local level has resulted in the community continually adapting to and mitigating changes, particularly in relation to extra-local policies. While it is unwarranted to suggest that the community of West Yellowstone is not concerned with future generations, it is clear that their continued focus on the economy and extra-local influences has created an environment where it is not a vocalized priority; shorter term concerns are more critical to residents' thinking at the present time.

In Red Lodge and Jackson, I believe that definitions focused on multi-generational thinking can be attributed to on-going revisions to city or county comprehensive plans that have focused residents' attention on long-term planning, as well as the amenity-driven nature of those communities. This is particularly evident

when considering the influence of time of residence on definitions. Those who have lived in the GYE for less than 10 years focus on multi-generational thinking as a result of their desire to maintain the quality of life and environmental and societal amenities that first drew them to the region. For respondents who had lived in the region between 10 and 20 years, I propose that their inclusion of multi-generational thinking was tied to the recognition of their dependence on the natural environment for quality of life and economic vitality. The recognition of the embedded nature of the local economy in the environment is important because it provides incentives to long-term residents to sustain natural, societal, and economic systems over the long-term. Lastly, I believe that those residents who have lived in the GYE for more than 20 years continue to recognize the embedded nature of local economies in the natural environment, but define sustainability in terms of multi-generational thinking out of their desire to sustain the uniqueness of Greater Yellowstone for future generations.

The objectives and multiple goals implemented to facilitate that vision are often complicated by local context and the numerous challenges that exist within study communities. The communities of West Yellowstone, Red Lodge, and Jackson are cognizant of their reliance on the natural environment, primarily federally protected lands, for economic and community well-being. There is acknowledgement that a healthy, vibrant, and sustainable natural environment will result in not only a sustainable economy, but also sustainable social characteristics that will enhance the existing quality of life. Priorities (goals and objectives) were found to vary not only spatially between study communities, but also temporally within individual communities. Spatial variations were largely a product of dependence on tourism and recreation-based industries and proximity to Yellowstone and Grand Teton National Parks, while temporal variations were the product of extra-local forces such as shifts in National Park Service policy and changes in local, regional, and global economies.

The content analysis of the *West Yellowstone News* revealed that the highest priorities in West Yellowstone were related to the natural environment and the economy, most notably through on-going litigation involving winter access to Yellowstone National Park, and the Interagency Bison Management Plan. The analysis of key informant interviews from West Yellowstone also indicated that these topics were top priorities for

decision makers in the community. There was also the perception that the winter access and bison management debates had a direct impact not only on the local economy through decreased visitation rates, but also the community itself. Both content analysis and key informant interviews also indicated that community development was prioritized, primarily through discussions of long-term strategic planning and the lack of a unified collective vision for the community. Further, there was recognition that while the economy was a top priority, other dimensions of sustainability (environment and society) should receive equal attention.

As the busiest gateway to Yellowstone National Park, the community of West Yellowstone is dependent upon YNP for its economic vitality and the livelihoods of residents. With an economic capture period of less than six months per year, the development of a year-round economy is critical to West Yellowstone's survival. Winter access policies since the 1970s have facilitated growth and development in both the local economy and the community. Changes in winter access policies since the early 2000s have resulted in business closures, economic loss, declining school enrollment, and a fear that additional restrictions will result in the community returning to a one-season town. The Interagency Bison Management Plan was designed to protect local ranchers from economic loss associated with brucellosis, a disease that has the potential to be transmitted from bison and elk to cattle. However, decades after the implementation of the plan there is growing concern that on-going litigation, demonstrations from activist groups, and world-wide media attention regarding bison management has resulted in a tarnished image of the community, its goals, and way of life, all of which has the potential to be detrimental to the tourism-based economy of the community.

The content analysis of the *Carbon County News* revealed that the highest priorities in Red Lodge were related to community development, government services, the economy, and growth, while the analysis of key informant interviews indicated that tourism and the local economy were the highest priority for the community. Priorities related to community development were primarily focused on education through the construction of a new high school and on-going debates on the consolidation of rural schools and a proposed four-day school week as a result of budget shortfalls at the state and local level. Deficiencies in community infrastructure, specifically those associated

with water treatment and distribution, resulted in government services being a top priority of the community as well. While there was near universal acceptance of the upgrades to such infrastructure, concern over the inclusion of a locally funded solar array to power a new water treatment facility caused some frustrated residents to question if such projects were the best use of limited resort tax revenues. Concern also exists in relation to growth and development, particularity the lack of county-wide planning and zoning ordinances. While some in the community believed that further growth and an expansion of tourism activities will be beneficial to the community economically, there were also those who feared the environmental impacts of such growth, as well as how growth might impact community character and way of life. Lastly, because of its tourism and recreation-based economy, there was growing concern that the community lacked sufficient diversification. This was particularly evident in discussions on the implications of recent forest fires and landslides in the area that closed the community's main tourist attraction, the Beartooth Highway, and resulted in decreased tourist visitation rates and economic inputs.

The content analysis of the *Jackson Hole News & Guide* revealed that the highest priorities/clearest concerns in Jackson were related to natural resources, growth and development, and community development, while key informant interviews indicated that the economy and the environment were the highest priorities. As one of the fastest growing counties in the country, decision makers and stakeholders were concerned with the environmental impacts associated with such rapid growth in the past, and how impacts could be mitigated in the future. In addition, because of the amenity-driven nature of the community, residents were also concerned with a lack of affordable housing options as long-time residents and service workers were unable to afford to live in town as real estate prices continually increased. Concern also existed in relation to oil and gas development on federal lands, particularly on Bridger-Teton National Forest. While a recent move to expand leasing operations considerably was thwarted, ongoing fear over future development and its potential impacts on the natural environment were a high priority in the community. Additionally, there was concern with wildlife management initiatives, including the reintroduction of the gray wolf to the GYE, as well as the

management of elk on the National Elk Refuge, and how both species would impact ranching operations in Teton and adjacent counties.

Content analysis and key informant interviews also revealed distinct sustainability objectives in study communities. In West Yellowstone; specific actions taken to achieve sustainability goals included a city-wide initiative known as Green-Up West Yellowstone that focused primarily on the reduction of non-recyclable materials, particularly in local businesses. The project also included an outreach program that centered on better consumptive patterns by local residents and tourist alike, as well as the use of renewable energy sources. One of the largest obstacles to recycling programs in the community was its isolation, making transportation of materials cost-prohibitive, and eventually resulting in the closure of the city's recycling center in 2008. However, due to resident and tourist demand, the facility was re-opened in 2010, although with limited services. Residents also actively set aside and protected sensitive tracts of private lands near the community. Two examples were the donation of 145 acres of prime wildlife habitat on Raynolds Pass to the Nature Conservancy, and the conservation easement of Three Dollar Bridge, a world-renowned fly fishing destination obtained by individual anglers and Montana Trout Unlimited.

In Red Lodge, specific actions to achieve sustainability are abundantly evident when approaching the community from the north, in the form of the large solar array attached to Red Lodge Brewing Company, the new water treatment facility, as well as numerous residential homes throughout the city. The newly constructed high school was also built specifically to take advantage of wind and solar patterns to heat and cool the facility. Most notable, however, is the Beartooth Nature Center, and its mission to protect and conserve the wildlife of southwestern Montana and their habitat. In addition, the Center is in the process of building a new LEED-certified facility to serve as an education center for tourists, especially in relation to the sustainability of the Greater Yellowstone Ecosystem.

Lastly, in Jackson, many of the actions related to sustainability were initiated by Jim Wolfensohn, former head of the World Bank, who challenged the city of Jackson to become a showcase community in relation to sustainability and energy efficiency. Initiatives included the energy sustainability project known as the Jackson 10x10

Initiative intended to reduce fossil fuel consumption 10 percent by 2010, and the recent acquisition of a $1.8 million Energy Efficiency and Conservation Block Grant that was specifically designed to protect open space in the community, expand existing recycling facilities, and install solar to power city infrastructure. In addition, in 2010, the community passed a Special Purpose Excise Tax of $3.8 million to retrofit all public buildings for renewable energy and provide residents with interest free loans to do the same. Lastly, the city was actively pursuing ways to certify the entire city as "green" as part of their sustainability initiatives.

This study also suggests that variations in sustainability objectives and goals in study communities are ultimately dependent upon local context. Proximate and underlying drivers of change, a community's vulnerability and resiliency to change and its ability to adapt to and mitigate change, and the various challenges each community faces constitute local context. In the Greater Yellowstone Ecosystem that context includes a tourism-based economy that is dependent upon the natural environment, a myriad of local, regional, national, and global stakeholders, the perceived lack of direct control over change, and the presence of federal land agencies that are responsible for the sustainability of natural systems.

The primary challenges facing the community of West Yellowstone on its transition toward sustainability were federal policies and on-going litigation involving winter access to Yellowstone National Park, the community's dependence on YNP for economic vitality, and the lack of a collective vision for the community's future. Although concern for diversification and a year-round economy permeated all three study communities, it was manifested differently in West Yellowstone than the other two communities: no other community perceived winter access to Yellowstone National Park as a challenge to sustainability. This is because West Yellowstone receives the highest percentage of winter visitors in the region, with most traveling to the community for snowmobile excursions into the park. Tied directly to issues involving winter access was a lack of collective visioning for the long-term. All key informants recognized the detrimental impacts of shifting federal policies and on-going litigation by environmental groups regarding winter access. However, there were mixed opinions on how to best move forward. Some believed that the diversification of the economy through additional

tourist industries such as casinos and amusement parks was the solution, while others believed that plowing park roads during the winter months would ensure economic vitality. Still others were not willing to give up the fight for snowmobile access to the park, and there were even those who had given up all together and were planning to move outside the region.

For Red Lodge, the primary challenges to transitioning toward sustainability included dependence on a tourism and recreation-based economy, and growth and development. Attractions including the Beartooth Pass and the Beartooth Plateau are the primary tourist draws in Red Lodge, and while cultural events such as the Festival of Nations and the Home of the Champion Rodeo may bring additional tourists to the community during the summer months, the lack of a diversified economy was perceived as a primary challenge. Like West Yellowstone, the lack of a collective vision for the community's future amplifies challenges to a sustainability transition. Recent growth and development were also viewed as a challenge, primarily based on the lack of county-wide zoning that had pitted long-time residents against amenity-migrants. Although the community had been proactive in limiting growth within city limits, concern existed over how growth in peripheral regions of the county, such as the recent purchase of Red Lodge Mountain by JMA Ventures, might impact not only the natural environment but also community character and quality of life.

In Jackson, the primary challenges were associated with growth and development and once again pitted long-term residents against recent amenity migrants. In particular, issues involving affordable housing were foremost on the minds of long-time residents; many of whom worked in the service industry preventing them from keeping pace with escalating real estate prices, and forcing their relocation outside the county. The rapid and continuing increases in migration to the Teton Valley also resulted in concerns over the impact of such growth on the natural environment. The challenge was how to maintain the open spaces, large tracts of pristine land, and the high quality of life that had driven population growth in recent decades, while simultaneously ensuring the continued success of the community's year-round economy. Although the protection of the natural environment has been considered a paramount concern for local residents and decision makers alike, with language in past and current comprehensive plans directly focused on

the environment, there was growing frustration over the lack of implementation of environmentally-oriented policies at the city and county level. Instead, the perception existed that such policies were more often than not sacrificed for growth and development, and would ultimately result in the lack of community cohesion and the degradation of the natural environment.

A critical component of research on the human dimensions of global change involves understanding better the forces that are driving change and the control over such changes at the local scale (Kates and Torrie 1998). Understanding drivers of change and control is important for understanding the decision making process and the context in which decisions are made (Kates et al. 1990). Local processes, including drivers of change and decision making, are shaped and modified by larger-scale processes such as government policies that may occur across political or ecosystem boundaries (Liu et al. 2007a), further complicating challenges to a sustainability transition. However, local actors may "modify, ignore, or even completely counteract" large-scale processes and policies if they believe they will improve local livelihoods (Haberl et al. 2006).

One of the many challenges facing the management of lands adjacent to protected areas is how to reconcile local, regional, state, and national interests. This is particularly true in areas where amenity-driven migrants diversify constituent bases and bring new attitudes and values into the region that may result in changes in governance structures. These contextual challenges in governance structures may include increases in civic participation that may require the inclusion of more diverse world views, or decreases in civic participation due to the seasonal nature of amenity time in residence that may hinder a community's ability to address changes in social and environmental systems (Krester et al. 2009). In the Greater Yellowstone Ecosystem, institutional challenges are primarily based on the myriad of state and federal land agencies charged with managing the GYE, their multiple management goals, and their lack of integration (Clark 1999). As Krester et al. (2009) suggested, what is needed most is the collaboration between place-based organizations, local citizens, and state and federal institutions.

Both contextual and institutional challenges toward a sustainable future occurred in study area communities, and were most often associated with control over change. In both Red Lodge and Jackson, control over change was perceived to extend from within

the community itself. While both communities took great pride in their ability to initiate effective communication with disparate stakeholders, there was growing concern that city or county visions were not always aligned with those of the residents. In particular, the key informants for Red Lodge believed that although they were able to control change within city limits, the lack of planning and zoning policies at the county level was undermining locally derived attempts to curtail the impacts of recent growth. And while it was perceived that city officials were open-minded and actively sought public input empowering local residents, particularly through organizations such as the Beartooth Forum, multiple ad-hoc organizations vying for limited funding and support had hindered collective community vision. Residents of Jackson also believed that control over change emanated from local sources. However, there was ongoing concern that amenity-driven migrants and second home owners, or those with the loudest voices and financial ability, were ultimately dictating change, and that such change may not align with the goals or priorities of longtime residents.

In West Yellowstone, local change was perceived to be controlled through extra-local forces. It was the perception of many that the National Park Service was controlling change in the community through continual revising of its winter access plan. However, many respondents also recognized that environmental groups such as the Greater Yellowstone Coalition were complicating the winter access debate through ongoing litigation and their perceived lack of compassion for the economic vitality of the community. Because of the high profile nature of YNP in national and international media, many expressed concern that the NPS made decisions to appease political and economic interests outside the region, while neglecting the well-being and longevity of the communities it depends on to house the over three million tourists who visit the park annually. In addition, because of their dependence on tourism and recreation-based industries, many decision makers, most notably business owners, were concerned about the negative publicity surrounding issues of bison management and winter access, and the potential of such publicity to tarnish the community's image to the outside world. It was also believed that extra-local policies had resulted in a lack of community cohesion, as new business owners and residents were hesitant to invest in their businesses or develop long term ties to the community. Federal policies had resulted in decreased tourist

visitation rates during the winter months, directly impacting the local economy and resulting in differing views on how to compensate for such losses.

In all three study communities, dependence on tourism and recreation-based industries, the lack of a diversified economy, and continued growth and development have resulted in a disconnect between perceptions, priorities, and goals as they relate to sustainability. In addition, each community was focused on multiple goals that further complicated the fulfillment of sustainability objectives. The multi-goal orientation of study communities is reflected in the multiple visions that various decision makers and stakeholders have for the community and their futures. What is needed most is a hierarchical approach to a sustainability transition, with each community setting its own, as well as ecosystem-wide, goals, objectives, and visions. By doing so, communities will not only possess a guide to begin the transition to a sustainable future, but will also ensure the health of the Greater Yellowstone Ecosystem. Such community and wider scale efforts must be ongoing.

The results from this study also indicate that a transition toward sustainability is manifested differently in the Greater Yellowstone Ecosystem, and potentially other communities adjacent to protected lands, than it is other areas because of its unique milieu. While the close proximity of federal lands, including Yellowstone National Park, may complicate the sustainability discourse at times and may, in certain instances, add additional challenges through extra-local control of change, these same federal lands may also favor a transition toward sustainability in amenity-driven gateway communities. The mandates of the National Forest Organic Act of 1897 and the National Park System Organic Act of 1917 provide the necessary means for the federal government to protect federal lands such as National Parks and National Forests and to "leave them unimpaired for the enjoyment of future generations (Organic Act of 1917). In addition, the mission statements of the US Fish and Wildlife Service, the Montana Department of Fish, Wildlife and Parks, the Idaho Department of Fish and Game, and the Wyoming Game and Fish Department all reflect the multi-generational mandates of both Organic Acts.

As a result of the federal oversight of public lands and their mandates for multi-generational protection of their resources for public enjoyment and use, the communities of West Yellowstone, Jackson, and Red Lodge are better able to focus attention on

sustainability objectives and goals oriented towards the local economy and community. This is not to say that environmental dimensions of sustainability can or should be neglected in gateway communities or their adjacent private lands. The sustainability of the Greater Yellowstone Ecosystem requires that the mosaic of private lands that connect and act as corridors between federal lands must also be maintained in a sustainable manner. While federally protected public lands are considered the centerpiece of the GYE, societal and economic dimensions of sustainability goals and objectives are often focused on private lands and the character of local communities. The recognition that the sustainability of private lands is a high priority was repeatedly seen throughout this study. While the community of West Yellowstone is geographically constrained and virtually unable to grow spatially, most respondents agreed that preserving the character of the community was of utmost importance. For Red Lodge and Jackson, their continued efforts to preserve open space in and adjacent to their town centers is further evidence of the importance of sustaining environmental attributes on private lands.

Because the environmental dimensions of sustainability are undertaken by the federal government, study communities are ensured to have a quality environment with which to draw new residents and tourists well into the future. This means that economic and societal goals and objectives should be sustainable as well, provided that gateway communities do not attempt to grow beyond the constraints of local constraints or tourist visitation rates.

The communities of West Yellowstone, Red Lodge, and Jackson are cognizant of their dependence on the natural environment, and although not explicitly stated, they are also aware that the federal government manages the environmental dimensions of sustainability for the good of all. Conflict arises when the federal government manages environmental assets in a manner that gateway communities believe diminishes local economic or societal goals and objectives. Because study communities are dependent on the natural environment, they are subsequently dependent on the federal government to manage lands in ways that ensure their continued use. If Yellowstone National Park, or any federally protected land with gateway communities, continues to receive ever-increasing tourist visitation rates, then gateway communities must grow proportionally to

keep up with demand. If, however, tourist visitation rates decline, gateway communities must have the adaptive capacity to mitigate those declines on their economy and society.

While federal oversight over the environmental dimensions of sustainability allows gateway communities to focus efforts on societal and economic dimensions of sustainability, issues such as bison management, the reintroduction of wolves, and winter access are challenges that the communities surrounding Yellowstone and Grand Teton national parks must face, and attributes that make them and the sustainability of the Greater Yellowstone Ecosystem unique. However, as Clark et al. (1991) suggested, the lack of shared policies, management goals, and objectives among land managers and the inclusion of local communities in the decision making process are the largest issues facing the GYE. A comprehensive ecosystem management policy that reorganizes agency bureaucracies and integrates coordination between management agencies and local communities to solve complex problems in both human and natural systems is needed.

