Burdens and Benefits of Climate Change Solutions: A Case Study of Climate Change Skeptics and Deniers in Rural Nevada

Patricia Dutcher
University of Nevada, Las Vegas, tmynster@hotmail.com

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BURDENS AND BENEFITS OF CLIMATE CHANGE SOLUTIONS: A CASE STUDY OF CLIMATE SKEPTICS AND DENIERS IN RURAL NEVADA

BY

PATRICIA DUTCHER

Bachelor of Science in Earth Systems Science and Policy
California State University Monterey Bay
2001

Master of Science in Environmental Science
University of Nevada, Las Vegas
2005

A dissertation submitted in partial fulfillment of the requirements for the

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School of Environmental and Public Affairs
Greenspun College of Urban Affairs
The Graduate College

University of Nevada, Las Vegas
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We recommend the dissertation prepared under our supervision by

**Patricia Dutcher**

entitled

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School of Environmental and Public Affairs

Robert Futrell, Ph.D., Committee Chair
Thomas Piechota, Ph.D., Committee Member
Helen Neill, Ph.D., Committee Member
William J. Smith, Jr., Ph.D., Committee Member
Daniel Benyshek, Ph.D., Graduate College Representative
Kathryn Hausbeck Korgan, Ph.D., Interim Dean of the Graduate College

May 2015
ABSTRACT

This dissertation is an ethnographic case study of climate change Doubtfuls and Dismissives with the purpose of understanding their perceptions of water use and renewable energy in the context of a changing climate. I also investigate the information sources and messages they use to understand climate change and climate change solutions. The Global Warming’s Six Americas project identifies climate change Doubtfuls and Dismissives as one third of the American public, and an active voice in US climate change policy (Maibach et al, 2009; Leiserowitz et al., 2014). Doubtfuls are people with skeptical attitudes towards anthropogenic climate change, while Dismissives deny any change is occurring. I conducted twenty-five interviews of Churchill County, Nevada residents, twenty-three of which reflected a Doubtful or Dismissive attitude towards climate change. The analysis focuses on three themes: 1) willingness to implement water conservation practices; 2) support for renewable energy developments and policies that encourage that development; and 3) information sources used to understand climate change and climate change solutions.

My informants perceive climate change as a natural, non-anthropogenic, non-threatening process, and therefore only plan for short-term drought mitigation. In fact, they fear losing existing water rights and supply if they implement water conservation practices. I also found that they support renewable energy in principle, but not in practice because they do not see monetary incentives and do not agree in government subsidies for the industry. In a departure from most research, they welcome development on local public lands, but only if the county accrues resources from those
developments. My informants look to peer groups and trade associations for primary information about water, renewable energy, and climate change.

I use these findings to discuss points of possible connection between the scientific concerns about climate change effects, and the practical concerns of a population important to shaping climate change policy. I describe how science-based decision-making can engage this population using boundary organizations to co-produce knowledge focused on mutually beneficial policies and practices. In summary, I demonstrate that it is quite possible for Doubtfuls and Dismissives to support climate beneficial measures, even if they disagree that climate change is a problem, if they see other practical benefits to be gained.
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DEDICATION

I would like to dedicate this dissertation to my loving husband, Eric Dutcher, and my new son, Eli Dutcher. This family was created during the course of my dissertation. I have had to sacrifice time and memories with them to see this project through completion. Eric has done quadruple duty as supporting husband, dedicated father, housekeeper, and bread-winner while I have been focused on achieving this goal. I dedicate this dissertation to them in an effort to recognize their support and as a promise to always support their dreams in return.
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CHAPTER ONE: INTRODUCTION

The scientific community is in a near unanimous agreement that anthropogenic climate change is real and portends a severe impact on global ecology and society (Intergovernmental Panel on Climate Change, 2014). Despite this scientific consensus, more than a decade of political debate about the realities of climate change has not achieved a critical mass of public support toward a national plan for climate adaption and mitigation strategies. A report from the Yale Climate Communication Project shows that climate change deniers and skeptics represent approximately twenty-five percent of the American population and tend to be more politically active than the average citizen (Leiserowitz et al., 2013). While climate skeptics, those that are open to the idea that the climate is changing but doubtful that humans are responsible for it, and climate deniers are in the numerical minority of Americans, they still make up an important slice of the population, occupy important socio-economic positions, such as farming and ranching, and control the political landscape in some regions.

Resources, from both government and non-governmental organizations, have been devoted to climate literacy campaigns with the goal to explain the science of anthropogenic climate change to achieve a public consensus and mobilize people to change how they live to fit new climate realities. Yet Kahan (2013), from the Yale Cultural Cognition Project, explains that garnering support for climate stabilization policies does not simply require climate literacy effort to convey scientifically accurate explanations of climate change. The information dilemma is much more complex.
Kahan (2013) observes that ordinary people typically seek out information that confirms their preconceived beliefs and avoid information that challenges those beliefs. In other words, scientific arguments about the reality and importance of climate change are not likely to change beliefs of those whose cultural milieu and social networks are saturated with arguments dismissive of climate change as a problem. This dilemma raises important questions about whether or not we should continue to expend resources to convince populations of skeptics and deniers about the reality of climate change rather than discover other ways to find common ground and engage deniers and skeptics to support climate change adaptation effort without having to fundamentally transform their beliefs.

In this dissertation, I use an ethnographic case study approach to understand how a farming and ranching community in Churchill County, Nevada, with demographics that well fit the profile of climate change deniers and skeptics, understands climate change, its implications, and policy strategies. My goal is to analyze and describe the social context, attitudes and knowledge, information sources, and everyday practices that shape perceptions about climate beneficial measures among these skeptics. Ultimately, as a means to enhance collective efforts to move forward with policies, technologies, and practices that address climate change, I am interested in identifying strategies with the potential to address climate change while simultaneously appealing to climate deniers and skeptics. Strategies that can provide practical benefits to skeptics and deniers through economic efficiency regardless of whether or not climate change is a serious threat are seen as “no regrets” policies (Adler, et al., 2000).
I conducted interviews within a region that is overwhelmingly represented by those who are climate change skeptics. It is an area with an economy and ecosystem highly vulnerable to a warming climate. It is also an area targeted by public and private interests for renewable energy resource development, such as solar and geothermal projects.

My analysis of interviewee responses, participant observations, and documentary data focuses on three aspects of the climate change problem and adaptive strategies: 1) The need for water policy to adapt to climate change as a means to incentivize adaptation among farmers; 2) The perceived costs and benefits of renewable energy development at the local county scale, and 3) Communication strategies that can highlight multiple benefits of climate solutions for local interests. The scholarly literature on climate denial, science communication, and rural environmentalism guided my initial selection of questions for the interview guide, but I identified the above three inquiry domains as my interview respondents revealed them as significant topics for them in their responses to the questions regarding climate adaptation and renewable energy development.

RESEARCH QUESTIONS

We, as a nation and members of a global community, face a dilemma in how to address climate change. We have adaptation and mitigation strategies, but we need to implement them. I am particularly interested in climate skeptics as individuals who are

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1 I use the terms “climate solutions” and “climate adaptation and mitigation strategies” interchangeably. While no particular strategy or suite of strategies are guaranteed to ultimately solve the issue of anthropogenic global warming, adaptation and mitigation measures are designed to solve problems arising from detrimental consequences of a changing climate. Moreover, “climate change solutions” and “solutions-based” strategies and education are commonly used terms in climate rhetoric.
resistant to incorporating climate solutions in their lives. The objective of the study is to use a ground-level ethnographic method to understand the perspectives of climate skeptics and deniers, also called Doubtfuls and Dismissives, regarding climate change and potential solutions-based strategies. The Global Warming’s Six Americas (Maibach, Roser-Renouf, and Leiserowitz, 2009) describes Doubtfuls as people who are skeptical of anthropogenic climate change and Dismissives as climate change deniers that do not believe the climate is changing. Doubtfuls may believe that the climate is changing but not that the change is caused by human action or that it is cause for concern. A study of ranchers and farmers in Nevada suggests that the majority of them hold Doubtful attitudes toward climate change (Safi, 2011; Liu, Smith Jr., and Safi, 2014; Safi, Smith Jr., and Liu, 2012). Therefore, I expected that my sample population of ranchers and farmers in Nevada would be mostly Doubtfuls, with some Dismissives. My first task then was to assess whether or not my sample did, indeed, consistent of Doubtfuls and Dismissives.

**Research Question 1:** Do research subjects in Churchill County, Nevada hold attitudes similar to the Global Warming’s Six America categories of Doubtfuls or Dismissives, as expected?