Study Limitations

A number of limitations inherent in the study should be identified. First, although key informants were specifically selected based on their likely knowledge of issues related to sustainability, their responses reflect their own values, beliefs, and goals, and may not be representative of all decision makers in the study area. While every effort was made to include as many diverse responses as possible, it should be noted that decision makers consisted of business owners, city and county government officials, and non-government organizations, and thus the perceptions of other groups (*i.e.*, government organizations, extractive industries etc.) are not included in this analysis. It is hoped that in the future mailed surveys and in-person interviews will provide for a more inclusive study. Second, the content analysis of newspaper articles was based on keyword searches and not the entirety of each edition, and as such, some topics, themes, and concepts that are pertinent to sustainability discourses may be absent from this analysis, if typical sustainability jargon was not included in the article. Third, although inter-coder reliability checks were performed for newspaper content analysis, researcher biases may still be present. Finally, as only three communities were examined in this study, the

generalization of research findings to the Greater Yellowstone Ecosystem as a whole should be limited. Although West Yellowstone, Red Lodge, and Jackson were chosen because they are three of the most influential communities in the region, their priorities, challenges, and transitions toward sustainability may be fundamentally different from others among the region's communities.

Future Research

The research presented here is representative of the spatial and temporal patterns of human-environment interactions with fragile ecosystems, and the sustainability of the linked human (social and economic) and natural systems. In order for this research to be relevant to stakeholders and decision makers in the Greater Yellowstone Ecosystem, it must be accessible. Dissemination of research results from this study will include synthesized reports to community and county officials, local chambers of commerce, non-government organizations, appropriate state and federal agencies, and the local citizenry. Additionally, presentations of research results will be offered to the study communities and other gateway communities in the region that may facilitate future stakeholder and decision maker workshops, and lead to a more effective transition toward sustainability.

Future research can build upon the work presented here to include more diverse and robust data sets and analysis techniques that will broaden scholars' overall understanding of coupled and complex human-environment systems. Although this study focused on a mixed methods approach and included both key informant interviews and content analysis of community newspapers, a wider variety of data sources is needed. In addition, future research should incorporate stakeholder's from the onset. This will ensure vested interest from both stakeholders' and decision makers', and will result in more useful and applicable results for local communities and the incentive to initiate proposed recommendations. The following are suggestions as to how this study could be improved in the future, including additional stakeholders from whom to solicit views of the system and sustainability needs:

- Inclusion of additional key informant interviews with stakeholders and decision makers in the region that will broaden existing data and allow for further qualitative and quantitative analysis.
- Implementation of mailed surveys pertaining to research questions for the general public throughout the region. Understanding the perceptions, priorities, and goals of the public is essential for decision makers to implement effective long-term planning.
- Incorporation of the remaining gateway communities to Yellowstone and Grand Teton National Parks (Gardiner and Cooke City, Montana, and Cody, Wyoming) to determine whether there are additional community differences in contexts and priorities.
- Expansion of the study area to include communities in the GYE that are not necessarily gateway communities for a broader regional scale understanding and more information regarding local variability.
- Exploration of the views of other stakeholders to broaden understanding of varying perceptions and priorities for sustainability, including representatives of tribal groups from the Wind River and Crow reservations, federal and state agencies; a more diverse collection of regional non-government agencies; natural resource extraction industries, guide services, and other resources users from the region.
- Completion of interviews and mailed/in-person surveys with tourists and recreationists to gain a better understanding of outside perceptions of the region.
- Accomplishment of broadened newspaper content analysis (temporally) to analyze longitudinal changes.
- Improvement of statistical analysis through the inclusion of additional key informant interviews. Little statistical analysis could reliably be conducted with this study as a result of a small sample size.
- Analysis of trends related to time of residence, role in community, and other demographic characteristics more completely to gain additional insights into relationships of people with place-based sustainability efforts and potentials.

- Creation and analysis of land use and land cover change data sets (remotely sensed imagery, geographic information systems) at local scales to inform decision making.
- Achievement of a more in-depth appraisal of historical trends relating to the relationships of social, economic, and natural systems in the region to better understand regional change, driving forces, and adaptation.

Future Prospects

The goal of this study was to reach better understanding the needs and desired directions for transitions toward sustainability in a coupled and complex human-environment system, the Greater Yellowstone Ecosystem, including how amenity-driven communities perceive the concept of sustainability, how those perceptions are acted upon, and how institutions influence sustainability goals. Thinking beyond the GYE, the research techniques and methods performed in this study may be used elsewhere to allow for a systematic and replicable model of study for other gateway communities to protected lands throughout the United States (and elsewhere). Analyses of sustainability objectives and goals at multiple localities and investigation regarding how transitions toward sustainability are affected by local context will allow for a comparative approach across multiple scales and environments. These would inform scholars and decision makers as they address similar topics in different locations. Such research will prove valuable in advancing understanding of the complexity and sustainability of coupled human-environment systems.

Just as Swanson et al. (2003) found when examining a similar environment adjacent to Glacier National Park in northwestern Montana, this study has shown that the quality of the natural environment is recognized as the greatest asset in the Greater Yellowstone Ecosystem, although it is vulnerable to change as a result of the differing levels of resiliency and adaptive capacity of study area communities. The communities of West Yellowstone, Red Lodge, and Jackson are conscious of the embedded and hierarchical nature of local communities, economies, and natural environments, although this is seldom (if ever) verbalized. However, variations in local context among study

communities ultimately resulted in variations in perceptions, priorities, and goals related to the transition toward sustainability. Each community was focused on multiple goals that further complicated the fulfillment of sustainability objectives and goals. The multi-goal orientation of study communities is reflected in the multiple visions that decision makers and stakeholders have for their communities and the region as a whole. Gateway communities in the Greater Yellowstone Ecosystem are fortunate that the federal government manages environmentally-focused sustainability goals, objectives, and visions, freeing them to focus more attention and energy on societal and economic dimensions of sustainability. However, the local context of the Greater Yellowstone Ecosystem has complicated their transitions toward sustainability. That all three communities struggle to ensure viability in a tourism-dominated economy, have similar challenges managing growth and development, are impacted by extra-local policy decisions, recognize the importance of the natural environment, and strive to enhance their community as a whole should be seen as building blocks for the successful transition toward sustainability in the GYE. A collective vision for the region that incorporates the objectives and goals of not only gateway communities, but also the numerous land management agencies that are charged with protecting the region's most valuable asset, the natural environment, will help facilitate a successful transition toward sustainability in the Greater Yellowstone Ecosystem.

Final Comments

Ultimately, further education, discussion, and action regarding an adaptive pathway toward sustainability is needed if communities hope to meet objectives that facilitate their sustainability visions. The Greater Yellowstone Ecosystem is held together through the complex dependencies and interactions between physical and biological systems, and communities in the GYE play a critical role in the perpetuation of those interactions. If each community in the region is willing and able to recognize its role and the role of others in the ecosystem, a definition for sustainability that is mutually beneficial to all systems is possible and will ensure that future generations will receive the same, if not a better, Greater Yellowstone Ecosystem than exists today.

Because of its normative and ambiguous nature, a transition toward sustainability must take into account the numerous objectives and goals of stakeholders (Parris and Kates 2003), while simultaneously recognizing sustainability visions. Visions are directly aligned with the core values of the organization, and reflect what ought to be and why, and often focus on the future. Goals are broadly defined expectations of what is hoped to be attained, while objectives are the specific outcomes and actions that will facilitate the achievement of goals (Walker 2002). The use of strategic planning has becoming increasingly useful to organizations ranging from local governments to non-governmental organizations over the past several decades (Bryson 1998). Because decision makers require a structured process to identify and resolve organizational challenges, the ability of strategic planning to direct and shape decision making has become an incredibly powerful and useful tool. Strategic planning consists of the establishment of organizational objectives, goals, and visions. The vision-driven strategic planning process lends itself well to communities transitioning toward sustainability. Sustainability objectives and goals are subjective because they are derived from social consensus (Kates 2000), and are based on societal value systems (Farber et al. 2002). Because goals and objectives are created locally using a bottom-up approach with (Loorback and Rotmans 2006), communities are better able to accommodate changes and challenges based on local context.

Conceptually, sustainability visions across a given region such as the Greater Yellowstone Ecosystem should be aligned. However, each individual community within a given region will have disparate objectives and goals based on local context that may facilitate the vision of a transition toward sustainability (or not). Sustainability goals most often focus on the environment, economy, and society, and as this research has shown, multi-generational thinking, and their prioritization within each community. Sustainability objectives consist of measurable actions (past, present, and future) taken, as well as the operationalized trade-offs that occur to achieve sustainability goals. Local context consists of the coupled human and natural system at a given location, as well as the numerous challenges that are inherent in such systems. Sustainability objectives and goals are directly related and influenced by the challenges that exist in human-natural

systems, and differ based on a community's vulnerability and resiliency to change, as well as its ability to adapt and mitigate changes and challenges.

References

Aaker, G. 2008. Easy riders. *Carbon County News*. April 24.

Abramo, B. 2007. Double standards. *West Yellowstone News.* February 2.

Adelle, C., and S. Withana. 2008. *EU and US public perceptions of environmental, climate change and energy issues.* London: Institute for European Environmental Policy.

Alberi, J., A. Ellis, K. Hyvonen, C. W. Spencer, M. Hyvonen, B. James, H. Bliss, K. Bliss, J. Prinkki, D. Stempfel, B. J. Stampfel, C. Bellek, C. Bellek, and G. McKittrick. 2001. Questions about schools still need to be answered. *Carbon County News.* March 22.

Alberti, M. 2011. Research on coupled human and natural systems (CHANS): Approach, challenges, and strategies. *Bulletin of the Ecological Society of America*. 92: 218-228.

Aderhold, M. 2005. *Montana's path to state wildlife grants*. Helena, Montana: Montana, Fish, Wildlife and Parks.

Angel, T. 2008. County gets funding for pregnancy project. *Jackson Hole News and Guide*. September 27.

AP (Associated Press). 2008. Snowmobile use repealed. *West Yellowstone News.* November 29.

———. 2011. Yellowstone bison get room to roam in Montana. *West Yellowstone News*. March 17.

APHIS (Animal and Plant Health Inspection Service). 2003. *Brucellosis eradication: Uniform methods and rules*, Effective October 1, 2003. U.S. Department of Agriculture, Animal and Plant Health Inspection Service. APHIS 91-45-013.

Askins, R. 1987. Wolf recovery in the Yellowstone Ecosystem: A progress report. *Endangered Species Update*. 4(11): 1-5.

Aspinall, R. 2003. Modelling Land use change with generalized linear models – a multi-model analysis of change between 1860 and 2000 in Gallatin Valley, Montana. *Journal of Environmental Management.* 72:91-103.

ATLAS.ti. 2010. Atlas.ti visual qualitative data analysis. Version 5.0.66. ATLAS.ti Scientific Software Development Gmbh, Berlin.

Audirac, I. 1997. Rural sustainable development: a postmodern alternative. In *Rural sustainable development in America*, ed. I. Audriac, 3-28. New York: John Wiley and Sons.

Axline, J. 2004. Bear Creek, Montana. *Montana: The Magazine of Western History*. 54(3): 74-75.

Babchuk, W.A. 2009. Grounded theory 101: Strategies for research and practice. Presentation at the *Midwest Research-to-Practice Conference in Adult, Continuing, Community and Extension Education.* Northeastern Illinois University. Chicago, IL. October 21-23, 2009.

Baker, A. 2008. City receives one million dollars from USGS rural development to fund city water system project. *Carbon County News*. May 15.

———. 2008b. Homes land on Cooper Ave. Lots. *Carbon County News*. May 29, 2008.

———. 2008c. Mayor says 'no' to dancing in the streets of Red Lodge. *Carbon County News.* April 17, 2008.

Barcus, H.R. 2003. Changing occupant characteristics in rural public housing in the great plains: 1977-1996. *Housing Policy Debate*. 13(4): 729-753.

Barkley, D. L. 1995. The economics of change in rural America. *American Journal of Agricultural Economics.* 77(5): 1252-1258.

Baron, J.S., D.M. Theobald, and D.B. Fagre. 2000. Management of land use conflicts in the United States Rocky Mountains. *Mountain Research and Development* 20(1): 24-27.

Bartlein, P.J., C.Whitlock, and S. L. Shafer. 1997. Future climate in the Yellowstone National Park region and its potential impact on vegetation. *Conservation Biology.* 11(3): 782-792.

Bazeley, P. 2004. Issues in mixing qualitative and quantitative approaches to research. In *Applying qualitative methods to marketing management research*, ed. R. Buber, , J. Gadner, and L. Richards, 141-156. United Kingdom: Palgrave Macmillan.

Beaumont, S. 2000. Mayor – is proposed improvement plan adequate. *Carbon County News*. February 2.

———. 2003. City hears new economic development plan. *Carbon County News.* October 2.

———. 2004a. EIS required for grove creek development. *Carbon County News*. January 15.

———. 2004b. Grand view plat gets preliminary approval. *Carbon County News*. July 1.

———. 2004c. Mayoral aide, land use issues occupy council. *Carbon County News*. November 4.

———. 2004d. Town pump no go. *Carbon County News.* April 29.

———. 2006. City outgrows aging water system. *Carbon County News*. April 13.

Beder, S. 1994. The role of technology in sustainable development. In S*ocial, ethical, and policy implications of engineering*, ed. J.R. Herkert, 14-19. Australia: University of Wollongong.

Beeson, E. and M. Strange. 2003. Why rural matters 2003: The continuing need for every state to take action on rural education. *Journal of Research in Rural Education*. 18(1): 3-16.

Bender, H.W., S. Donnelly, J. Dick, B.A. Hamilton, L. McDonald, and D. Taylor. 2007. *Oil and gas economic contributions study*. Casper, Wyoming: Wyoming Heritage Foundation.

Bennett, D. and D. McGinnis. 2008. Coupled and complex: human-environment interaction in the Greater Yellowstone Ecosystem, USA. *Geoforum*. 39:833-845.

Bennett, E.M., G.D. Peterson, and E.A. Levitt. 2005. Looking to the future of ecosystem services. *Ecosystems*. 8(2): 125-132.

Berelson, B. 1952. *Content analysis in communication research*. Glencoe, IL: Free Press.

Bergstrom, J.C., H.K. Cordell, A.E. Watson, and G.A. Ashley. 1990. Economic impacts of state parks on state economies in the south. *Southern Journal of Agricultural Economics*. 22(2): 69-77.

Bergstrom, R. 2008. The geographic and economic importance of hunting in Southwestern Montana, USA. Master's Thesis. Montana State University.

———. 2009. Perceptions of sustainable community development and natural resource management: A case study of two Montana amenity towns. *Papers of the Applied Geography Conference*. 32: 86-95.

Bernard, H. R. 2000. *Social research methods*. Thousand Oaks, California: SAGE.

Bertaux, D. 1981. From the life-history approach to the transformation of sociological practice. In *Biography and society: The life history approach in the social sciences,* ed. D. Bertaux. London: SAGE.

Betts, R.B. 1978. *Along the ramparts of the Tetons: The saga of Jackson Hole, Wyoming.* Boulder, Colorado. Colorado Associated University Press.

Bevenger, G., M. Story, P. Bengeyfield, and B. Higginson. 2006. Watershed management strategy for the Greater Yellowstone Area. *Proceedings of 8th Biennial Scientific Conference on the Greater Yellowstone Ecosystem*. Yellowstone Center for Resources. Yellowstone National Park, WY. pp. 27-33.

Bidwell, D. 2010. Bison, boundaries, and brucellosis: risk perception and political ecology at Yellowstone. *Society & Natural Resources.* 23(1): 14-30. DOI: 10.1080/08941920802132575

Blakie, P. and H. Brookfield. 1987. *Land degradation and society*. New York, New York: Methuen.

BLM. 2011. Oil and Gas. Bureau of Land Management. Last accessed on August 20, 2011. [http://www.blm.gov/mt/st/en/prog/energy/oil_and_gas.html]

Blow, J. 2010. Recycling program blossoms over summer. *West Yellowstone News*. September 10.

Blutstein, H. 2003. A forgotten pioneer of sustainability. *Journal of Cleaner Production* 11: 339-341.

Books, D. 2000. A Century of conservation. *Montana Outdoors*. 31(6).

Bord, R.J., A. Fisher, and R.E. O'Connor. 1998. Public perceptions of global warming: United States and international perspectives. *Climate Research*. 11:75-84.

Bouchard, T.J., Jr. 1976. Unobtrusive measures: Inventory of uses. *Sociological Methods and Research* 4:267-300.

Bowerman, T.S., J. Dorr, S. Leahy, K. Varga, and J. Warrick. 1999. *Targhee National Forest ecological unit inventory*. Volume 1. US Department of Agriculture, Forest Service.

Bozeman Chronicle. 2010. An expanded wolf timeline. *Bozeman Daily Chronicle*. March 28.

Brand, R. and A. Karvonen. 2007. The ecosystem of expertise: Complementary knowledge for sustainable development. *Sustainability, Science, Practice & Policy*. 3(1): 21-31.

Brander, J.A. 2007. Viewpoint: Sustainability: Malthus revisited? *Canadian Journal of Economics* .40(1): 1-38.

Bratton. 1928. *Highway From Red Lodge, Mont., to Cooke City, Mont*. 70th Congress 1st Session. Report 885.

Brenner, N. 2006a. Gov. Objects again to nearby oil leasing. *Jackson Hole News and Guide*. June 02.

———. 2006b. Gas fields win praise. *Jackson Hole News and Guide*. August 25.

———. 2007a. Senator for energy use buyout. *Jackson Hole News and Guide*. July 04.

———. 2007b. Governor: Feed grounds necessary in Wyoming. *Jackson Hole News and Guide*. July 17.

———. 2007c. Board cool on KOA project. *Jackson Hole News and Guide*. July 18.

———. 2007d. Council to discuss hotel plan, sales tax. *Jackson Hole News and Guide*. October 01.

———. 2007e. Town: Environment key in comp plan revision. *Jackson Hole News and Guide.* October 12.

———. 2007f. Fruedenthal: Cancel leases. *Jackson Hole News and Guide*. October 19.

———. 2007g. Property owners blast affordable rate hike. *Jackson Hole News and Guide.* November 17.

———. 2007. Planners aim to show comp plan a revision. *Jackson Hole News and Guide*. March 18. .

Brody, S.D., W. Highfield, and L. Alston. 2004. Does location matter? Measuring environmental perceptions of creeks in two San Antonio watersheds. *Environment and Behavior*. 36(2): 229-250. DOI: 10.1177/0013916503256900

Brown, M. 2011. Gray wolves go back to state control. *West Yellowstone News.* May 4.

———. 2008. Bison brawl. *West Yellowstone News*. August 22.