To answer this question, I asked participants if they believed the climate was changing, and if so, what they believe is the cause of any perceived changes. I also asked the extent to which they were concerned about climate change and whether there were
any plans (on a personal or community level) to prepare for or adapt to a changing climate.

Briefly, my research subjects do hold Doubtful and Dismissive attitudes. Seventy-four percent of the subjects express attitudes that match the Doubtful group by saying they do believe the climate is changing, but they do not believe that human actions are responsible for the change or that it is a cause for concern. Seventeen percent of the research participants align with the Dismissive audience group denying that the climate is changing at all. The remaining nine percent was undecided on whether the climate was changing or not. I describe their climate beliefs in more detail in Chapter 5.

Next, I needed to understand the study participants’ ideas of climate adaptation. My case study site is an agricultural county in Northern Nevada. Since water is the critical resource for desert ranchers and farmers, I expected that my research subjects would favor water conservation strategies regardless of their climate change attitudes.

**Research Question 2:** If subjects do believe that the climate is changing, regardless of the cause, do they plan to strategically adapt their ranching and farming practices to conserve water? And, if so, how?

To answer this second major research question, I needed to understand several related questions. Do the participants employ water conservation measures already? What is
motivating them to do that? I expected that farmers in the desert would already be efficient in their water use as a means to maximize their benefits of the resource, but I needed to confirm that assumption. If most of the informants are Doubtfuls, then they may believe that the climate is changing due to the variations of natural cycles. Regardless of the cause of the change, if they do believe the climate is changing, are they concerned about future water supplies to the extent that they are planning to adapt to a decrease in water deliveries? Are there other reasons or influencing factors that are motivating them to decrease or change their water use?

I found that water conservation practices were already implemented by all the farmers that I observed, not in response to climate change concerns but because of the arid environment they farm in. Despite the belief that the climate is changing, there was no concern that climate change would affect future water supplies, so there is no motivation to further invest in water conservation measures. The water infrastructure that currently delivers their water has been in place for more than a century and has seen the agricultural community through past droughts, so they believe it will continue to ensure a water supply through future any future droughts. Additionally, I found that the current water policy system actually discourages water conservation through the “use it or lose it” principle that guides western water law. They perceive a more immediate and consequential threat to their water supply is competing water interests from urban growth and wildlife protection advocates. Farming practices have evolved to incorporate water conservation, but I argue that water policies also need to evolve in order to provide secure water rights for farmers to any water they save through conservation efforts. By legally ensuring access to future water, farmers will feel
incentivized to modify their farming practices and incorporate adaptive technologies to save water in the face of impending drought. Without such policy, they will continue to use large quantities as they have always done and, in fact, have been encouraged to according to the present “use it or lose it” water regulations they work under. Chapter 5 further explains in more detail the perceptions and policies involved in climate adaptation through agricultural water conservation.

Climate change has raised the profile of renewable energy as one part of the solution to excessive carbon emissions. National surveys have shown Doubtfuls and Dismissives are more likely to favor developing nuclear and oil and gas for energy generation as opposed to building new renewable energy power plants (Maibach et al., 2009), yet a survey conducted in Nevada showed that Churchill County farmers and ranchers were generally supportive of national policies to develop renewable energy (Safi 2011; Smith Jr. et al., 2014a). I expected that, due to political ideology and not-in-my-backyard (NIMBY) opposition, Doubtfuls and Dismissives in my sample would not support renewable energy projects to help mitigate climate change. I hypothesized that the previous finding of support for renewable energy (Safi, 2011; Smith Jr. et al, 2014a) was more likely to be explained by an expectation of economic benefits flowing to Churchill County via taxes and jobs from the new energy developments.

**Research Question 3:** Are Doubtfuls and Dismissives in Churchill County supportive or renewable energy developments and if so, what is the nature and basis of that support?
To answer that question, I first needed to confirm the level of support for renewable energy from my informants and ask them to rank their preference of technology for energy production. What reasons do they give that have generated the varying amounts of support for the different technologies? Is there NIMBY opposition to the local renewable energy industry or is it welcomed in the county because of the economic benefits it creates? Given the informants’ responses, how might this population support the development of clean energy?

Briefly, I found there was support for the renewable energy industry, but it was relatively weak. When given a choice, 72% of the research participants actually preferred fossil fuels or nuclear technology over renewable energy generation, but their arguments opposing renewable energy did not stem from NIMBY sentiments. The subjects objected to policies they perceived as incentivizing renewable energy developments at a cost to the local community. Individual states have more flexibility in implementing climate mitigation policies than the federal government (Goulder and Stavins, 2011; Lutsey and Sperling, 2008; Engel, 2006). Nevada, specifically, has encouraged growth in the renewable energy sector through several state policies including a Renewable Portfolio Standard and tax abatements. However, those tax abatements mean a decrease in revenue from renewable energy developments at both the county and state level. Churchill County considers their renewable energy resources as a local economic good, not necessarily a global good for mitigating climate change. To garner local support, arguments favoring renewable energy must emphasize local benefits for local residents. Government incentives that decrease or eliminate benefits to the local communities are not supported by rural residents even if they support the
concept of developing renewable energy. Incentives like subsidies and tax abatements lead my informants to believe that renewable energy technologies are not developed to the point where they should be implemented on a large scale. They support more research and development of renewable technologies, but not the implementation of local projects that need to be subsidized by the government. To garner more support from conservative populations in rural counties where renewable energy projects are going to be sited more often in the future, I suggest that the analysis of costs and benefits of state policies show benefits to the local counties, not just statewide impacts. I explore the complexities of renewable energy support by rural conservatives in Chapter 6.

Based on Liu et al. (2014), I expected to find support for renewable energy in the conservative county. My expectations led to further questions regarding communication. Research (Davidson, Williamson, and Parkins, 2003; Smith, Anderson, and Moore, 2012; Smith Jr. et al., 2014a) suggests that rural, conservatives are fairly closed to new ideas and distrust climate change scientists, making them an especially challenging audience group for messages about climate change and adaptive strategies. Given this, I asked:

**Research Question 4:** What local messages generate support or opposition for climate change adaptation and mitigation strategies?
To answer this question, I needed to know if there were local messages circulating in Churchill County, what were those messages, and how were they communicated? What aspect of the messages resonated with the informants? Are there specific messengers within the community that act as opinion leaders that have successfully garnered support for renewable energy or climate adaptation? Assuming that the conservative community does not have vocal advocates for climate change solutions, I wanted to learn more about the specific sources of knowledge that the subjects refer to as important to their worldview and their daily decision-making in their work and family lives. I wanted to know if there was potential for climate change messages, relevant to rural communities, to be integrated into these sources of information that the informants already use as a reference. My hypothesis is that strategies are being ignored as solely responses to climate change rather than being viewed as mutually beneficial, “no regrets” policies and practices that offer a wide array of benefits. Rather than portrayed as climate change solutions, can similar strategies be communicated in the context of energy and water efficiency by relevant and trusted information sources?

There were some locally generated messages in favor of the geothermal industry, but most of the messages about renewable energy were about the cost and subsidies associated with the technology. My research indicates that rural, conservative populations do not identify scientists as authorities to be deferred to regarding policy decisions. Similar to other audience segments, these conservative populations tend to defer to family and friends, people with shared experiences that they can relate to, for information and advice. Since Nevada farmers do not relate to academics or scientists, they tend to discount any information from these sources that counters any of their
preconceived beliefs. I argue that more dialogue between those with scientific messages and conservative populations and the sources they already trust would create a collaborative experience, increasing the relevancy and credence of the scientific messages concerning climate change for this audience group. Scientists must acknowledge farmers as experts in their own fields. Participants referred to knowledge they gained through their professional networks and trade magazines as trusted sources. I believe it is possible to use these trade sources as vehicles to convey climate change solutions as “no regrets” practices. Articles can connect scientific messaging with examples of climate mitigation or adaptation practices in their respected trade magazines and other familiar information sources, thus demonstrating the practical economic and ecological benefits of climate mitigation or adaptation strategies. Chapter 7 explores where informants receive their information from and how expertise is a social construct. The broader implications of how to communicate with climate change skeptics and deniers is discussed in Chapter 8.