Brown, D. L. and L.E. Swanson. 2007. Rural America enters the new millennium. In *Challenges for rural America in the twenty-first century*, ed. D.L. Brown, and L. E. Swanson, 1-18. University Park, Pennsylvania: The Pennsylvania University Press.

Bryant, R.L. 1991. Putting politics first: The political ecology of sustainable development. *Global Ecology and Biogeography*. 1(6): 164-166.

Bryson, J.M. 1988. A strategic planning process for public and non-profit organizations. *Long Range Planning*. 21(1): 73-81.

Brunson, M.W. and L. Huntsinger. 2008. Ranching as conservation strategy: Can old ranchers save the new west? *Rangeland Ecological Management*. 61:137-147.

BSI. 2011. Greater Yellowstone GIS Data. Big Sky Institute. Last accessed on October 24, 2011. [bsi.montana.edu].

Bunting, T.E. and L. Guelke. 1979. Behavioral and perception geography: A critical appraisal. *Annals of the Association of American Geographers.* 69(3): 448-462.

Burla, L., B. Knierim, J. Barth, K. Liewald, M. Duetz, and T. Abel. 2008. From text to codings: intercoder reliability in qualitative content analysis. *Nursing Research*. 57(2); 113-117.

Burns, T.P. 1992. Ecosystem: A powerful concept and paradigm for ecology. *Bulletin of the Ecological Society of America.* 73(1): 39-43.

Buttel, F.H. 2000. Ecological modernization as social theory. *Geoforum* 31: 57-65.

———. 1987. New directions in environmental sociology. *Annual Review of Sociology*. 13:465-488.

Bybee, R.W. 1991. Planet earth in crisis: How should science educators respond? *The American Biology Teacher.* 53(3): 146-153

.

Byers, E. 1995. *Mountain agenda: Environmentally sustainable and equitable development opportunities*. Franklin, WV: The Mountain Institute.

Cain, S.A. 1968. Conservation, the federal government, and the International Biological Program. *PNAS*. 60(1): 42-50.

Camenzind, F. J. 1985. Yellowstone ecosystem. *Park Science*. 5(2): 12-14.

Campbell, D.T. and D.W. Fiske. 1959. Convergent and discriminant validation by the multitrait-multimethod matrix. *Psychological Bulletin*. 56:81-105.

Carpenter, R.S. 2008. Science for managing ecosystem services: Beyond the Millennium Ecosystem Assessment. *PNAS*. 106(5): 1305-1312.

Carpenter, S.R., H.A. Mooney, J. Agard, D. Capistrano, R.S. DeFries, S. Diaz, T. Dietz, A.K. Duraiappah, A. Oteng-Yeboah, H.M. Pereira, C. Perrings, W.V. Reid, J. Sarkhan, R.J. Scholes, and A. Whyte. 2009. Science for managing ecosystem services: Beyond the Millennium Assessment. *PNAS*. 106(5): 1305-1312.

Carbon County News (CCN). 2001a. Low bid on sewer project at $3.2 million. *Carbon County News*. March, 29.

———. 2001b. Community invited to discuss school facilities. *Carbon County News*. January 10.

———. 2004a. Halfway mark reached in new economic development plan. *Carbon County News*. April 1.

———. 2004b. RC&D lending fund boosted by $750,000 loan. *Carbon County News*. November 24.

———. 2006a. Housing survey response good, data being analyzed by MSU-B. *Carbon County News*. March 16.

———. 2006b. Project progress report paints a rosy picture. *Carbon County News*. October 26.

———. 2007. Baucus halts cut to Beartooth Highway. *Carbon County News*. February 22.

———. 2008. Forum to address motorcycle tourism. *Carbon County News.* February 28.

———. 2009b. The year in review. *Carbon County News.* December 31.

———. 2009a. City approves solar project. *Carbon County News*. October 8.

Clark County, 2011. Clark County history. Last accessed on July 9, 2011. [http://www.clark-co.id.gov]

Compas, E. 2007. Measuring exurban change in the American west: A case study in Gallatin County, Montana, 1973-2004. *Landscape and Urban Planning*. 82: 56-65. DOI:10.1016/j.landurbplan.2007.01.016

Corbin, J. and A. Strauss. 1990. Grounded theory research: Procedures, canons, and evaluative criteria. *Qualitative Sociology.* 13(1): 3-21.

Chee, Y. E. 2004. An ecological perspective on the valuation of ecosystem services. *Biological Conservation*. 120: 549-565. DOI: 10.1016/j.biocon.2004.03.028.

Christensen, N.L. et al. 1989. Interpreting the Yellowstone fires of 1988. *BioScience*. 39(10): 678-685.

Christiansen, R.L. 2001. *The Quaternary and Pliocene Yellowstone Plateau volcanic field of Wyoming, Idaho, and Montana*. US Geologic Survey. Professional Paper 729-G.

City of Red Lodge. 2008. *2008 Red Lodge Growth Policy*. The City of Red Lodge, Montana.

Clark, M. 2001. Keep snowmobile debate focused on science. *West Yellowstone News*. April 13.

Clark, T.W., E.D. Amato, D.G. Whittemore, and A.H. Harvey. 1991. Policy and programs for ecosystem management in the Greater Yellowstone Ecosystem: An analysis. *Conservation Biology*. 5(3): 412-422.

Clark, R. and L.W. Canter. 1997. *Environmental Policy and NEPA: Past, present, and future*. Boca Raton, Florida. CRC Press LLC.

Clark, W.C. 2007. Sustainability Science: A room of its own. *Proceedings of the National Academy of Sciences*. 104(6): 1737-1738.

Clark, W.C., and N.M. Dickson. 2003. Sustainability science: The emerging research program. *Proceedings of the National Academy of Sciences.* 100(14): 8059-8061.

Clark, T.W. 1999. Interdisciplinary problem-solving: Next steps in the Greater Yellowstone Ecosystem. *Policy Sciences*. 32: 393-414.

Clark, T.W. and S.C. Minta. 1994. *Greater Yellowstone's future: Prospects for ecosystem science, management, and policy*. Moose, Wyoming: Homestead Publishing.

Clarkson, J. 2008. Green Up West Yellowstone! *West Yellowstone News*. March 14.

———. 2008b. Green Up: What you can do to help. *West Yellowstone News*. April 18.

Clendenning, G., D.R. Field, and K.J. Kapp. 2005. A comparison of seasonal homeowners and permanent residents on their attitudes toward wildlife management on public lands. *Human Dimensions of Wildlife* 10: 3-17.

Coffmann, M. and K. Umemoto. 2010. The triple-bottom-line: framing of trade-offs in sustainability planning practice. *Environmental Development and Sustainability*. 12:597-610. DOI: 10.1007/s10668-009-9213-4.

Compas, E. 2007. Measuring exurban change in the American West: A case study in Gallatin County, Montana, 1973-2004. *Landscape and Urban Planning* 82: 56-65.

Conradi, D. 2008. The Montana global warming debate. *West Yellowstone News*. February 29.

Council Journal. 1866. *Council Journal of the First Legislative Assembly of Montana Territory: 1864-1865.* Virginia City, Montana: D.W. Tilton & Company. pp. 23, 44, 202.

Cutter, S.L. 2003. The vulnerability of science and the science of vulnerability. *Annals of the Association of American Geographers*. 93(1): 1-12.

Corbin, J. and A. Strauss. 1990. Grounded theory research: procedures, canons, and evaluative criteria. *Qualitative Sociology.* 13(1): 3-21.

Costanza, R., H.E. Daly, and J.A. Bartholomew. 1991. Goals, agenda, and policy recommendations for ecological economics In E*cological economics: The science and management of sustainability*, ed. R. Costanza, 1-20. New York: Columbia University Press.

Costanza, R., R. d'Arge, R. de Groot, S. Farber, M. Grasso, B. Hannon, K. Limburg, S. Naeem, R.V. O'Neill, J. Pareulo, R.G. Raskin, P. Sutton, M. van den Belt. 1997. The value of the world's ecosystem services and natural capital. *Nature*. 287; 253-260.

Crandall, J. 2001. Make a difference and get involved. *Carbon County News*. January 24.

Creative Research Systems. 2010. Sample Size Calculator.

Creswell, J.H. 2009. *Research design: Qualitative, quantitative, and mixed methods approaches*. London: SAGE.

Cutter, S.L., R. Golledge, and W.L. Graf. 2002. The big questions of geography. *The Professional Geographer.* 54(3): 305-317.

Cutter, S. L., and W. H. Kenwick. 2004. *Exploitation, conservation, preservation: A geographic perspective on resource use*. 4th ed. Wiley. P. 1-13.

Daly, H. 1973. Towards a steady-state economy. London, England: WH Freeman.

Daily, G.C. 1997a. What are ecosystem services? In *Nature's services: Societal dependence on natural ecosystems*, ed. G.C. Daily, 1-10. Washington, D.C.: Island Press. pp. 392.

———. 1997b. Ecosystem services: Benefits supplied to human societies by natural ecosystems. Issues of Ecology. Number 2. Spring 1997. *Ecological Society of America*.

Dana, A. 1990. Water Resource Management In *The Yellowstone Primer: Land and Resource Management in the Greater Yellowstone Ecosystem*, ed. J.A. Baden and D. Leal, 49-80. Pacific Research Institute for Public Policy. San Francisco, California.

Daniels, A. 2008. Concerned Red Lodge will change. *Carbon County News*. April 10.

Daniels, B.G. and B. R. Hillman. 2002. The Greater Yellowstone Interagency Brucellosis Committee In *Brucellosis in elk and bison in the Greater Yellowstone Area*. ed. T.J. Kreeger, 140-145. Cheyenne, Wyoming: Wyoming Game and Fish Department.

Daughery, J. 1999. A p*lace called Jackson Hole: A historic resource study of Grand Teton National Park*. Moose, Wyoming: Grand Teton Natural History Association.

Dasgupta, P. 2007. The idea of sustainable development. *Sustainability Science*. 2:5-11. DOI: 10.1007/s11625-007-0024y.

Davey, C.A., K.T. Redmond, and D.B. Simeral. 2006. *Weather and climate inventory – National Park Service – Greater Yellowstone Network*. Natural Resource Technical Report NPS/GRYN/NRTR – 2006/001. WRCC Report 06-02.

Davis, R.C. 1983. *Encyclopedia of American Forest and Conservation History*. New York: Macmillian.

Dayton, K. 2008a. Hospital board moves ahead with lease talks. *Jackson Hole News and Guide*. February 01.

———. 2008b. Hospital nonprofit pushes 45-year lease. *Jackson Hole News and Guide*. February 08.

DeFries, R. and L. Bounous. 2004. Consequences of land use change for ecosystem services: A future unlike the past. *GeoJournal*. 61: 345-351.

DeFries, R., A. Hansen, B.L. Turner, R. Reid, and J. Liu. 2007. Land use change around protected areas: Management to balance human needs and ecological function. *Ecological Applications*. 17(4): 1031-1038.

Deller, S.C., T.H. Tsai, D.W. Marcouiller, and D.B.K. English. 2001. The role of amenities and quality of life in rural economic growth. *American Journal of Agriculture Economics.* 83(2): 352-365.

Denzin, N.K. 1978. *The research act: A theoretical introduction to sociological methods*. New York.: Praeger.

Despain, D.G. 1990. *Yellowstone vegetation: Consequences of environment and history in a natural setting*. Boulder, CO: Roberts Rinehart.

Dewell, T. Tax collections grow locally, explode in state. *Jackson Hole News and Guide*. November 26.

Dillman, D.A. 2000. *Mail and internet surveys: The tailored design method*. Hoboken, NJ: John Wiley & Sons.

Dittmann, D. Mental health services now available in West Yellowstone. *West Yellowstone News*. March 08.

Dovring, K. 1954. Quantitative semantics in 18th century Sweden. *Public Opinion Quarterly*. 18(4): 389-394.

Draffan, G. 2012. Chronology of the Northern Pacific & related land grant railroads. Last accessed 24-Jan-2012. [www.landgrant.org/history].

Duffield, J., C. Neher, and D. Patterson. 2006. *Wolves and people In Yellowstone: Impacts on the regional economy*. Mammoth Hot Spring, Wyoming: Yellowstone Park Foundation.

Dustin, D.L. and I. E. Schneider. 2005. The science of politics/the politics of science: Examining the snowmobile controversy in Yellowstone National Park. *Environmental Management*. 34(6): 761-767. DOI: 10.1007/s00267-004-0082-1.

Dyer, M.I. and M.M. Holland. 1988. UNESCO's Man and the Biosphere Program. *BioScience*. 38(9): 635-641.

Earl, J., A. Martin, J.D. McCarthy, and S.A. Soule. 2004. The use of newspaper data in the study of collective action. *Annual Review of Sociology*. 30:65-80. DOI: 10.1146/annurev.soc.30.012703.110603.

Ecosystem Restoration. 2011. Mineland restoration. Ecosystem restoration. Montana State University. Last accessed on August 20, 2011. [www.ecorestoration.montana.edu].

Edgerton, D. 2006. Plowing the park. *West Yellowstone News*. May 05.

Elliot, E. 2009. City council. *Carbon County News*. October 22.

Eiswerth, M.W., T.D. Darden, W.S. Johnson, J. Agapoff, and T.R. Harris. 2005. Input-output modeling: Outdoor recreation, and the economic importance of weeds. *Weed Science.* 53: 130-137.

English, P.D. 1968. Landscape, ecosystem, and environmental perception: Concepts in cultural geography. *Journal of Geography*. 67(4): 198-205.

Engstedt-Simpson, E. 2008. Burning forests contribute to global warming. *West Yellowstone News*. July 25.

Enrlich, P.R. and A.H. Enrlich. 2009. The population bomb revisited. *The Electronic Journal of Sustainable Development*. 1(3): 63-71.

EPA. 2011. U.S. environmental protection agency. National pollutant discharge elimination systems – clean water act. Last accessed on July 25, 2011. [http://cfpub.epa.gov/npdes].

Erickson, J.D. 2000. Endangering the economics of extinction. *Wildlife Society Bulletin*. 28(1): 34-41.

Evans, N., C. Morris, and M. Winter. 2002. Conceptualizing agriculture: A critique of post-productivism as the new orthodoxy. *Progress in Human Geography*. 26(3): 313-332.

Farber, S.C., R. Costanza, and M.A. Wilson. 2002. Economic and ecological concepts for valuing ecosystem services. *Ecological Economics.* 41: 375-392.

Fiksel, J. 2006. Sustainability and resilience: Towards a systems approach. *Sustainability: Science, Practice & Policy*. 2(2): 14-21.

Flandro, C. 2011a. Controversial plan to manage bison leaving Yellowstone was born as a solution to conflict more than a decade ago – but is it still the answer? *Bozeman Daily Chronicle*. February 20.

———. 2011b. Agreement to let bison roam Gardiner basin finalized. *Bozeman Daily Chronicle*. April 15.

———. 2011c. Montana wolf hunt, season two. *Bozeman Daily Chronicle*. July 10.

Flynn, K. 2008. Dear Pat Flowers and the committee for Montana Fish, Wildlife and Parks revised bison hunt environmental assessment. *West Yellowstone News*. March 14.

Folke, C. 2006. Resilience: The emergence of a perspective for social-ecological systems analyses. *Global Environmental Change* 16:253-267. DOI: 10.1016/j.gloenvcha.2006.04.002.

Foster, J.B., 2005. The Vulnerable Planet In *Environmental Sociology: From Analysis to Action,* ed. L. King and D. McCarthy, 25-37. Lanham, Maryland: Rowman & Littlefield Publishers.

Franklin, J.F. 1977. The Biosphere Reserve Program in the United States. *Science* 195(4275): 262-267. *DOI:* 10.1126/science.195.4275.262.

Franklin County. 2011. Franklin County facts. Franklin County Idaho. Last accessed on July 9. [http://franklincountyidaho.gov].

Freelon, D.G. 2010. ReCal: Intercoder reliability calculation as a web service. *International Journal of Internet Science*. 5(1): 20-33.

Freemuth, J. and R.M. Cawley. 1998. Science, expertise and the public: the politics of ecosystem management in the Greater Yellowstone Ecosystem. *Landscape and Urban Planning*. 40: 211-219.

Fremont County. 2011. General County Information: County History. Last accessed on July 9, 2011. [http://www.co.fremont.id.us/misc/index].

French, B. 2010. Forest, Red Lodge Resort study land deal. *Billings Gazette*. January 8.

Friend, D.A. 2003. Mountain geography In *Geography in America at the dawn of the 21st century*, ed. G.L. Gaile and C.J. Willmott, 72-80. United Kingdom: Oxford University Press.

Friends of the Beartooth All-American Road. 2011. The Beartooth Highway & Gateway Communities. Last accessed on 21-November-2011. [www.beartoothhighway.com].

Friese, S. 2004. User's Manual for ATLAS.ti 5.0. 2nd Edition. Berlin.

Froedge, C. 2006a. St. John's critical to outlying communities. *Jackson Hole News and Guide*. April 19.

———. 2006b. County to hear latest SRA plans tomorrow. *Jackson Hole News and Guide.* June 19.

———. 2006c. SRA seeks easement approval from county. *Jackson Hole News and Guide*. October 2.

———. 2006d. Affordable housing deadline draws near. *Jackson Hole News and Guide*. November 27.

———. 2007a. Reinert assembles experienced Teton Meadows Team. *Jackson Hole News and Guide.* September 05.

———. 2007b. Developer cut KOA plan. *Jackson Hole News and Guide*. September 24.

———. 2008a. County surveys seeks development opinions. *Jackson Hole News and Guide*. March 04.

———. 2008b. Leaders eye subdivision time-out. *Jackson Hole News and Guide*. March 26.

———. 2008c. A fight of rare intensity. *Jackson Hole News and Guide.* April 29.

———. 2008d. Housing fuels county race. *Jackson Hole News and Guide.* June 04.

———. 2008e. Moratorium challenged. *Jackson Hole News and Guide*. June 12.

———. 2008f. Learn about SPET proposals at forum. *Jackson Hole News and Guide*. July 21.

———. 2008g. Elderly homeowner feels pinch of property taxes. *Jackson Hole News and Guide*. October 01.

———. 2009a. County needs $45m to hit housing mark. *Jackson Hole News and Guide*. April 29.

———. 2009b. Board details plan problems. *Jackson Hole News and Guide*. July 01.

———. 2009c. Judge tosses out suit against moratorium. *Jackson Hole News and Guide*. August 19.

Funnell, D.C., and M.F. Price. 2003. Mountain geography: A review. *The Geographical Journal* 169(3): 183-190.

Furu, B. 2001a. Foundation grants $8.2 million. *West Yellowstone News.* August 30.

———. 2001b. Three dollar bridge project a worthy cause for conservation. *West Yellowstone News*. August 17.

———. 2001c. Three Dollar Bridge property rights secured by conservation groups' funds. *West Yellowstone News.* September 05.