SIX AMERICAS ON CLIMATE CHANGE

I structures my research based on the most comprehensive analysis of climate change beliefs in the United States, Global Warming’s Six Americas: An audience Segmentation Analysis report (Maibach et al., 2009). For the purpose of this dissertation, I will continue to refer to this project and its body of reports as the Six Americas Project.² The Six Americas project is a broad cross-sectional survey designed

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² A full collection of publications, surveys, and other materials produced by the Global Warming’s Six Americas project is available at http://environment.yale.edu/climate-communication/. Since the original survey that identified the six audience segments in 2008, follow up surveys have been conducted in subsequent years as well as additional surveys that focus on specific audience groups (e.g. meteorologists) or topics (e.g. climate knowledge or climate in the media).
to understand and categorize the range of beliefs and concerns about climate change held among the U.S. population. Researchers sorted Americans into categories along a spectrum based on their beliefs towards whether climate change is happening, their concern for climate change, knowledge of climate change causes, and motivations to act to mitigate climate change. Follow up surveys have been conducted in subsequent years as well as additional surveys that focus on specific audience groups or topics like climate knowledge or climate in the media.

I am interested in the audience segments referred to by the Six Americas Project as Doubtfuls and Dismissives, similar to climate skeptics or deniers. According to the Six Americas Project, Doubtful audience members are split on whether they believe climate change is happening or not happening. Many believe that if it is happening, it may be a natural phenomenon, which does not require a lot of attention and poses a minimal threat. Any climate change they have noticed or acknowledge is viewed as a natural transformation and the consequences will be relatively mild and familiar. Dismissives typically do not believe that global warming is happening at all. Doubtfuls and Dismissives are politically conservative, support relatively unrestrained free market capitalism, and claim that public policy actions to limit greenhouse gases would be economically catastrophic. Consequently, Doubtfuls and Dismissives are least likely to affiliate with liberal, environmental groups and most likely to advocate for delaying any action to curb greenhouse gas emissions. Importantly, while Dismissives are the smallest of the populations identified in the Six Americas report, they are also just as politically active as the most concerned, motivated group, the Alarmed. My sampling of
rural Nevadans were mostly Doubtfuls (17), with a few Dismissives (4) and Concerned (2).

Communication strategies that focus on enhancing peoples’ science literacy ignores the fact that people process facts based on their previously held beliefs. I argue that there needs to be a change to the principle communication strategy used by the science community and proponents of climate change solutions from this literacy-based strategy to one that acknowledges the perceptions and beliefs of the target audience. Climate change messages need to explicitly show how climate beneficial measures also correspond with their target audience’s beliefs. The crucial question, then, for climate change science and public policy advocacy is: Can the attitudes and beliefs of Doubtfuls and Dismissives be incorporated into messaging about climate change mitigation and adaptation policies in ways that garner support from these groups, and, if so, how? My research uses a case study approach to answer that question by developing qualitative insights into how climate change Doubtfuls and Dismissives construct their opinions of energy and climate policies and technologies.

BEYOND THE DEFICIT MODEL

This is not a study to demonstrate how to better create knowledge-based messages to increase climate literacy, nor is this project primarily focused on the dynamics of siting renewable energy projects. Rather, this is a study to analyze the perceptions of a target audience groups to identify conceptual frames and associations that simultaneously resonate with climate change skeptics and encourage support for climate change policies and technologies. Most climate literacy campaigns work off of the knowledge deficit model, which assumes that the American public needs more
information and better understanding of the climate issue in order to take effective action to achieve climate stabilization. Social science research increasingly shows that one’s personal beliefs and attitudes have more influence on how receptive a person is to climate change messages than the logic and content of those informational messages (Agrawal and Maheswaran, 2005; Jain and Maheswaran, 2000; Taber and Lodge, 2006; Kahan et al., 2011).

The traditional deficit model of literacy-based messages suggests that those who doubt or dismiss strong scientific claims, such as messages that identify climate change as real and human-caused, are simply ignorant of the facts and require more information (Schulz, 2010). However, recent research suggests that the deficit model offers an overly simplified approach to understanding the factors shaping perceptions among Doubtfuls and Dismissives (Kahan et al., 2011; Weber and Stern, 2011; Jain and Maheswaran, 2000; Taber and Lodge, 2006). For instance, recent communication scholarship suggests that the messenger may be more important than the message, so identifying where or from whom the study population gets its information about climate change is critical (Weber and Stern, 2011). Messages that do not fit with an audience member’s preconceived beliefs, no matter the accuracy of the message, do not change those beliefs. Climate messaging that uses data does not convince skeptics that anthropocentric climate change is happening, rather it seems to more strongly polarize them as skeptics (Kahan et al., 2011). I think it is possible to identify shared goals between the highly polarized viewpoints of those who believe anthropocentric climate change requires us to take immediate action and those who do not believe climate change poses a threat. My purpose in this case study is to identify those shared goals
and suggest communication strategies that would highlight those common objectives and encourage support for climate change strategies.

CASE STUDY SELECTION

My research offers a case study approach to understanding some of the pitfalls and potentials of the climate communication process. I focus my analysis on the agricultural area of Churchill County, Nevada, which lies an hour east of Reno where U.S. Interstate 50 and U.S. Interstate 95 intersect. Fallon is the largest town in the county and acts as the county seat. In addition to the farms there, most of which grow feed to support the local dairy industry, there is also a large, active US Naval air base located just outside of Fallon that contributes to the local economy. Chapter Four provides a more in depth description of the case study with maps.

I selected Churchill County for the case study based on several factors. The demographics and attitudes provided by a Nevada survey supported my expectation that the target audience of Doubtfuls and Dismissives can be found there (Safi, 2011; Liu et al., 2014; Smith Jr. et al., 2014a). As an agricultural community, the residents there rely on scarce hydrological resources and are particularly vulnerable to climate change (Safi, 2011; Liu et al., 2014). Churchill County has several geothermal energy developments that have been operated within the county for decades already, and it is slated for several more large geothermal developments. It has recently gained press for the first hybrid renewable power plant in the nation with the Stillwater Solar project being built adjacent to an existing geothermal plant (Meehan, 2011). Prior contacts with a local agriculture conservation group, the Lahontan Valley Environmental Alliance, provided initial entrée to a network of county residents. Choosing this site for a case
study allowed me to explore the concurrence of climate change mitigation in the form of renewable energy developments amongst a population skeptical of anthropogenic climate change despite their vulnerability to its impacts (Safi, 2011; Safi et al., 2013).

METHODS

I conducted my case study using ethnographic field methods, such as interviews and participant observations, to gauge attitudes, perceptions, and informational sources among respondents. I was in the county for a month living with a local family who, in addition to their full time jobs, had a ranch on one hundred acres. Living with a local family allowed me the opportunity to do participant observations during informal interactions with county residents at social occasions. Using purposive and snowball sampling, I was able to interview 25 residents of Churchill County that spanned the main economic sectors of the area: Military, agriculture, local business owners, and geothermal operations. The interviews were semi-structured using a list of questions to guide the conversation across the topics of climate change, adaptation, renewable energy, and experts and sources. The interviews were recorded and transcribed allowing for analysis along the themes of climate communication, adaptation, and support for renewable energy policy. I offer a more detailed discussion of my methodological approach in Chapter 3, and the interview guide is provided in Appendix A.

SIGNIFICANCE

Using rural Nevadans as an example of the larger Doubtful/Dismissive group, this study allows me to explore further the viewpoint of an audience that tends to disbelieve that global climate change is caused by humans, if it is even happening at all.
My research highlights what perspectives and beliefs are held in common by this conservative audience and the scientists, decision makers, and policy advocates that are advocating climate change mitigation. Additionally, in many instances a great deal of time, effort, and money has been expended on renewable projects that fail due to siting issues because the local audience was not well understood (Hartford, Staffrod, and Reategui, 2011; Smith and Klick, 2007). This research can provide insights about conditions under which even ardent climate skeptics may support renewable energy, which policy strategies they believe are worthy of support and investment, and how to enhance climate change communication strategies targeting climate change skeptics.

The broader impact of this study can extend beyond Nevada. Many western states (i.e. Idaho, Utah, Oregon, and New Mexico) have rural, conservative populations who shape state and federal approaches to energy and climate policy. The lessons learned from this research could prove to be useful in those areas as well. Moreover, a continued delay in a national energy policy means that state level policies could be the impetus to our independence from fossil fuels (Harvey, 2011). As such, regional and state level audience analysis will be more important than nation-wide surveys to better unite a state’s population behind the best energy policy available based on the region’s resources.

Water policy is also established at the state level. As such, audience analyses at the county and district level are required to better understand the needs and perceptions of the constituency. Western states share similar principles that shape water policy. As climate impacts different regions in the West, states will need to evolve water policies to maximize the efficiency of their water systems. My research illustrates
the disincentives to water conservation and climate adaptation as perceived by the agricultural water rights holders in Nevada. Their perceptions could inform policy makers in other western states as well.