Fussell, J.B. 2001. Back to square one on the snowmobile ban. *West Yellowstone News*. April 6.

Garcia, J. 2010. Personal Communication, Email. Editor. *Carbon County News*. March 1, 2010.

Garrott, R.A., J.A. Gude, E.J. Bergman, C. Gower, P.J. White, and K.L. Hamlin. 2005. Generalizing wolf effects across the Greater Yellowstone Area: A cautionary note. *Wildlife Society Bulletin*. 33(4): 1245-1255.

Gaurino, D. 2000. *Living in pleasant valleys: Life in Carbon County, Montana*. Roberts, Montana: Clear Creek Publishing.

Geist, H.J. and E.F. Lambin. 2002. Proximate causes and underlying driving forces of tropical deforestation. *BioScience*. 52(2): 143-150.

Glaser, B.G. and A.L. Strauss. 2009. *The discovery of grounded theory: Strategies for qualitative research*. 4th Edition. Aldine Transaction.

Glick, D. 1995. Greater Yellowstone tomorrow: Charting a course for a greater Yellowstone forever. In *Conservation of biodiversity and the new regional planning*, ed. R.E. Saunier and R.A. Meganck, . Organization of American States and the IUCN – The World Conservation Union. Last access on 18-January-2012 [http://www.oas.org/usde/publications/Unit/oea04e/oea04e.pdf].

Glick, D. and C. Freese. 2004. Yellowstone: A 130-year experiment in integrated conservation and development. In *Getting biodiversity projects to work*, ed. T.O. McShane and M.P. Wells, 124-153. New York: Columbia University Press.

Goldstein, B. 1992. The struggle over ecosystem management at Yellowstone. *BioScience* 42(3): 183-187.

Golley, F.B. 1991. The ecosystem concept: A search for order. *Ecological Research*. 6: 129-138.

———. 1996. *A history of the ecosystem concept in ecology: More than the sum of the parts.* Cambridge, MA: Yale University Press.

Gosnell, H., J.H. Haggerty, and W.R. Travis. 2006. Ranchland ownership change in the Greater Yellowstone Ecosystem, 1990-2001: implications for conservation. *Society and Natural Resources* 19: 743-758.

Gosnell, H., and W.R. Travis. 2005. Ranchland ownership change in the Greater Yellowstone Ecosystem, 1990-2001: Implications for conservation. *Society and Natural Resources*. 19 (8): 743-758.

Graff, J. 2005. *Economic development in environmental economies of the northern Greater Yellowstone region*. National Parks Conservation Association. Dec. 16.

Grau, K, and M. Bruns-Dubois. 2008. *The economic review of the travel industry in Montana.* The Institute of Tourism and Recreation Research. Missoula, Montana: The University of Montana.

Gray, P.N. 1934. The Grand Teton, Wyoming. *The Geographical Journal*. 83(3): 218-222.

Greene, J. and Godwin, R. 2008. *Open letter to town*. *West Yellowstone News*. August 22.

Grossman, L. 1977. Man-environment relationships in anthropology and geography. *Annals of the Association of American Geographers*. 67(1): 126-144.

Grovenstein, S. 2000. CCRC member discusses sewer project. *Carbon County News*. March 15.

Guarino, D. 2000. *Living in pleasant valleys: Life in Carbon County, Montana*. Roberts, Montana: Clear Creek Publishing.

Gude, P.H., A. J. Hansen, and D.A. Jones. 2007. Biodiversity consequences of alternative future land use scenarios in Greater Yellowstone. *Ecological Applications.* 17(4): 1004-1018.

Gude, P. H., A. J. Hansen, R. Rasker, and B. Maxwell. 2005. Rates and drivers of rural residential development in the Greater Yellowstone. *Landscape and Urban Planning*. 77 (1): 131-151.

Guest, G., A. Bunce, and L. Johnson. 2006. How many interviews are enough? : An experiment with data saturation and variability. *Field Methods*. 18: 59-82. DOI: 10.1177/1525822X05279903.

Gunson. 2008. Planning and implementing a reintroduction of wolves to Yellowstone National park and Central Idaho. *Restoration Ecology*. 5(1): 7-27. DOI: 10.1046/j.1526-100X.1997.09702.x

Gustavo, S. and O. Manor. 1998. Social ties, environmental perception, and local attachment. *Environment and Behavior*. 30(4): 504-519. DOI: 10.1177/001391659803000405.

Gutkoski, J. 2007. Regionalizing brucellosis can be a win/win solution. *West Yellowstone News.* December 14.

Guys, S.M., and D.L. Rogers. 1999. Community surveys measuring citizen's attitudes towards sustainability. *Extension Journa*l 37(3): 1-9.

GYC. 1994. *Sustaining Greater Yellowstone: A blueprint for the future*. Bozeman, Montana: Greater Yellowstone Coalition.

GYC. 2011. Idaho: Phosphate mining – poisoning lands, waters, wildlife. Greater Yellowstone Coalition. Last accessed on August 20, 2011 [www.greateryellowstone.org/issues/lands].

GYCC. 1990. Vision for the future: A framework for coordination in the Greater Yellowstone Area. *Greater Yellowstone Coordinating Committee*. Billings, MT.

GYCC. 2006. *Recreation in the Greater Yellowstone Area: An interagency report*. Greater Yellowstone Coordinating Committee.

GYCD. 2011. *Greater Yellowstone conservation directory*. Last accessed on July 6, 2011. [http://www.gycd.org].

GYSLC. 2011. *Greater Yellowstone science learning center – physical resources: water*. Last Accessed July 25, 2011. [http://www.greateryellowstonescience.org/topics/physical].

Haarh, M. 2006. True random number service. Last accessed on February 25, 2011. [http://www.random.org].

Haberl, H., V. Winiwarter, K. Andersson, R.U. Ayres, C. Boone, A. Castillo, G. Cunfer, M. Fischer-Kowalski, W.R. Freudenburg, E. Furman, R. Kaufmann, F. Krausmann, E. Langthaler, H. Lotze-Campen, M. Mirtl, C.L. Redman, A. Reeberg, A. Wardell, B. Warr, and H. Zechmeister. 2006. From LTER to LTSER: Conceptualizing the socioeconomic dimension of long-term socioecological research. *Ecology and Society.* 11(2): 13.

Haig, B.D. 2006. *Grounded theory as a scientific method*. Last accessed on February 28, 2011. [www.edu.uc.edu].

Haines, A.L. 1996. *The Yellowstone story: A history of our first national park.* Boulder, Colorado: University Press of Colorado.

Hall, C.M, and S.J. Page. 2002. *The geography of tourism and recreation: Environment, place and space*. New York: Routledge.

Halpenny, E. 2006. Examining the relationship of place attachment with pro-environmental intentions. *Proceedings of the 2006 Northeastern Recreation Research Symposium*. GTR-NRS-P-14. pp. 63-66.

Hancock, V. 2004. Time for positive spin to snowmobile ruling. Letter to the Editor. *West Yellowstone News*. January 2.

Hansen, A. and R. DeFries. 2007. Land use change around nature reserves: implications for sustaining biodiversity. Invited feature for Ecological Applications.

Hansen, A., A. Gallant, J. Rotella, and D. Brown. 1998. Natural and human drivers of biodiversity in the Greater Yellowstone Ecosystem. In *Perspectives on the Land-Use History of North America: A Context for Understanding our Changing Environment*. T.D. Sisk, ed. U.S. Geological Survey. Biological Science Report USGS/BRD/BSR 1998-003.

Hansen, A.J., R. Rasker, B. Maxwell, J. J. Rotella, J.D. Johnson, A. W. Parmenter, W. B. Cohen, R. L. Lawrence, and M. P. V. Kraska. 2002. Ecological causes and consequences of demographic change in the New West. *BioScience*. 52(2): 152-162.

Hansen, A.J., R.L. Knight, J.M. Marzluff, S. Powell, K. Brown, P.H. Gude, and K. Jones. 2005. Effects of exurban development on biodiversity: Patterns, mechanisms, and research needs. *Ecological Applications*. 15(6): 1893-1905.

Hansen, K., W.Wyckoff, and J. Banfield. 1995. Shifting forests: Historical grazing and forest invasion in southwestern Montana. *Forest & Conservation History*. 39(2): 66-76.

Hansmann, R. 2010. "Sustainability learning": An introduction to the concept and its motivational aspects. *Sustainability*. 2: 2873-2897. Doi:10.3390/su2092873.

Harbour, J. 1980. *Summary of the Overthrust Belt in parts of Wyoming, Utah, and Idaho*. Geological Survey. Technical Report 80-9. Moscow, Idaho: Geological Survey.

Hardin, G. 1968. The tragedy of the commons. *Science* 162(3859): 1243-1248. *DOI:* 10.1126/science.162.3859.1243.

Hardoy, J.E., D. Mitlin, and D. Satterthwaite. 1992. *Environmental problems in third world cities*. London: Earthscan Publications.

Harrington, L.M.B. 2011. *Rural sustainability and theoretical concepts*. Paper Presentation at the 7th Quadrennial Conference of British, Canadian, and American Rural Geographers. 13-20 July 2011. Manitoba, Canada.

Harrington, L.M.B. 2005. Vulnerability and sustainability concerns for the US High Plains. In *Rural change and sustainability: Agriculture, the environment and communitie*s. eds. A. Gilg, R. Yarwood, S. Essex, J. Smithers, and R. Wilson. 169-184. Cambridge, MA: CABI.

Harting, B. and D. Glick. 1994. *Sustaining Greater Yellowstone: A blueprint for the future*. Bozeman, Montana: Greater Yellowstone Coalition.

Hatala, J. A., R. L. Crabtree, K. Q. Halligan, and P. R. Moorcroft. 2010. Landscape-scale patterns of forest pest and pathogen damage in the Greater Yellowstone

Ecosystem. *Remote Sensing of Environment* 114(2): 375-384. DOI: 10.1016/j.rse.2009.09.008.

Hatch, C. 2006a. Greens meet on new Bridger-Teton drilling. *Jackson Hole News and Guide*. June 05.

———. 2006b. Grouse protections 'good for industry'. *Jackson Hole News and Guide*. July 24.

———. 2006c. Idaho possess seek elk. *Jackson Hole News and Guide*. September 09.

———. 2006d. Sportsmen plan to give hay to "starving" elk. *Jackson Hole News and Guide*. November 30.

———. 2006e. Feds propose wolf deal. *Jackson Hole News and Guide*. December 15.

———. 2007a. Sportsmen take on rigs. *Jackson Hole News and Guide*. January 26.

———. 2007b. Feds to delist wolves. *Jackson Hole News and Guide*. January 30.

———. 2007c. Refuge plan slashes herd. *Jackson Hole News and Guide.* February 07.

———. 2007d. EPA cites developer. *Jackson Hole News and Guide*. March 31.

———. 2007e. Scientists oppose delisting. *Jackson Hole News and Guide*. May 14.

———. 2007f. Once-in-a-lifetime hunt. *Jackson Hole News and Guide*. September 19.

———. 2007g. Plan keeps feed areas. *Jackson Hole News and Guide*. June 11.

———. 2008a. Federal officials: 'wolves are back.' *Jackson Hole News and Guide*. February 22.

———. 2008b. Can valley elk live without winter feed? *Jackson Hole News and Guide*. June 11.

———. 2008c. Elk feed areas get 20 years. *Jackson Hole News and Guide*. July 16.

———. 2009a. River, range bill on table. *Jackson Hole News and Guide.* January 08.

———. 2009b. State hasn't fed elk at Gros Ventre feedlots. *Jackson Hole News and Guide.* March 11.

———. 2009c. River, range bill passes. *Jackson Hole News and Guide*. March 26.

Heberlein, T. *Environmental attitudes*. Madison, Wisconsin: University of Wisconsin. Unpublished Manuscript.

Hedges, J. 2008. Bridger to buzz with new wood processing business. *Carbon County News*. July 12.

Hendry, R.L. 2002. The cattle industry of the Greater Yellowstone Area In *Brucellosis in elk and bison in the Greater Yellowstone Area*, ed. T.J. Kreeger, 146-152. Cheyenne, Wyoming: Wyoming Game and Fish Department.

Hens, L. and B. Nath. 2003. The Johannesburg Conference. *Environment, Development and Sustainability*. 5: 7-39.

Herzberg, R. 2009. Citizens groups continuing to work on noise and other issues. *Carbon County News*. July 16.

Hessl, A. 2002. Aspen, elk, and fire: The effects of human institutions on ecosystem processes. *BioScience.* 52(11): 1011-1022.

Heyes, T. 2003. What is success? *West Yellowstone News*. May 19.

Hoffmann, C. 2008b. The 'no child left inside' project. *West Yellowstone News*. April 24.

———. 2007a. Seeing eye-to-eye on bison? *West Yellowstone News*. March 26.

———. 2007b. Bison vs. Montana. *West Yellowstone News*. February 2.

———. 2007c. YNP holds town meeting in west. *West Yellowstone News*. May 25.

———. 2008. Buffalo roam heads into second year. *West Yellowstone News.* June 13.

———. 2009. Grand finale. *West Yellowstone News.* September 5.

Holloran, M.J. , R.C. Kaiser, and W.A. Hubert. 2010. Yearling greater sage-grouse response to energy development in Wyoming. *The Journal of Wildlife Management*. 74(1): 65-72. DOI: 10.2193/2008-291.

Holstein, J. A. 2003. Inside interviewing: New lenses, new concerns, ed. J.F. Gubrium, 3-32. Thousand Oaks, California: SAGE Publications Inc.

Holton, J. 2007. The coding process and its challenges In T*he sage handbook of grounded theory*, ed. A. Bryantz and K. Charmaz, 237-261. London: SAGE Publications Ltd.

Howe, J., E. McMahon, and L. Propst. 1997. *Balancing nature and commerce in gateway communities*. Washington, DC: Island Press.

HSCNRPC, 2005. *Hot Spring County natural resources plan for state and federal lands: an addendum to the revised Hot Springs County land use plan of 2002.* Hot Springs County Natural Resource Planning Commission.

Hsieh, H.F. and S.E. Shannon. 2005. Three approaches to qualitative content analysis. *Qualitative Health Research.* 15(9): 1277-1288. DOI: 10.1177/1049732305276687

Huelsmann, K. 2009a. State awards $1.8m for efficiency projects. *Jackson Hole News and Guide*. December 07.

———. 2009b. Plan before commission. *Jackson Hole News and Guide*. June 11.

———. 2009c. New road map to help leaders to cut energy use. *Jackson Hole News and Guide*. July 27.

———. 2009d. Grant will help health clinic meet demand. *Jackson Hole News and Guide.* September 07.

———. 2009e. Jackson seeks $5m grant for energy project. *Jackson Hole News and Guide*. November, 24.

Huerta, M.A., C. Whitlock, and J. Yale. 2008. Holocene vegetation-fire-climate linkages in northern Yellowstone National Park, USA. *Palaeogeography, Palaeoclimatology, Palaeoecology*. 271: 170-181. doi:10.1016/j.palaeo.2008.10.015.

Huntington, R. 2006. Clash drives refuge feeding. *Jackson Hole News and Guide*. January 18.

Husby, T. 2009. Forest supervisor confused. *West Yellowstone News*. January, 23.

Ibery, B., Bowler, I. 1998. From agricultural productivism to post-productivism In *The geography of rural change*. ed. Ibery, B. Longman. United Kingdom: Harlow.

IBMP. 2009. Annual Report, Interagency Bison Management Plan. *IBMP Technical Committee.*

IDL. 2011. County work force trends. State of Idaho Department of Labor.

IDFG. 2011. Idaho Department of Fish and Game. Mission Statement. Last accessed on July 6, 2011. [http://fishandgame.idaho.gov].

IUCN. 1980. *World Conservation Strategy: Living resource conservation for sustainable development*. Union for Conservation of Nature and Natural Resources.

———. 1991. *Caring for the earth: A strategy for sustainable living*. Gland, Switzerland. International Union for Conservation of Nature and Natural Resources.

Ives, J.D., and B. Messerli. 1990. Progress in theoretical and applied mountain research, 1973-1989, and major future needs. *Mountain Research and Development* 10(2): 101-127.

Ives, J.D., B. Messerli, and E. Spiess. 1997. Mountains of the world: A global priority. In *Mountains of the World: A Global Priority*, ed. B. Messerli and J.D. Ives, 1-17. London: The Parthenon Publishing Group.

Ives, J.D., B. Messerli, and R.E. Rhoades. 1997. Agenda for sustainable mountain development. In *Mountains of the World: A Global Priority*, ed. B. Messerli and J.D. Ives, 455-466. London: The Parthenon Publishing Group.

Jackson Hole Chamber of Commerce. 2011. Jackson Hole economic dashboard. Last accessed on June 16, 2011. [www.jacksonholechamber.com].

James. P.E. 1936. Regional planning in the Jackson Hole country. *Geographical Review* 26(3): 439-453.

Janes, R.W. 1958. A technique for describing community structure through newspaper analysis. *Social Forces* 37(2): 102-109.

JCP. 2011. City of Jackson, Wyoming development regulations and comprehensive plan. Last accessed on 12-October-2011 [www.ci.jackson.wy.us].

JHNG. 2007. Feds approve Wyo. Wolf plan. *Jackson Hole News and Guide*. December 15.

JHNG. 2009. Wolf delisting faces new court challenge. *Jackson Hole News and Guide*. June 11.

Jick, T.D. 1979. Mixing qualitative and quantitative methods: Triangulation in action. *Administrative Science Quarterly*. 24: 602-611.

Jobes. P. 1991. The Greater Yellowstone social system. *Conservation Biology* 5(3): 387-394.

Johnson, J. 2011. *Past present and future tourism development and impacts in the Greater Yellowstone Region, USA*. Unpublished Manuscript.

Johnson, J.D. 2004. Impacts of tourism-related in-migration: The Greater Yellowstone Region. In *Environmental impacts of ecotourism*. ed. Buckley, R, 25-40. United Kingdom: CABI Publishing.

Johnson, J., B. Maxwell, and R. Aspinall. 2003. Moving nearer to heaven: Growth and change in the Greater Yellowstone Region, USA. In *Nature-based tourism, environment, and land management*, ed. R. Buckley, C. Pickering, and D.B. Weaver, 77-88. United Kingdom: CABI Publishing.

Johnson, R.L. and E. Moore. 1993. Tourism impacts estimation. *Annals of Tourism Research*. 20: 279-288.

Johnson, R.B., A.J. Onwuegbuzie, and L. A. Turner. 2007. Toward a definition of mixed methods research. *Journal of Mixed Methods Research*. 1: 112-133. DOI: 10.1177/1558689806298224.

Johnson, V. K. 2001. Trends in rural residential development in the Greater Yellowstone Ecosystem since the listing of the grizzly bear, 1975-1998. *Yellowstone Science.* Spring 2001.

Jones, D.A., A.J. Hansen, K. Bly, K. Doherty, J. P. Verschuyl, J. I. Paugh, R. Carle, and S. J. Story. 2009. Monitoring land use and cover around parks: A conceptual approach. *Remote Sensing of the Environment*. 113: 1346-1356. DOI: 10.1016/j.rse.2009.08.018.

Jorgensen, B.S. and R.C. Stedman. 2001. Sense of place as an attitude: lakeshore owners attitudes toward their properties. *Journal of Environmental Psychology*. 21:233-248. DOI: 10.1006/jevp.2001.0226.

Kates, R.W. 2000. *Sustainability science*. World Academies Conference Transition to Sustainability in 21st century. Tokyo, Japan 5/18/2000.

———. 2010. Readings in sustainability science and technology. *Center for International Development at Harvard University*. CID Working Paper No. 213.

Kates, R.W. and T.M. Parris. 2003. Long-term trends and a sustainability transition. *PNAS.* 100 (14): 8062-8067. Doi_10.1073_pnas.1231331100.

Kates, R.W., T.M. Parris, and A.A. Leiserowitz. 2005. What is sustainable development? Goals, indicators, values, and practice. *Environment*. 47(3): 9-21.

Kates, R.W. and R.D. Torrie. 1998. Global change in local places. *Environment.* 40(2): 5

Kates, R.W., B.L. Turner III, and W. C. Clark. 1990. The great transformation. In *The Earth as transformed by human action*, ed. B.L. Turner, W.C. Clark, R.W. Kates, J.F. Richards, J.T. Matthews, and W.B. Meyer, 1-17. Cambridge: Cambridge University Press.

Kajikawa, Y. 2008. Research core and framework of sustainability science. *Sustainability Scien*ce 3: 215-239.

Keiter, R.B. 1993. Greater Yellowstone: managing a charismatic ecosystem. *Proceedings of the Symposium – Conflicts in Natural Resources Management*. April 21-23, 1993. Logan, Utah.

Kemmick, E. 2008. Bike rally concerns red lodge mayor. *Billings Gazette*. April 11.

Kemp, R., and P. Martens. 2007. Sustainable development: How to manage something that is subjective and never can be achieved? *Sustainability: Science, Practice & Policy* 3(2): 5-12.

Kiasatpour, S. and C. Whitfield. 2008. Politics in action: Wolves, snowmobiles, and bison and the Greater Yellowstone Ecosystem. *Political Science and Politics* 41: 193-206. DOI: 10.1017/S104909650808030X.

King, L., and D. McCarthy. 2005. Environmental Problems Require Social Solutions In *Environmental Sociology: From Analysis to Action*. ed. L. King and D. McCarty, 1-24. Maryland: Rowman & Littlefield Publishers, Inc.

Kilpatrick, A.M., C.M. Gillin, and P. Daszak. 2009. Wildlife-livestock conflict: The risk of pathogen transmission from bison to cattle outside Yellowstone National Park. *Journal of Applied Ecology* 46: 476-485. DOI: 10.111/j.1365-2664.2008.01602.x.

Kirk, N. 2007. Water woes. *Carbon County News.* October 11.

Kirk, W. 1952. Historical geography and the concept of the behavioral environment. *Indian Geographical Journal*. Silver Jubilee Edition, ed. G. Kuriyan, pp. 52-160. Madras: Indian Geographical Society.

Kleopffer, W. 2008. Life cycle sustainability assessment of products. *The International Journal of Life Cycle Assessment* 13(2): 89-95. DOI: 10.1065/lca2008.02.376.

Knight, D. H. 1994. *Mountains and plains: the ecology of Wyoming landscapes.* New Haven, Connecticut: Yale University Press.

Koel, T.M., P.E. Bigelow, P.D. Doepke, B.D. Ertel, and D.L. Mahony. 2006. Conserving Yellowstone cutthroat trout for the future of the GYE. *Yellowstone Science* 14(2): 20-28.

Kolbe, R.H. and M.S. Burnett. 1991. Content-analysis research: An examination of applications with directives for improving research reliability and objectivity. *Journal of Consumer Research* 18: 243-250.

Koontz, L. and J.B. Loomis. 2005. *Economic importance of elk hunting in Jackson Hole, Wyoming*. US. Geological Survey. Report 2005-1183.

Krannich, R.S., and A.E. Luloff. 1991. Problems of resource dependency in US rural communities. In *Progress in rural policy and planning,* ed. A.W. Gilg, 5-18. London: Belhaven Press.

Kreatz, D. and G. Shanks. 2009. Affordable housing. *Carbon County News*. October 22.

Krester, H.E., J.A. Hilty, M.J. Glennon, J.F. Burrell, Z.P. Smith, and B.A. Knuth. 2009. Challenges of governance and land management on the exurban/wilderness frontier in the USA. In *Research in rural sociology and development*. Ed. T. Marsden. 277-304. United Kingdom: Emerald Group Publishing Limited.

Krippendorff, K. 1980. *Content Analysis*. Beverly Hills, CA: Sage.

———. 2004. *Content analysis: An introduction to its methodology.* Thousand Oaks, CA: Sage.

Krippendorff, K. 1980. *Content analysis*. Beverly Hills, CA: Sage.

Kuck, L.G. L. Hompland, and E.H. Merrill. 1985. Elk calf response to simulated mine disturbance in southeast Idaho. *The Journal of Wildlife Management* 49(3): 751-757.

Kuhlman, T. and J. Farrington. 2010. What is sustainability? *Sustainability* 2: 3436-3448. DOI: 10.3390/su2113436.

Kuzel, A. 1992. Sampling in qualitative inquiry. In *Doing qualitative research*, ed. B. Crabtree and W. Miller, 31-44. Newbury Park, CA: SAGE.

Lackett, J. M., and N.T. Hobbs. 2008. Land use, fragmentation, and impacts of wildlife in Jackson Valley, Wyoming, USA. In *Fragmentation in semi-arid and arid landscapes: Consequences for human and natural systems*, ed. K.A. Galvin et al., 135-150. Netherlands: Springer.

Lambin, E.F., B.L. Turner, H.J. Geist, S.B. Agbola, A. Angelsen, J.W. Bruce, O.T. Coomes, R. Dirzo, G. Fischer, C. Folke, P.S. George, K. Homewood, J. Imbernon, R. Leemans, X. Li, E.F. Moran, M. Mortimore, P.S. Ramakrishnan, J. F. Richards, H. Skanes, W. Steffen, G.D. Stone, U. Svedin, T.A. Veldkamp, C. Vogel, and J. Xu. 2001. The causes of land-use and land-cover change: Moving beyond the myths. *Global Environmental Change* 11: 261-269.

Lampi, L. 1961. Red lodge: From a frenetic past of crows, coal and boom and bust emerges a unique festival of diverse nationality groups. *Montana: The Magazine of Western History* 11(3): 20-31.

Lapping, M.B., T.L. Daniels, and J.W. Keller. 1989. An overview of rural America In *Rural planning and development in the United States*, ed. M.B. Lapping, T.L. Daniels, and J.W. Keller, 1-21. New York: Guildford Press.

Lapping, M.A. 1997. Tradition of rural sustainability: The Amish portrayed In R*ural sustainable development in America*. ed. I. Audirac, 29-40. New York: John Wiley & Sons, Inc.

Laska, S.B. 1993. Environmental Sociology and the State of the Discipline. *Social Forces*. 72(1): 1-17.

Leal, D. 1990. Saving an Ecosystem: From Buffer Zone to Private Initiatives In *The Yellowstone Primer: Land and Resource Management in the Greater Yellowstone Ecosystem*, ed. J.A. Baden and D. Leal. Pacific Research Institute for Public Policy. San Francisco, California.

LeCompte, M.D., S.L. Schensul, and J.J. Schensul. 1999. *Essential ethnographic methods: Observations, interviews and questionnaires*. Walnut Creek, CA: AltaMira Press.

Leiserowitz, A.A., R.W. Kates, and T.M. Parris. 2006. Sustainability values, attitudes, and behaviors: A review of multinational and global trends. *Annual Review of Environmental Resources* 31:413-444.
DOI: 10.1446/annurev.energy.31.102505.133552.

Lemly, A.D. 1999. Selenium impacts of fish: An insidious time bomb. *Human and Ecological Risk Assessment*. 5(6): 1139-1151.

Leu, M., S.E. Hanser, and S.T. Knick. 2008. The human footprint in the west: A large-scale analysis of anthropocentric impacts. *Ecological Applications*. 18(5): 1119-1139.

Leusch, P. 2001. New bison plan is just more bureaucratic business as usual. *West Yellowstone News*. Jan 18.

Lewis, D.S. 2008. Yellowstone's Sheep Eater Indians: Living Among Powerful Spirits. The Montana Pioneer. Livingston, Montana. Last accessed on 18-January-2012. [www.mtpioneer.com].

Limburg, K.E., R.V. O'Neill, R. Costanza. 2002. Complex systems and valuation. *Ecological Economics*. 41:409-420.

Liu, J., T. Dietz, S.R. Carpenter, M. Alberti, C. Folke, E. Moran, A. N. Pell, P. Deadman, T. Kratz, J. Lubchenco, E. Ostrom, Z. Ouyang, W. Provencher, C.L. Redman, S.

H. Schneider, and W. W. Taylor. 2007a. Complexity of coupled human and natural systems. *Science* 317: 1513-1516.

Liu, J., T. Dietz, S.R. Carpenter, C. Folke, M. Alberti, C.L. Redman, S.H. Schneider, E. Ostrom, A.N. Pell, J. Lubchenco, W.W. Taylor, Z. Ouyang, P. Deadman, T. Kratz, and W. Provencher. 2007b. Coupled human and natural systems. *Ambio*. 36(8): 639-650.

Logan, J.A., J. Regniere, and J.A. Powell. 2003. Assessing the impacts of global warming on forest pest dynamics. *Frontiers in Ecology and the Environment*. 1(3): 130-137.

Logan, J.A., W.W. MacFarlane, and L. Willcox. 2010. Whitebark pine vulnerability to climate-driven mountain pine beetle disturbance in the Greater Yellowstone Ecosystem. *Ecological Applications*. 20(4): 895-902.

Lombard, M., J. Snyder-Duch, and C. C. Bracken. 2010. Practical resources for assessing and reporting intercoder reliability in content analysis research projects. Last accessed on September 22, 2011. [http://astro.temple.edu/~lombard/reliability/].

Lombard, M., J. Snyder-Duch, and C.C. Bracken. 2002. Content analysis in mass communication: Assessment and reporting of intercoder reliability. *Human Communication Research*. 28(4): 587-604.

Loorbach, D. and J. Rotmans. 2006. Managing Transitions for Sustainable Development. *Environment & Policy*. 44:187-206.

Lorah, P. and R. Southwick. 2003. Environmental protection, population change, and economic development in the rural western United States. *Population and Environment*. 24(3): 255-272.

Lynch, H.J., S. Hodge, C. Albert, and M. Dunham. 2008. The Greater Yellowstone Ecosystem: Challenges for regional ecosystem management. *Environmental Management* 41: 820-833.

Lyon, A.G. and S.H. Anderson. 2003. Potential gas development impacts on sage grouse nest initiation and movement. *Wildlife Society Bulletin*. 31(2): 486-491.

Macnaghten, P., R. Grove-White, M. Jacobs, and B. Wynne. 1995. *Public perceptions and sustainability in Lancashire: Indicators, institutions, and participation.* Centre for the Study of Environmental Change. United Kingdom: Lancaster University.

Macnaghten, P., and M. Jacobs. 1997. Public identification with sustainable development: Investigating cultural barriers to participation. *Global Environmental Change*. 7(10): 5-24. DOI: 10.1016/s0959-3780(96)00023-4.

Madison County. 2011. Idaho community profiles: Madison County. Last accessed on July 9, 2011. [http://www.co.madison.id.us/pdf/about.pdf].

Marshall, M.N. 1996. The key informant technique. *Family Practice.* 13(1): 92-97.

———. 1996b. Sampling for qualitative research. *Family Practice*. 13(6): 522-525.

Marshall, N.A., D.M. Fenton, P.A. Marshall, and S.G. Sutton. 2007. How resource dependency can influence social resilience within a primary resource industry. *Rural Sociology*. 72(3):359-390.

Marston, R.A. and J.E. Anderson. 1991. Watersheds and vegetation of the Greater Yellowstone Ecosystem. *Conservation Biology*. 5(3): 338-346.

Maxey, L. 2006. Can we sustain sustainable agriculture? Learning from small-scale producer-suppliers in Canada and the UK. *The Geographical Journal* 172(3):230-244.

McClure, R. and A. Schneider. 2001. The General Mining Act of 1872 has left a legacy of riches and ruin. *Seattle Post*. June 10.

McClure, S. 2007. Letter to Governor Schweitzer, Senator Baucus and senator tester. *West Yellowstone News*. May 04.

McCool, S.F., C. Burgess, N. Nickerson. 1998. *Toward a sustainable tourism and recreation industry in Montana: An examination of concepts and industry perceptions.* Institute for Tourism and Recreation Research. Missoula, Montana: The University of Montana.

McCool, S. F., N. Moisey and N.P. Nickerson. 2001. What should tourism sustain? The disconnect with industry perceptions of useful indicators. *Journal of Travel Research* 40: 124-131.

McCormick, J. year. The origins of the World Conservation Strategy. *Environmental Review* 10(3): 177-187.

McLeod, D., C. Kruse, and J. Woirhaye. 1998. Results from a land use survey in Sublette County, Wyoming. University of Wyoming. Agricultural Experiment Station. College of Agriculture. B-1067.

McIntosh, C.B. 1975. Use and Abuse of the Timber Culture Act. *Annals of the Association of American Geographers*. 65(3): 347-362.

McMahon, K. 2000. Regional non-resident spending in Montana: an analysis of 1998 regional nonresident spending in nine Montana counties and nine Montana

communities. Institute for Tourism and Recreation Research. University of Montana. Research Report 75.

McMillion, S. 2007. Land buyers offer sanctuary to bison. *West Yellowstone News.* November 16.

McPherson, B. 2008. Good news, bad news: examining the highs and lows of West Yellowstone's economy. *West Yellowstone News*. March 08.

———. 2009a. A health care system for West Yellowstone? *West Yellowstone News*. January 16.

———. 2009b. A further update on the new medical clinic. *West Yellowstone News*. September 09.

MDLI. 2005. Demographic and economic information by county. Montana Department of Labor and Industry. Office of Research and Analysis. Helena, Montana.

———. 2006. Demographic and economic information by county. Montana Department of Labor and Industry. Office of Research and Analysis. Helena, Montana.

———. 2010. Demographic and economic information by county. Montana Department of Labor and Industry. Office of Research and Analysis. Helena, Montana.

Millennium Ecosystem Assessment (MA). 2005. *Ecosystems and Human Well-Being: Synthesis*. Washington, D.C.: Island Press.

Millennium Ecosystem Assessment (MA). 2011. *Overview of the Millennium Ecosystem Assessment.* Millennium Ecosystem Assessment. Last Accessed on September 1, 2011. (ww.maweb.org).

Meadows, D.H. 1998. *Indicators and information systems for sustainable development*. Hartland, Vermont: The Sustainability Institute.

Meadows, D.H., J. Randers, and D.L. Meadows. 1972. *The limits of growth: A report for the Club of Rome's Project on the predicament of mankind*. New York: Universe Books.

Meagher, M. and M.E. Meyer. 1994. On the origin of brucellosis in bison of Yellowstone National Park: A review. *Conservation Biology*. 8(3): 645-653.

Meagher, M.M. 1973. *The bison of Yellowstone National Park.* National Park Service. Scientific Monograph Series. Number One.

Mebratu, D. 1998. Sustainability and sustainable development: Historical and conceptual review. *Environmental Impact Assessment Review.* 18:493-520.

Merrill, A., and J. Jacobson. 1997. *Montana Almanac*. Falcon Press, Helena, Montana

Meyer, W.B. 1999. George Perkins Marsh (1801-1882) In *Encyclopedia of Environmental Science*, ed. Alexander, D. E. and Fairbridge, R. W. Netherlands: Kluwer Academic Publishers.

MFWP. 2011. Montana Department of Fish, Wildlife and Parks. Our Mission. Last accessed on July 6, 2011. [http://fwp.mt.gov].

MFWP. 2005. *Montana's comprehensive fish and wildlife conservation strategy*. Helena, Montana: Montana Fish, Wildlife, and Parks.

Miller, J. 2011. Idaho wolf hunting rules don't include quotas. *Associated Press*. July 8.

Miller, A. 2008. Hospital board hopefuls face off in debate. *Jackson Hole News and Guide.* October, 08.

Morgenstern, E.K. 2007. The origin and early application of the principle of sustainable forest management. *The Forestry Chronicle.* 83(4):485-489. DOI: 10.5558/tfc83485-4.

Morris, J.M. and M.K . McBeth. 2003. The new west in the context of extractive commodity theory: The case of bison-brucellosis in Yellowstone National Park. *The Social Science Journal*. 40: 233-247. DOI: 10.1016/S0362-3319(03)00006-5.

Morse, J. 1991. Approaches to qualitative-quantitative methodological triangulation. *Nursing Reserch*. 40:120-123.

Mudd, K. 2000. New Bridger school facilities axed. *Carbon County News*. January 19.

Nasr, S.L. 2006. *The buffalo wars.* Master's Thesis. Massachusetts Institute of Technology.

Nath, B. 2003. Education for sustainable development: The Johannesburg Summit and beyond. *Environment, Development and Sustainability.* 5: 231-254.

National Park Service (NPS-PUSO). 2010. *National Park Service Public Use Statistics Office*. National Park Service. assessed on May 01, 2010. [www.nature.nps.gov/stats].

National Research Council (NRC), Board on Sustainable Development. 1999. *Our common journey: a transition toward sustainability*. Washington, DC: National Academy Press.

Norton, B.G. 2005. *Sustainability: A Philosophy of Adaptive Ecosystem Management.* Chicago: University of Chicago Press.

NCH Software. 2010. Express scribe transcription playback software. Greenwood Village, CO. [www.nch.com].

Nelson, F.K. 1994. *This* w*as Jackson's Hole: Incident's and profiles from the settlement of Jackson Hole*. Glendo, Wyoming: High Plains Press.

NEPA. 1969. The National Environmental Policy Act. 42 USC § 4321.

Nickerson, N., J. Wilton, and M. McBride. 2004. *Carbon County visitor characteristics*. Institute of Tourism and Recreation Research. The University of Montana-Missoula. College of Forestry and Conservation.

Nimmo, D. R., M.J. Willox, T. D. LaFrancois, P. L. Chapman, S. F. Brinkman, and J. C. Greene.1998. Effects of metal mining on boundary waters of Yellowstone National Park, USA. *Environmental Management.* 22(6): 913-926. DOI: 10.1007/s002679900158

Nolan, G. 2008. Which Beartooth rally? *Carbon County News*. March 27.

North, D. 1998. Rural industrialization. In *The geography of rural change,* ed. B. Ilbery, 161-188. Harlow: Addison Wesley Longman.

NPS PUSO. 2011. Annual Park Visitation: Yellowstone National Park. National Park Service Public Use Statistics Office. Last accessed on 27-October-2011. [www.nature.nps.gov/stats/park].

NRC. 1999. *Our common journey: A transition toward sustainability*. Board on Sustainable Development. National Research Council.

NRCS. 1981. *Soil survey of Fremont County, Wyoming – Lander Area*. Natural Resources Conservation Service.

———. 1982. *Soil survey of Teton County, Wyoming and Grand Teton National Park*. Natural Resources Conservation Service.

———. 1996. *Soil survey of Gallatin National Forest, Montana.* Natural Resources Conservation Service.

———. 2007. *Soil survey of Beaverhead National Forest Area, Montana*. Natural Resources Conservation Service.

———. 2010. *Soil survey of Bear Lake County Area, Idaho*. Natural Resources Conservation Service.

NPS. 1916. The National Park Service Organic Act (16 U.S.C.1 2 3, and 4)(39 Stat. 535). 64th Congress of the United States of America.

Onwuegbuzie, A.J. and K. M. T. Collins. 2007. A typology of mixed methods sampling design in social science research. *The Qualitative Report.* 12(2): 182-316.

Onwuegbuzie, A.J. and N.L. Leech. 2006. Linking research questions to mixed methods data analysis procedures. *The Qualitative Report.* 11(3): 474-498.

Osorio, L.A.R., M.O. Lobato, and X. A. Del Castillo. 2005. Debates on sustainable development: Towards a holistic view of reality. *Environment, Development, and Sustainability*. 7: 501-518.

Ostrom, E., J. Burger, C.B. Field, R. B. Norgaard, and D. Policansky. 1999. Revisiting the commons:Local lessons, global challenge. *Science* 284:278-284.

Parmenter, A.W., A.H. Hansen, R.E. Kennedy, W. Cohen, U. Langner, R. Lawrenece, B. Maxwell, A. Gallanet, and R. Aspinal. 2003. Land Use and Land Cover Change in the Greater Yellowstone Ecosystem: 1975-1995. *Ecological Applications*. 13(3): 687-703.

Parris, T.M., and R.W. Kates. 2003. Characterizing a sustainability transition: Goals, targets, trends, and driving forces. *Proceedings of the National Academy of Sciences* 100(14): 8068-8073.

Patten, D. 1991. Human impacts in the Greater Yellowstone Ecosystem: Evaluating sustainability goals and eco-redevelopment. Conservation Biology. 5(3): 405-411.

Paulson, S., L.L. Gezon, and M. Watts. 2003. Locating the Political Ecology: An Introduction. *Human Organization*. 62(3): 205-217.

Pavlikakis, G.E. and V.A. Shihrintzis. 2000. Ecosystem management: A review of a new concept and methodology. *Water Resources Management*. 14: 257-283.

Person, D. 2009. Turning to the tourists. *Bozeman Daily Chronicle*. April, 15.

———. 2009b. Horse Butte bison controversy spills into court. *West Yellowstone News*. August 7.

Pierce, K.L., D.G. Despain, L.A. Morgan, and J.M. Good. 2007. *The Yellowstone Hotspot, Greater Yellowstone Ecosystem, and human geography*. U.S. Department of the Interior, U.S. Geologic Survey. Professional Paper 1717.

Pomerantz, J.R. 2006. *Perception: Overview.* Encyclopedia of Cognitive Science. DOI: 10.1002/0470018860.s00589.

Power, T.M. 1991. Ecosystem preservation and the economy in the Greater Yellowstone Area. *Conservation Biology* 5(3): 395-404.

Price, L.W. 1981. *Human impact on mountain environments in mountains and man: A study of process and environmen*t. Berkeley: University of California Press. Pp. 419-441.

Preist, J. 2009a. Right about one issue. *Carbon County News*. June 15.

———. 2009b. The word is broke. *Carbon County News*. July 2.

Price, L.W. 1981. Human impact on mountain environments *In Mountains and man: A study of process and environmen*t, ed. L.W. Price, 419-441. Berkeley: University of California Press.

Pritchard, J. 1999. *Preserving Yellowstone's natural conditions: Science and the perception of nature*. Lincoln, Nebraska. University of Nebraska Press.

Provonost, M. 2005. Forest land purchase first step in diversification process. *West Yellowstone News*. May 6.

Quental, N. J.M. Lourenco, and F.N. da Silva. 2010. Sustainability: Characteristics and scientific roots. *Environ Dev Sustain*. DOI 10.1007/s10668-010-9260-x

Ragan, V.E. 2002. The brucellosis eradication program in the United States. In *Brucellosis in elk and bison in the Greater Yellowstone Area*, ed. T.J. Kreeger, 11-18. Cheyenne, Wyoming: Wyoming Game and Fish Department.

Rasker, R. 1993. Rural development, conservation, and public policy in the Greater Yellowstone Ecosystem. *Society and Natural Resources* 6: 109-126.

Rathge, R., and P. Highman. 1998. Population change in the Great Plains: A history of prolonged decline. *Rural Development Perspectives* 13(1): 19-26.

RavenHeart, M. 2008. To the Editor. *West Yellowstone News*. February 22.

ReCal3. 2011. Reliability calculation for the masses. Last accessed on October 28, 2011. [www.dfreelon.org].

Redclift, M. 2003. The multiple dimensions of sustainable development. In P*erspectives in resource management in developing countries*, ed. B. Thakur, 36-42. New Dehli: Concept Publishing Company.

Red Lodge. 2008. *Red Lodge Growth Policy*. April 12, 2008. Red Lodge, Montana.

Reed, M. 2006. Leaders may separate pathways, comp plans. *Jackson Hole News and Guide*. July 10.

Reading, R.P., T.W. Clark, and S.R. Kellert. 1994. Attitudes and knowledge of people living in the Greater Yellowstone Ecosystem. *Society and Natural Resources*. 7:349-365.

Reeder, R.J. and D.M. Brown. 2005. *Recreation, tourism, and rural well-being*. US Department of Agriculture. Economic Research Report Number 7.

Reisner, M. and S. Bates. 1990. *Overtapped Oasis: Reform or Revolution for Western Water*. Island Press. Covelo, California.

Riebsame, W.E., H. Gosnell, and D.M. Theobald. 1996. Land Use and Landscape Change in Colorado Mountains I: Theory, Scale and Pattern. *Mountains Research and Development*. 16(4): 395-405.

Rindfuss, R.R., S.J. Walsh, B.L. Turner II, J. Fox, and V. Mishra. 2004. Developing a science of land change: Challenges and methodological issues. *PNAS.* 101(39): 13976-13981. DOI: 10.1073/pnas.0401545101.

Ripple, W.J. and R.L. Beschta. 2003. Wolf reintroduction, predation risk, and cottonwood recovery in Yellowstone National Park. *Forest Ecology and Management*. 184: 299-313. DOI:10.1016/S0378-1127(03)00154-3

Roat, B. 2006. Motorcycle rally issues. *Carbon County News*. October 12.

Roat, B. 2007. Riders are welcome. *Carbon County News*. November 1.

Robbins, P., K. Meehan, H. Gosnell, and S.J. Gilbertz. 2009. Writing the New West: A critical review. *Rural Sociology*. 74(3): 356-382.

Robinson, B. 2008. Yellowstone Park not made for business. *West Yellowstone News*. December 19.

Rogers, P.P., K.F. Jalal, and J.A. Boyd. 2008. *An introduction to sustainable development.* London: Earthscan.

Rohling, K. 2011. *Mining Claims and Sites on Federal Lands*. Bureau of Land Management.

Romme, W.H., and D.G. Despain. 1989. Historical perspective on the Yellowstone fire of 1988. *BioScience.* 39(10): 695-699.

Romme, W.H., M.G. Turner. 1991. Implications of global climate change for biogeographic patterns in the Greater Yellowstone Ecosystem. *Conservation Biology*. 5(3): 1991. 373-386.

Ropke, I. 2005. Trends in the development of ecological economics from the late 1980s to the early 2000s. *Ecological Economics*. 55: 262-290.

Royster, W. 2011. Wyoming range oil and gas development back on the table. *Wyoming Star Tribune*. May 06.

Rubin, A. and E.R. Babbie. 2009. *Essential research methods for social work.* Belmont, CA: Crooks Cole. Belmont, CA.

Rudzitis, G. 1999. Amenities increasingly draw people to the rural West. *Rural Development Perspectives* 14(2): 9-13.

Running, S.W. 2006. Is global warming causing more, larger wildfires? *Science.* 313: 927-928.

Rushton, G. 1979. On behavioral and perception geography. *Annals of the Association of American Geographers*. 69(3): 463-464.

Sacklin, J.A., K.K. Legg, M.S. Creachbaum, C.K. Hawkes, and G. Helfrich. 2000. *Winter visitor use planning in Yellowstone and Grand Teton National Parks*. USDA Forest Service Proceedings. RMRS-P-15-Vol. 4.

Sale, J. E. M, L. H. Lohfeld, and K. Brazil. 2002. Revisiting the quantitative-qualitative debate: Implications for mixed-methods research. *Quality and Quantity.* 36: 43-53.

Samuel, M. J. 1986. Jackson Hole, a summer tradition continues. *Rangelands*. 8(1): 23-26.

Sanborn, M. 1978. *The Grand Tetons: The Story of the Men Who Tamed the Western Wilderness*. G.P. Putnam's Sons. New York, New York.

Sang, B. 2009a. Future of horse butte bison in question. *West Yellowstone News*. January 2.

Sang, B. 2009b. Fight over Yellowstone winter use continues. *West Yellowstone News*. August 03.

Saarinen, T.F. 1969. *Perception of Environment*. Association of American Geographers. Resource Paper No. 5. Washington, DC: Commission on College Geography.

SAS. 2011. Statistical Analytic Software. Last Accessed: 23-November-2011 [www.sas.com].

Sawyer, H., M.J. Kauffman, R.M. Nielson. 2009. Influence on well pad activity on winter habitat selection patterns of mule deer. *The Journal of Wildlife Management* 73(7): 1052-1061. DOI: 10.2193/2008-478.

Sawyer, H., F. Lindzey, D. McWhirter, and K. Andrews. 2002. Potential effects of oil and gas development on mule deer and pronghorn populations in western Wyoming. *Transactions of the Sixty-Seventh North American Wildlife and Natural Resources Conference*. ed. J. Rahm. Washington, DC.

Schecther, J. 2006. Politicians should focus on growth. *Jackson Hole News and Guide*. August 30.

———. 2007a. Valley must start looking to long term. *Jackson Hole News and Guide*. March 14.

———. 2007b. Forest service budget woes to continue. *Jackson Hole News and Guide*. September 26.

———. 2008. Governance system hobbles hospital. *Jackson Hole News and Guide*. January 30.

———. 2009. Our niche green resort community. *Jackson Hole News and Guide*. April 8.

Schmidt, D.B. 1978. *Montana's subdivision laws: Problems and prospects*. Montana Legislative Council. Helena, Montana.

Schnaiberg, A., D.N. Pellow, and A. Weinberg. 2002. The Treadmill of production and the environmental state. *The Environmental State Under Pressure*. 10:15-32.

Schubert, A., and I. Lang. 2005. The literature aftermath of the Brundtland Report 'Our Common Future': A scientometric study based on citations in science and social science journals. *Environment, Development and Sustainability* 7:1-8. DOI 10.1007/s10668-003-0177-5.

Schullery, P. 1997. *Searching for Yellowstone: Ecology and Wonder in the Last Wilderness*. Houghton Mifflin Company. New York, New York.

Schullery, P. 1989. Yellowstone fires: A preliminary report. *Northwest Science* 63(1): 44-54.

Seay, S.J. 2007. Guest column. *West Yellowstone News*. May 8.

Seay, S.J. 2008. It's time to let the buffalo roam in Montana. *West Yellowstone News*. November 11.

Seely, C. 2004. Clyde Seely – A conversation. *West Yellowstone News*. Jan 2.

Segall, M. H., D.T. Campbell, and M.J. Herskovit. 1968. The influence of culture on visual perception. In *Social perception*, ed. H. Toch and C. Smith, 1-5. New York: Van Nostrand Reinhold.

Sene, E.H., and D. McGuire. 1997. Sustainable mountain development In *Action in Mountains of the World: A Global Priority*, ed. B. Messerli and J.D. Ives, 447-454. London: The Parthenon Publishing Group.

Shea, P. 2009. *Images of America: West Yellowstone*. Charleston, South Carolina: Arcadia Publishing.

———. 2000. A town at the end of the line. *In West Yellowstone visitor's guide*. Jackson, Wyoming: Circummerro Publishing.

Sheridan, T.E. 2007. Embattled ranchers, endangered species, and urban sprawl: The political ecology of the new American West. *Annual Review of Anthropology* 36: 121-138.

Shumway, J.M. and S.M. Otterstrom. 2001. Spatial patterns of migration and income change in the Mountain West: The dominance of service-based, amenity-rich counties. *Professional Geographer*. 53(4): 492-502.

Shumway, J.M. and J.A. Davis. 1996. Nonmetropolitan population change in the Mountain West: 1970-1995. *Rural Sociology*. 61(3): 513-529.

Sikdar, S.K. 2004. Sustainable development and sustainability metrics. *AlChe Journal* 49(8): 1928-1932. DOI: 10.1002/aic.690490802.

Simmons, M.R. 2000. *Revisiting the limits to growth: could the Club of Rome have been correct, after all?* An Energy White Paper.

Slaper, T.F. 2011. The triple bottom line: What is it and how does it work? *Indiana Business Review*. Spring.

Slevin, M. 2008. To the editor. *West Yellowstone News*. February 17.

Smethurst, D. 2000. Mountain geography. *Geographical Review* 90(1): 35-56.

Smith, D.W., R.O. Peterson, and D.B. Houston. 2003. Yellowstone after wolves. *BioScience*. 53(4): 330-340.

Smith, F.E. 1968. The International Biological Program and the science of ecology. *PNAS* 60(1): 5-11.

Smith, M.D., and R.S. Krannich. 2000. "Culture clash" revisited: Newcomer and longer-term residents' attitudes toward land use, development, and environmental issues in rural communities in the Rocky Mountain West. *Rural Sociology* 65(3): 396-421.

Smit, B., and J. Wandel. 2006. Adaptation, adaptive capacity and vulnerability. *Global Environmental Change*.16: 282-292.

SOLO. 2011. *SOLO: A guide to soil quality monitoring for long term ecosystem sustainability on northern region national forests.* US. Forest Service. Rocky Mountain Research Station. Last accessed on July 7, 2011. [http://forst.moscowfsl.wsu.edu].

Sousa, W. 1984. The role of disturbance in natural communities. *Annual Review of Ecology and Systematics* 15: 353-391.

Speth, G. 1980. The global 2000 report to the President. *Boston College Environmental Affairs Law Review* 8(4): 695-703.

START. 2011. Southern Teton Area Rapid Transit. Last accessed on September 11, 2011. [www.startbus.com].

Starnes, E.M. 1997. Preface. In *Rural sustainable development in America*, ed. I. Audirac, 432. New York: John Wiley & Sons.

Starrs, P. 2003. An inescapable range, or the ranch as everywhere. In *Western places American myths*, ed. Hausladen, P. Reno, 57-84. Nevada: University of Nevada Press.

Stedman, R.C., J.R. Parkins, and T.M. Beckley. 2005. Forest dependence and community well-being in rural Canada: variation by forest sector and region. *Canadian Journal of Forestry* 35:215-220.

Steffen, W., A. Sanderson, P.D. Tyson, J. Jager, P.A. Matson, B. Moore III., F. Oldfield, K. Richardson, H.J. Schellnhuber, B.L. Turner III., and R.J. Wasson. 2004. *Global change and the earth system: A planet under pressure*. Stockholm, Sweden: IGBP.

Stemler, S. 2001. An Overview of Content Analysis. Practical Assessment. *Research & Evaluation*. 7(17).

Stenzel, P. L. 2010. Sustainability, the triple bottom line, and the global reporting initiative. *Global Edge Business Review.* 4(6): 1-2.

Stoddard, J. 2007. The cows have come home! "Painted buffalo" get their final coat before june 2nd grand unveiling event. *West Yellowstone News*. May 05.

Story, M.T., J. Shea, T. Svalberg, M. Hektner, and G. Ingersoll. 2006. Greater Yellowstone areas air quality assessment update. In *Greater Yellowstone Public Lands: A Century of Discovery, Hard Lessons, and Bright Prospects*. Ed. A. W. Biel. *Proceedings of the 8th Biennial Scientific Conference on the Greater Yellowstone Ecosystem*. October 17-19, 2005. Mammoth Hot Spring. Yellowstone National Park.

Stoughton, J.E., and W.A. Marcus. 2000. Persistent impacts of trace metals from mining on floodplain grass communities along Soda Butte Creek, Yellowstone National Park. *Environmental Management* 25(3): 305-320. DOI: 10.1007/s002679910024.

Stynes, D.J. 2008. *Impacts of visitor spending on the local economy: Yellowstone National Park 2006.* Department of Community, Agriculture, Recreation and Resource Studies. Michigan State University.

Sumi, A. 2007. On several issues regarding efforts toward a sustainable society. *Sustainability Science* 2:67-76.

Sung, J., D.J. Phaneuf, and W. Thurman. 2008. *Estimating the welfare impacts of snowmobile use restrictions in Yellowstone National Park*. Unpublished Manuscript.

Swanson, L. 2007. Growth and change in the Yellowstone-Teton Region. Yellowstone Business Partnership.

Sweet, T. 2002. *American Georgics: Economy and Environment in Early American Literature*. University of Pennsylvania Press. Philadelphia, PA.

Taylor, D.T. 1999. *Economic importance of the winter season to Park County, Wyoming.* University of Wyoming Cooperative Extension Service. Department of Agricultural and Applied Economics.

Taylor, D.T. and T. Foukle. 2008a. *Fremont County, Wyoming: A socio-economic profile*. University of Wyoming, Department of Agricultural and Applied Economics.

Taylor, D.T. and T. Foukle. 2008b. *Lincoln County, Wyoming: A socio-economic profile*. University of Wyoming, Department of Agricultural and Applied Economics.

Taylor, D.T. and T. Foukle. 2008c. Teton County, Wyoming: A socio-economic profile. University of Wyoming. Department of Agricultural and Applied Economics.

Teddlie, C. and F. Yu. 2007. Mixed methods sampling: A typology with examples. *Journal of Mixed Methods Research* 1: 77-100. DOI: 10.1177/2345678906292430.

Thorne, T. and T. Kreeger. 2002. *Management options for the resolution of brucellosis in the gya in brucellosis in elk and bison in the Greater Yellowstone Area*. Cheyenne, Wyoming: Wyoming Game and Fish Department.

Thorsell, J. 1997. Protection of nature in mountain regions. In *Mountains of the World: A Global Priority*, ed. B. Messerli and J.D. Ives, 237-248. London: The Parthenon Publishing Group.

Thuermer, A.M., Jr. 2006. State delegation fails on environmental votes. *Jackson Hole News and Guide*. October 12.

———. 2008. Energy money secures sage grouse easement. *Jackson Hole News and Guide*. April 04.

Tickamyer, A.R. 2006. Rural poverty In *Handbook of Rural Studies*, ed. P.T. Cloke, T. Marsden, and P.H. Mooney, 411-426. London: Sage Publications.

Todorov, V.I. and D. Marinova. 2009. Models of sustainability. *18th World IMACS/MODSIM Congress*. Cairns, Australia. 13-17 July 2009.

Travis, W.R. 2007. *New Geographies of the American West: Land Use and the Changing Patterns of Place*. Washington, D.C.: Island Press.

Tremblay, M. 2009. The key informant technique: A nonethnographic application. *American Anthropologist*. 59(4): 688-701.

Tuan, Y. 1974. *Topophilia: A study of environmental perception, attitudes, and values*. New York: Columbia University Press.

Tuan, Y. 2003. Perceptual and cultural geography: A commentary. *Annals of the Association of American Geographers*. 93(4): 878-881.

Turner, M.G., W.H. Romme, and D.B. Tinker. 2003. Surprises and lessons from the 1988 Yellowstone Fires. *Frontiers in Ecology and the Environment*. 1(7): 351-358.

Turner, B. L., II, and P. Robbins. 2008. Land-change science and political ecology: Similarities, differences, and implications for sustainability science. *Annual Review of Environment and Resources*. 33: 295-316. DOI: 10.1146/annurev.environ.33.022207.104943.

Turner, B.L. II, E.F. Lambin, and A. Reenberg. 2007. The emergence of land change science for global environmental change and sustainability. *PNAS* 104(52): 20666-20671.

United Nations. 1992. *Results of the world conference on environment and development: agenda 21*. Chapter 40. UNCED United Nations Conference on Environment and Development. Rio de Janeiro. United Nations, New York.

United Nations Environment Programme (UNEP). 1972. Declaration of the United Nations Conference on the Human Environment. United Nations Environment Programme. Last accessed Sept. 1, 2011 [www.unep.org].

United Nations Education, Scientific, and Cultural Organization (UNESCO). 1984. Activities of the UNESCO-UNEP International Environmental Education Programme (1965-1983). UNESCO. Paris: Boudin. ED. 84/WS/36.

United Nations Education, Scientific, and Cultural Organization (UNESCO). 1993. *The Biosphere Conference 25 Years Later*. Paris: United Nations Education, Scientific, and Cultural Organization.

USCB. 2011. American fact finder 2005-2009 American community survey 5-year estimates. Last accessed on July 7, 2011. [http://factfinder.census.gov].

USDA. 2007. *Valuing ecosystem services: Capturing the true value of nature's capital*. U.S. Department of Agriculture. U.S. Forest Service. FS-870a

U.S.C. 1974. Forest and Rangeland Renewable Resources Planning Act of 1974. United States Code Title 16, Chapter 36.

USFS. 1960. Multiple-Use and Sustained Yield Act of 1960. Public Law 86-517. 86th Congress. June 12, 1960.

USFS. 2011. U.S. Forest Service. A Historical Perspective: Organic Administration Act of 1897. Last accessed on July 6, 2011. [http://www.fs.fed.us./forestmanagment/aboutus/historicalperspective].

USFS. 2012. United States Forest Service: Timeline of key events. Last accessed on 23-Jan-2012 [www.fs.usda.gov/stelprdb5186358.pdf].

Van Den Brock, J. 1995. A score test for zero inflation in a Poisson distribution. *Biometrics*. 51(2): 738-743.

Van Dyke, F. and W.C. Klein. 1996. Response of elk to installation of oil wells. *Journal of Mammology*. 77(4): 1028-1041.

Vitousek et al. 1997. Human domination of earth's ecosystems. *Science* . 277: 494-499.

Volker, K. 1997. Local commitment for sustainable rural landscape development. *Agriculture, Ecosystems and Environment* 63: 107-120.

Vos, R.O. 2007. Defining sustainability: a conceptual orientation. *Journal of Chemical Technology and Biotechnology*. 82:334-339. DOI: 10.1002/jctb.1675.

Vought, Jr., T.J., J.M. Hutchison, S.L. Hutchinson, J.A. Harrington, and L.M.B. Harrington. 2011. Redefining military training land sustainability. In Review.

Wackernagel, M. and W. Rees. 1996. *Our ecological footprint: Reducing human impact on earth*. Gabriola Island, BC: New Society Publishers.

Waite, T. 2006. *Yellowstone by train: a history of rail travel to America's first national park*. Missoula, Montana. Pictorial Histories Publishing Co., Inc.

Walford, N. 2003. Productivism is allegedly dead, long live productivism. Evidence of continued productivist attitudes and decision-making in South-East England. *Journal of Rural Studies*. 19: 491-502.

Walker, B.L. 2007. Greater sage-grouse population response to energy development and habitat loss. *The Journal of Wildlife Management*. 71(8): 2644-2654.

Walker, K. 2002. *Strategic planning and mobilizing resources*. LEADS Curriculum Notebook Unit IV, Module 2. Manhattan, Kansas: Kansas State University.

Wallace, B. 2005b. New high school talks continuing. *Carbon County News*. September 15.

———. 2005a. School postpones new facility forum. *Carbon County News*. May 26.

———. 2005c. Committee preparing survey. *Carbon County News*. December 29.

———. 2005d. Fourth of July business holds steady. *Carbon County News*. July 14.

———. 2005e. Burns, FHWA inspect pass repairs. *Carbon County News.* July 14, 2005.

———. 2005f. Beartooth Pass reopens briefly for party. *Carbon County News*. October 13.

———. 2006. R. L. Cannery bought by group. *Carbon County News*. June 8.

———. 2007. Red Lodge school board chooses architect firm for new high school. *Carbon County News*. January 11.

Wallace, M.S., H.L. Stribling, and H.A. Clonts. 1991. Effect of hunter expenditure distribution on community economics. *Wildlife Society Bulletin.* 19(1): 7-14.

Ward, B. and R. Dubos. 1972. *Only One Earth: The Care and Maintenance of a Small Planet*. W.W. New York, New York: Norton Company.

Warner, D. 2001a. Visioning group discusses community's priorities at great length. *West Yellowstone News*. April 13.

———. 2001b. Everyone's "raven" about visioning. *West Yellowstone News*. April 27.

———. 2004. Horse Butte group to DOL: Let the buffalo roam. *West Yellowstone News.* December 3.

———. 2005a. Walker Cross gives Raynolds Pass land to Forest Service. *West Yellowstone News*. May 13.

———. 2005b. Everybody likes upcoming land acquisition. *West Yellowstone News*. May 06.

———. 2005c. Council approves preliminary FY 2006 budget. *West Yellowstone News*. July 1.

———. 2006a. Painted buffalo set to stampede. *West Yellowstone News*. June 06.

———. 2007. Travel plan protest draws a crowd. *West Yellowstone News*. February 9.

———. 2008a. One man's view of West Yellowstone's Future. *West Yellowstone News.* February 01.

———. 2008b. Chamber conference urges town to green up. *West Yellowstone News*. May 02.

———. 2008c. Chamber nurtures plan to 'green up' West Yellowstone. *West Yellowstone News.* April 4.

Watkins, T. H. 2011. Mining's hard rock legacy. *National Geographic Society*. Last accessed on August 20, 2011. [http://science.nationalgeographic.com/science/earth/inside-the-earth/hard-rock/].

Webb, E.J., D. T. Campbell, R.D. Schwartz, and L. Sechrest. 1966. *Unobtrusive Measures*. Chicago: Rand McNally.

Weber, R.P. 1985. *Basic content analysis.* Beverly Hills, California: SAGE Publications, Inc. pp. 95.

Webster's College Dictionary. 2003. Webster's College Dictionary. Darien, CT: Federal Street Press

Westerling, A.L. 2011. Continued warming could transform greater Yellowstone fire regimes by mid-21st century. *PNAS*. doi/10.1073/pnas.1110199108.

WGFD. 2011. Wyoming Game and Fish Department. History. Last accessed on July 6, 2011. [http://gf.state.wy.us/admin/aboutus].

White, K.J.C. 2008. Population change and farm dependence: Temporal and spatial variation in the U.S. Great Plains, 1900-2000. *Demography.* 45(2): 363-386.

Whitener, L. A. and D. A. McGranahan. 2003. Rural America: Opportunities and challenges. *Amber Waves* 1(1): 14-21.

Wiersum, K.F. 1995. 200 years of sustainability in forestry: Lessons from history. *Environmental Management*. 19: 321-329.

Wilbanks, T.J., and R.W. Kates. 1999. Global change in local places: How scale matters. *Climatic Change* 43:601-628.

Williams, G.W. 2005. *The USDA Forest Service – The first century*. FS-650. Washington, DC: USDA Forest Service Office of Communication.

Wilmers, C.C., and W.M. Getz. 2005. Gray wolves as climate change buffers in Yellowstone. *PLoS Biology.* 3(4): 0571-0576.

Wilson, G. A. 2001. From productivism to post-productivism…and back again? Exploring the (un)changed natural and mental landscapes of european agriculture. *Transactions of the Institute of British Geographers*. New Series. 26(1): 77-102.

Wiltsie, M.N. 1998. *Land use and landscape evolution in the west: a case study of Red Lodge, Montana* 1884-1995. Unpublished Thesis. Montana State University.

Woodward, J.L. 1934. Quantitative newspaper analysis as a technique of opinion research. *Social Forces.* 12(4): 526-537.

Wood, T.J. 1970. Perception studies in geography. *Transaction of the Institute of British Geographers*. 50: 129-142.

Woods, M. 2005. *Rural geography: processes, responses and experiences in rural restructuring.* London: Sage Publications.

World Commission on Environment and Development (WCED). 1987. *Our Common Future*. United Kingdom: Oxford University Press

Wuerthner, G. 1994. Subdivisions versus Agriculture. *Conservation Biology* 8(3): 905-908.

WYCC. 2009. *West Yellowstone Montana 2009 Marketing Plan*. West Yellowstone Chamber of Commerce. West Yellowstone, Montana.

WRCC. 2010. *West Yellowstone Montana climatic data*. Western Regional Climate Center. Assessed on May 01, 2010.[www.wrcc.dri.edu]

Wright, G.A. 1984. *People of the High Country: Jackson Hole Before the Settlers.* Peter Lang. New York, New York.

Wright, J.K. 1974. Terrae incognitae: The place of imagination in geography. *Annals of the Association of American Geographers*. 37:1-15.

WY. 2008a. Four day school week? *West Yellowstone News*. October 24.

———. 2008b. Open letter to town. *West Yellowstone News*. August 22.

———. 2008c. Yellowstone officials: Bison conflict could increase. *West Yellowstone News.* January 11.

———. 2008d. Voltswagen. *West Yellowstone News.* July 18.

———. 2008e. Recycling in West Yellowstone gets dumped. *West Yellowstone News*. November 21.

WYN. 2001. Visioning sets goals for future. *West Yellowstone News*. June 01.

———. 2003a. Take another look…the glass is half full. *West Yellowstone News.* July 25.

———. 2003b. Chamber creates a plan for the new year at annual session. *West Yellowstone News.* January 01.

———. 2004. Assessment team asks community many questions. *West Yellowstone News*. May 21.

———. 2004b. Compromise is the best path to our future. Opinion. *West Yellowstone News.* March 5.

———. 2008a. GAO Report: Yellowstone Bison Management Plan Failing. *West Yellowstone News.* April 4.

———. 2007. Winter use decision protects parks while providing visitor access. *West Yellowstone News.* November 30.

———. 2007b. Bits and Pieces. *West Yellowstone News*. February 23.

———. 2009a. 10 more years: forest service re-authorizes bison capture facility on Horse Butte. *West Yellowstone News*. January 16.

Yin, R.K. 2006. Mixed methods research: Are the methods genuinely integrated or merely parallel? *Research in the Schools.* 13(1): 41-47.

YNP. 2003. *Yellowstone National Park Business Plan*. U.S. Department of the Interior. Yellowstone National Park. Mammoth Hot Springs, Wyoming.

YNP. 2011. Nature and Science. Yellowstone National Park. Last accessed on July 23, 2011. [http://nps.gov/yell/naturescience].

———. 2010. About Bison. Yellowstone National Park. *Yell 298*.

Yochim, M. J. 2009. *Yellowstone and the snowmobile: locking horns over national park use*. Lawrence, Kansas: University of Kansas Press.

———. 1999. The development of snowmobile policy in Yellowstone National Park. *Yellowstone Science*. 7(2): 2-10.

Yung, L. and J. Belsky. 2007. Private property rights and community goods: Negotiating landowner cooperation amidst changing ownership on the rocky mountain front. *Society & Natural Resources*. 20 (8): 689-703.

Young, D.A need to explore. *Carbon County News*. February 12.

Yin, R. K. 2006. Mixed methods research: are the methods genuinely integrated or merely parallel? *Research in the Schools.* 13(1): 41-47.

Zeide, B. 2001. Resolving contradictions in forestry: back to science. *The Forestry Chronicle*. 77(6): 973-981.

Zhou, D. J.F. Yanagida, U. Chakravorty, and P. Leung. 1997. Estimating economic impacts from tourism. *Annals of Tourism Research*. 24(1): 76-89.

Zimmermann, E . W. 1964. Meaning and nature of resources. In *introduction to world resources,* ed. H.L. Hunker, 1-29. New York: Harper & Row. P. 1-29.

Zupan, S. and H .J. Owens. 1979. *Red Lodge: Saga of a western area.* Carbon County Historical Society. Red Lodge, Montana.

Appendix A - Content Analysis Coding Matrix

		Newspaper	
Key Word	**West Yellowstone (n=193)**	**Red Lodge (n=287)**	**Jackson (n=333)**
Affordable Housing	4	10	41
Agriculture	1	9	1
Air Travel	2	5	6
Alpine Skiing	0	0	2
Alternative Fuels	0	12	1
Amenity-Migrants	0	1	6
Animal Control	1	4	0
Animal Safety	1		0
Annexation	4	2	0
Attachment to Place	0	0	2
Arts and Entertainment	0	2	0
Avalanche	0	0	2
Bears	4	2	7
Beaverhead - Deerlodge NF	1	0	0
Bed Tax	1	0	2
Beartooth Nature Center	0	3	0
Beartooth Pass	0	5	4
Beartooth Rally	0	10	1
Biggest Challenge - Growth	0	1	1
Bison	3	1	2
Bison Capture Facility	4	0	4
Bison Economics	0	0	9
Bison Hunt	6	0	1
Bison Management	21	0	1
Blue Ribbon Coalition	1	0	0
Brucellosis	16	0	2
Buffalo Allies of Bozeman	1	0	0
Buffalo Field Campaign	11	0	0
Buffalo Roam Project	7	0	0
Bureau of Land Management	1	0	0
Business Construction	2	0	0
Bureau of Reclamation	0	0	1
Business Training	1	0	0

		Newspaper	
Key Word	**West Yellowstone (n=193)**	**Red Lodge (n=287)**	**Jackson (n=333)**
Business Owners	0	3	8
Chamber of Commerce	0	0	1
Chronic Wasting Disease	0	0	6
Church Universal and Triumphant	3	0	0
City Government	0	3	0
Climate Change	0	0	3
Cloud Seeding	0	0	9
Commercial Development	0	6	2
Community Center	4	1	2
Community Development	0	13	14
Community Image	1	3	1
Community Involvement	2	14	7
Community's Future	0	1	0
Comprehensive Plan	0	1	1
Compost	2	0	0
Conservation	0	1	3
Conservation Easements	0	1	2
Custer NF	1	0	0
Dept. of Livestock	19	0	0
Domestic Violence	0	6	0
Downtown Beautification	3	0	0
Downtown Development	0	0	2
Downtown Improvement District	1	0	0
Drug and Alcohol Use	0	2	8
Economic Concern	1	0	0
Economic Development	3	8	1
Economic Diversification	3	1	0
Education	7	32	11
Education - Public	0	1	1
Education - Community	0	0	1
Elk	3	2	12
Emergency Management	10	0	3
Employment	0	0	5
Endangered Species Act	3	1	1
Endangered Species Act Litigation	0	0	1
Energy	0	7	0
Energy Use	0	3	6

		Newspaper	
Key Word	**West Yellowstone (n=193)**	**Red Lodge (n=287)**	**Jackson (n=333)**
Environment	1	0	19
Environment as Economics	1	0	1
Environmental Impacts	0	0	2
Environmental Protection	0	4	2
Feed Grounds	0	0	5
Festival of Nations	0	1	0
Fire and Rescue	2	8	0
Fishing	2	0	13
Foreclosure	0	0	1
Forest Fires	10	10	1
Forest Plan	1	0	0
Forest Service	7	4	1
Fun Run	0	6	0
Gallatin NF	4	0	0
Gateway Communities	0	0	1
Geotourism	1	0	0
Greater Yellowstone Coalition	13	0	0
Green Up West Yellowstone	3	0	0
Gravel Pit	0	4	17
Greater Yellowstone Ecosystem	0	0	7
Green	0	0	3
Growth	0	5	3
GTNP	4	0	1
Habitat	0	0	1
Hazing and Slaughter	15	0	1
Hiking	5	0	0
Historical District	4	2	2
Historic Preservation	0	2	0
History	1	0	0
Historic Society	0	4	14
Home Values	0	0	3
Horse Butte	12	0	0
Human Impacts on the Environment	0	1	0
Hunting	4	1	8
Hydroelectric	1	0	0

		Newspaper	
Key Word	**West Yellowstone (n=193)**	**Red Lodge (n=287)**	**Jackson (n=333)**
Immigration	0	0	6
Income Tax	0	0	5
Infrastructure	2	7	7
Invasive Species	3	1	3
Land Acquisition	14	2	0
Land Value	0	0	1
Law Enforcement	0	3	17
Library	2	1	7
Livestock Industry	2	0	0
Local Foods	0	0	1
Madison Valley Ranchlands Group	2	0	0
Medical	7	15	10
Mining	1	2	0
Mixed Use Development	0	2	1
Montana FWP	7	0	0
Multi-Generational	0	0	9
Municipal Services	1	9	0
Nature	1	0	0
National Elk Refuge	0	0	22
Natural Hazards	0	0	13
New Businesses	9	0	0
New Fire District	1	0	0
Non-Profits	0	4	1
Nordic Skiing	3	0	0
NPS	4	0	0
Oil and Gas	1	1	9
Open Space	0	2	1
Old vs. New West	1	0	0
Parks and Recreation	5	8	16
Pathways	0	0	4
Pine Beatle	0	0	3
Politics	0	9	2
Pollution	0	0	3
Private Property Rights	3	1	4
Public Access	1	0	4
Public Lands	2	1	0

		Newspaper	
Key Word	**West Yellowstone (n=193)**	**Red Lodge (n=287)**	**Jackson (n=333)**
Public Outreach	4	0	0
Public Transportation	0	0	16
Quality of Life	0	4	1
Real Estate Market	0	2	1
Recreation Activities	6	4	33
Recycling	6	3	1
Red Lodge Mountain	0	8	0
Renewable Energy	1	0	1
Residential Development	1	16	2
Resort Tax	10	5	0
Retail	0	0	2
Science	0	0	1
Secure Rural School Act	1	0	0
Senior Center	6	0	0
Sign Committee	3	0	0
Snowmobile - Economics	9	0	2
Snowmobile - Environment	3	0	1
Snowmobile - Regulations	3	0	2
Snowmobile - Visitation Rates	0	0	1
Snowmobile - Winter Use Plan	15	0	0
Snowmobile Safety	1	0	4
Snowmobiles	3	0	10
Snowpack	0	0	5
Social Development	5	0	0
Strategic Planning/Visioning	15	0	0
Sustainability	2	1	2
Sustainability - Environment	1	0	0
Sustainable Community	2	0	0
Sustainable Forestry	1	0	0
Sustainable Wildlife	3	0	0
Taxes	2	7	3
Teen Center	1	0	0
The Conservation Fund	1	0	0
The Nature Conservancy	1	0	0
Timber Management	1	0	0
Tourism	0	4	17

		Newspaper	
Key Word	**West Yellowstone (n=193)**	**Red Lodge (n=287)**	**Jackson (n=333)**
Tourism - Economics	3	4	3
Tourism - Visitation Rates	0	0	1
Transportation	6	10	2
Travel Plan	0	1	0
Trust for Public Lands	1	0	0
Uniqueness	0	2	2
Visitors Center	1	0	0
Volunteering	0	0	5
Wages	1	0	0
Waste	3	0	0
Water and Sewer	0	14	2
Water Conservation	1	0	0
Water Use	0	3	48
Waterways	1	1	3
Weather and Climate	5	1	0
Wealth	0	1	0
Wilderness Study Area	0	0	2
Weed District	0	2	0
Wildlife	2	2	1
Winter Use Plan	0	0	1
Wolf Depredation	0	1	14
Wolf Litigation	1	0	13
Wolf Reintroduction	1	0	0
Wolves	7	2	0
WYED	10	0	0
YNP	10	0	0
Zoning and Planning	3	3	0

Appendix B - Content Analysis Super-Families

Community Development
Arts and Entertainment
Attachment to Place
Biggest Challenge
Biggest Challenge - Collective Vision
Biggest Challenge - Community Development
Biggest Challenge - Community Involvement
Citizens
Community
Community Center
Community Development
Community Image
Community Involvement
Community Sustainability
Community's Future - Negative
Community's Future - Positive
Community's Future - Positive w/ Increased Visitation
Community's Future
Comprehensive Plan
Definitions - Community Development
Domestic Violence
Drug and Alcohol Use
Education
Education - Public
Education - Community
Festival of Nations
Fun Run
Gateway Communities
Gateway Community – Importance
Health Insurance
Historic Preservation
Historic Society
Historical District
History
Immigration
Local Organizations
Medical
Non-Profits
Outside Influences
Pace of Community Response to Change
Philanthropy
Priority Change w/ Spatial Scale
Public Health
Public Perception
Quality of Life
Time in Residence
Unique Challenges – Yes
Unique Challenges – No
Uniqueness
Volunteering
Who Controls Change – Community

Economic Development
Agriculture
Air Travel
Bed Tax
Biggest Challenge - Businesses
Biggest Challenge - Economy
Biggest Challenge - Working w/ County
Biggest Challenge - Year Round Economy
Business Owners
Casino
Chamber of Commerce
Delaware North
Dependence on the Park
Downtown Development
Economic Development
Economic Diversification
Economic Diversification - Education Facility
Employment
Employee Housing
Farm Bureau Federation
Global Economy
Income Tax

New Businesses
Resort Tax
Retail
Seasonality
Shoulder Seasons
Snowmobile – Economics
Snowmobile – Environment
Snowmobile – Regulations
Snowmobile - Visitation Rates
Snowmobile Litigation
Snowmobile Safety
Snowmobiles
Stockgrowers Association
Taxes
TBID
Unique Challenges - Yes: Economy
Unique Challenges - Yes: Snowmobiles
Wages
Wealth
Who Controls Change - Business Owners
WYED

Government
Animal Control
Annexation
Beaverhead - Deerlodge NF
Biggest Challenge - Federal Policy
Bozeman, Montana
City Government
City vs. County
Cody, Wyoming
County
Custer NF
Emergency Management
Emergency Services
Fire and Rescue
Gardiner, Montana
GTNP
Incorporation
Infrastructure
Jackson, Wyoming
Judicial
Law Enforcement

Library
Local Government
Municipal Services
NPS
Park Policies
Pathways
Politics
Public Comment
Public Transportation
Red Lodge, Montana
Transportation
Unique Challenges - Yes: Federal Influence
Water and Sewer
Weed District
West Yellowstone, Montana
Who Controls Change – City
Who Controls Change – County
Who Controls Change – Federal
YNP

Natural Resources
Avalanche
Bears
Biggest Challenge - Climate Change
Biggest Challenge - Energy
Biggest Challenge - Natural Resources
Bison
Bison Capture Facility
Bison Economics
Bison Hunt
Bison Management
BLM
Brucellosis
Buffalo Allies of Bozeman
Buffalo Economics
Buffalo Field Campaign
Bureau of Reclamation
Chronic Wasting Disease
Climate Change
Cloud Seeding
Conservation
Cutthroat Trout
Dept. of Livestock
EIS
Elk
Endangered Species Act
Endangered Species Act Litigation
Energy
Energy Use
Environment
Environment as Economics
Environmental Impacts
Feed Grounds
Food Production
Forest Fires
Forest Service
Geothermal

Greater Yellowstone Ecosystem
Habitat
Hazing and Slaughter
Horse Butte
Human Impacts on the Environment
Hydroelectric
Invasive Species
Livestock Industry
Local Foods
Mining
Mosquitos
Motorized Use
National Elk Refuge
Natural Amenities
Natural Hazards
Natural Resource Use
Oil and Gas
Pine Beatle
Plowing the Park
Pollution
Public Access
Public Lands
Science
Snow Removal
Snowpack
Timber Management
Waterways
Weather and Climate
Wild Buffalo Recovery Act
Wilderness Roadless Area
Wilderness Study Area
Wildlife
Wolf Depredation
Wolf Litigation
Wolf Reintroduction
Wolves

Growth and Development
Affordable Housing
Amenity-Migrants
Biggest Challenge - Growth
Biggest Challenge - Old vs. New Migrants
Commercial Development
Foreclosure
Geographic Constraints
Gravel Pit
Growth
Home Values
Jackson Hole Resort
Land Acquisition
Land Value
Long-term Residents
Mixed Use Development
Natural Amenities
Private Property Rights
Real Estate Market
Residential Development
Resort Development
Unique Challenge - Growth
Unique Challenges - Resort Community
Winham Properties
Zoning and Planning

Sustainability and Conservation
1%
Alternative Energy
Balanced Triple Bottom Line
Balanced Triple Bottom Line - Balanced
Balanced Triple Bottom Line - Community
Balanced Triple Bottom Line - Economy
Balanced Triple Bottom Line - Environment
Balanced Triple Bottom Line - Varies
Biggest Challenge - Energy Use
Compost
Community Sustainability
Conservation Easements
Definitions – Sustainability
Definitions - Sustainable Development
Economic Sustainability
Economy and Environment
Environment as Economy
Environment vs. Economy
Environmental NGO
Environmental Protection
Greater Yellowstone Coalition
Green
Green Up
Multi-Generational
Open Space
Recycling
Renewable Energy
Sustainability
Sustainability – Environment
Sustainable Development
Waste
Water Use
Who Controls Change - Environmental Groups

Sustainability and Conservation
1% for the Planet
Alternative Energy
Balanced Triple Bottom Line
Balanced Triple Bottom Line - Balanced
Balanced Triple Bottom Line - Community
Balanced Triple Bottom Line - Economy
Balanced Triple Bottom Line - Environment
Balanced Triple Bottom Line - Varies
Biggest Challenge - Energy Use
Compost
Community Sustainability
Conservation Easements
Definitions - Sustainability
Definitions - Sustainable Development
Economic Sustainability
Economy and Environment
Environment as Economy
Environment vs. Economy
Environmental NGO
Environmental Protection
Greater Yellowstone Coalition
Green
Green Up
Multi-Generational
Open Space
Recycling
Renewable Energy
Sustainability
Sustainability - Environment
Sustainable Development
Waste
Water Use
Who Controls Change - Environmental Groups

Appendix C - Key Informant Interview Instrument

I'm trying to get a better understanding of how people regard the idea of sustainable community development and natural resource management, what their priorities are, and what kinds of local difficulties and stresses people are facing in different places. Because of your position as a decision maker in the community, I would like to get your perspective on local issues related to sustainable community development and natural resource management, priorities, and change. If you would like to know more about what I find, I'd be glad to provide more information later. Would it be okay if I recorded our conversation?

1. Do you have a definition of sustainability?
2. Do you see any difference between sustainability and sustainable development?
3. What would you give as the most important things to focus on sustaining in the local area? Do you think others in this area would give different priorities?
4. Can you tell me what area you are considering – social, environmental, or economic – when describing these priorities?
5. How are priorities for the local area different from what people would want for the region, state, u.s.?
6. What are the biggest concerns, in terms of changes or difficulties occurring in the local area?
7. What do you think are the causes for these changes or difficulties?
8. How much local control is there over these changes?
9. What actions have or could you take to improve the changes that are taking place?
10. Where do you see your community in 5, 10, 20, 50 years down the road?

The other items I have are just what you see on a survey, and you don't have to answer them if you are not comfortable.

11. What is your primary racial or ethnic identity?

12. Highest level of education?

13. Age?

14. How long have you lived in X?

Appendix D - Informed Consent Form

KANSAS STATE UNIVERSITY INFORMED CONSENT

PROJECT TITLE: Perceptions of Sustainability in Amenity-Driven Communities of the Greater Yellowstone Ecosystem

APPROVAL DATE OF PROJECT: June 01, 2010 EXPIRATION DATE OF PROJECT: June 01, 2011

PRINCIPAL INVESTIGATOR: Dr. Lisa Harrington

CO-INVESTIGATOR(S): Ryan D. Bergstrom

CONTACT NAME AND PHONE FOR ANY PROBLEMS/QUESTIONS:
Dr. Lisa Harrington Phone: (785) 532-3410. Email: lbutlerh@ksu.edu

IRB CHAIR CONTACT/PHONE INFORMATION*:*

- Rick Scheidt, Chair, Committee on Research Involving Human Subjects, 203 Fairchild Hall, Kansas State University, Manhattan, KS 66506, (785) 532-3224.
- Jerry Jaax, Associate Vice Provost for Research Compliance and University Veterinarian, 203 Fairchild Hall, Kansas State University, Manhattan, KS 66506, (785) 532-3224.

PURPOSE OF THE RESEARCH: To better understand the perceptions, priorities and actions relating to sustainable community development and natural resource management in communities surrounding Yellowstone National Park.

PROCEDURES OR METHODS TO BE USED: Semi-structured interviews will be conducted in this research. A semi-structured interview consists of the interviewer asking a limited number of guiding questions, with follow-up questions developed based on the provided answer. Interviews will be tape recorded for quality assurances if approved by interviewee.

LENGTH OF STUDY: Interviews should last no longer than 25 minutes

RISKS OR DISCOMFORTS ANTICIPATED: There are no known risks associated with this study

BENEFITS ANTICIPATED: This study will benefit decision makers who may be able to use information from this study to increase the quality of life for residents.

EXTENT OF CONFIDENTIALITY: Each interview will be given a specific code which will include the date of the interview, the location (based on a code for each study community), and an occupational code (e.g. government official, business owner etc.). No names, titles, or affiliations will be recorded unless prior approval is given by the interview subject.

Appendix E - *West Yellowstone News*: Natural Resources Code List

Natural Resources	Number of References	Percent of all References	Percent within Category
Bison Management	21	10.9	11.7
Dept. of Livestock	19	9.8	10.6
Brucellosis	16	8.3	8.9
Hazing and Slaughter	15	7.8	8.4
Horse Butte	12	6.2	6.7
Buffalo Field Campaign	11	5.7	6.1
Forest Fires	10	5.2	5.6
Forest Service	7	3.6	3.9
Wolves	7	3.6	3.9
Bison Hunt	6	3.1	3.4
Weather and Climate	5	2.6	2.8
Bears	4	2.1	2.2
Bison Capture Facility	4	2.1	2.2
Hunting	4	2.1	2.2
Bison	3	1.6	1.7
Church Universal and Triumphant	3	1.6	1.7
Elk	3	1.6	1.7
Endangered Species Act	3	1.6	1.7
Invasive Species	3	1.6	1.7
Fishing	2	1.0	1.1
Livestock Industry	2	1.0	1.1
Public Lands	2	1.0	1.1
Wildlife	2	1.0	1.1
Buffalo Allies of Bozeman	1	0.5	0.6
Environment	1	0.5	0.6
Environment as Economics	1	0.5	0.6
Hydroelectric	1	0.5	0.6
Mining	1	0.5	0.6
Nature	1	0.5	0.6
Oil and Gas	1	0.5	0.6
Public Access	1	0.5	0.6
Timber Management	1	0.5	0.6
Waterways	1	0.5	0.6
Wolf Litigation	1	0.5	0.6
Wolf Reintroduction	1	0.5	0.6
Animal Safety	1	0.5	0.6
Water Conservation	1	0.5	0.6
Forest Plan	1	0.5	0.6

Appendix F - *West Yellowstone News*: Economic Development Code List

Economic Development	Number of References	Percent of all References	Percent of Category
Snowmobile - Winter Use Plan	15	7.8	17.9
WYED	10	5.2	11.9
Resort Tax	10	5.2	11.9
New Businesses	9	4.7	10.7
Snowmobile - Economics	9	4.7	10.7
Economic Development	3	1.6	3.6
Economic Diversification	3	1.6	3.6
Snowmobile - Environment	3	1.6	3.6
Snowmobile - Regulations	3	1.6	3.6
Snowmobiles	3	1.6	3.6
Tourism - Economics	3	1.6	3.6
Air Travel	2	1.0	2.4
Business Construction	2	1.0	2.4
Taxes	2	1.0	2.4
Agriculture	1	0.5	1.2
Bed Tax	1	0.5	1.2
Business Training	1	0.5	1.2
Snowmobile Safety	1	0.5	1.2
Wages	1	0.5	1.2
Downtown Improvement District	1	0.5	1.2
Economic Concern	1	0.5	1.2

Appendix G - W*est Yellowstone News*: Community Development Code List

Community Development	Number of References	Percent of all References	Percent within Category
Strategic Planning/Visioning	15	7.8	20.8
Buffalo Roam Project	7	3.6	9.7
Education	7	3.6	9.7
Medical	7	3.6	9.7
Senior Center	6	3.1	8.3
Social Development	5	2.6	6.9
Community Center	4	2.1	5.6
Historic District	4	2.1	5.6
Public Outreach	4	2.1	5.6
Downtown Beautification	3	1.6	4.2
Sign Committee	3	1.6	4.2
Community Involvement	2	1.0	2.8
Community Image	1	0.5	1.4
History	1	0.5	1.4
Secure Rural School Act	1	0.5	1.4
Teen Center	1	0.5	1.4
Visitors Center	1	0.5	1.4

Appendix H - *Carbon County News*: Community Development Code List

Community Development	Number of References	Percent of all References	Percent within Category
Education	32	11.1	27.59
Medical	15	5.2	12.93
Community Involvement	14	4.9	12.07
Community Development	13	4.2	11.21
Domestic Violence	6	2.1	5.17
Fun Run	6	2.1	5.17
Historic Society	4	1.4	3.45
Non-Profits	4	1.4	3.45
Quality of Life	4	1.4	3.45
Community Image	3	1.0	2.59
Arts and Entertainment	2	0.7	1.72
Drug and Alcohol Use	2	0.7	1.72
Historic Preservation	2	0.7	1.72
Historical District	2	0.7	1.72
Uniqueness	2	0.7	1.72
Community Center	1	0.3	0.86
Community's Future	1	0.3	0.86
Comprehensive Plan	1	0.3	0.86
Education - Public	1	0.3	0.86
Festival of Nations	1	0.3	0.86

Appendix I - *Jackson Hole News and Guide*: Natural Resources Code List

Natural Resources	Number of References	Percent of All References	Percent within Category
Wildlife	48	14.4	21.6
Oil and Gas	22	6.6	9.9
Wolves	14	4.2	6.3
Endangered Species Act	12	3.6	5.4
Elk	11	3.3	5.0
National Elk Refuge	10	3.0	4.5
Brucellosis	9	2.7	4.1
Climate Change	8	2.4	3.6
Bears	7	2.1	3.2
GTNP	7	2.1	3.2
Environmental Impacts	6	1.8	2.7
Invasive Species	6	1.8	2.7
Energy Use	5	1.5	2.3
Forest Fires	5	1.5	2.3
Waterways	5	1.5	2.3
Bison	4	1.2	1.8
Bison Management	4	1.2	1.8
Pollution	4	1.2	1.8
Endangered Species Act Litigation	3	0.9	1.4
Habitat	3	0.9	1.4
Hazing and Slaughter	3	0.9	1.4

Natural Resources	Number of References	Percent of All References	Percent within Category
Avalanche	2	0.6	0.9
Bison Hunt	2	0.6	0.9
Public Access	2	0.6	0.9
Wilderness Study Area	2	0.6	0.9
Wolf Depredation	2	0.6	0.9
Bison Capture Facility	1	0.3	0.5
Bison Economics	1	0.3	0.5
Bureau of Reclamation	1	0.3	0.5
Chronic Wasting Disease	1	0.3	0.5
Cloud Seeding	1	0.3	0.5
Conservation	1	0.3	0.5
Environment	1	0.3	0.5
Feed Grounds	1	0.3	0.5
Greater Yellowstone Ecosystem	1	0.3	0.5
Local Foods	1	0.3	0.5
Natural Hazards	1	0.3	0.5
Pine Beatle	1	0.3	0.5
Science	1	0.3	0.5
Snowpack	1	0.3	0.5
Wolf Litigation	1	0.3	0.5
Wolf Reintroduction	1	0.3	0.5