I have organized the dissertation around three analytic themes that emerged from informants’ responses: The need to adapt to a drier climate; renewable energy policy support; and communication strategies based on trusted sources. I use these themes to focus analytic chapters which explain: 1) how current policies and perception provide a disincentive for climate adaptation and how that might be overcome; 2) explore the multiple concerns that inhibit rural conservatives in the West from supporting government policies that encourage renewable energy development; and 3) describe my target audience and explain my recommendations for effectively communicating climate solutions with an engaged, if skeptical audience. Before moving into my analysis, I begin in Chapter Two by reviewing the literature on the social construction of climate change and climate communication strategies, climate challenges in rural communities, and renewable energy development. Chapter Three explains the methodology used to collect and analyze data. In Chapter Four, I provide a rich description of the context of the case study community, Churchill County, Nevada. Chapter Five explains how current water policy in the West is designed to maximize the use of water, but does not account for needs of a changing climate. I will describe current water policy and how it is perceived by my case study subjects. Additionally, I will discuss potential policy changes that could encourage more aggressive water conservation from farmers. Chapter Six describes the levels of support this conservative community has for renewable energy policy. I discuss the difference between the
developments of large projects in the vast landscape of the West, where the federal government is a large landowner, to energy projects prevalent in most of the literature where developments are sited on private land east of the Rocky Mountains. I also illustrate the concern the study subjects have regarding policies and costs related to the renewable energy industry beyond any association with climate change. Chapter Seven is a discussion of my analysis and recommendations of science communication strategies that target this politically conservative audience. Chapter Eight is the concluding chapter that discusses the broader impacts and implications of my research, particularly highlighting science communication strategies.
CHAPTER TWO: LITERATURE REVIEW

My research is guided by previous scholarship on climate science, climate change denial, science communication, and rural environmentalism. The first section of the literature review discusses how climate change is more than a measureable change in global climatic trends; it is also a socially constructed problem that has become part of the polarizing political landscape in America. The literature discusses how people can disregard scientific data when it is inconsistent with their own social norms, suggesting that messages about climate and climate change solutions need to be audience-specific. I review what the literature has to say about a conservative audience from a rural region and the challenges to climate communication that can be expected. This literature guided my selection of interview questions used to identify a participant as a climate skeptic or denier and to determine which sources and messages resonate with the study community.

The next section of the literature review looks at how climate is expected to impact farmers in the West. The biggest impact would be through a decrease in water supply and an increase in water demand for the arid region. Not only would that directly impact the farmers, but it could also set off changes in policies and markets that would impact the competition for water rights. Most farmers do believe the climate is changing, but they do not have adaptation plans in place since they believe it is part of a natural cycle that poses no more of a threat than past droughts have.

Lastly, I summarize the studies done regarding siting issues for renewable energy developments. Nevada has been pursuing renewable energy development as a
means to diversify its economic foundation. I will explain some of the policies that have been implemented to encourage growth on the clean energy industry in Nevada, and review the literature concerning how other communities have responded to local renewable energy developments.

THE SOCIAL CONSTRUCTION OF CLIMATE CHANGE

Approaching climate change as a socially constructed problem requires understanding the perspectives of audience groups. Social constructionist perspectives on climate change suggest that people give meaning to the world based on their views and social norms (Demeritt, 2006; Swim, Stern, and Doherty, 2011). Scientific messages about climate change emanate from a network of scholars with different norms and value systems than many of the lay public adhere to in their day-to-day lives. Kahan et al. (2011) explains that it is perfectly rational for a person’s beliefs to be governed by their social norms and those norms may contradict scientific assumptions and knowledge. Adhering to community norms may help individuals avoid dissonance, secure community status, and insure their personal well-being. The conundrum for scholars and practitioners interested in communicating science-based climate change information to skeptics and deniers is how to connect with them on a normative basis to align with their pre-existing, socially constructed personal and community-based perceptions.

AUDIENCE BASED COMMUNICATION THEORIES

Below, I review several audience related theories of communication, interpretation, and action. Each theory addresses the question: How is the same message perceived differently by different audiences? The problem of discrepancy
between evidence, interpretation, and action, is a crucial issue for understanding the problems in climate change communication. Scientists, as an audience group themselves, tend to believe that empirical evidence speaks for itself. On the contrary, communication and cognitive psychological studies demonstrate that audience members do not always react as expected when given data, and that is clearly true with the case of global climate change.

**Cognitive Dissonance**

Leon Festinger developed cognitive dissonance theory in 1957. Cognitive dissonance theory states that people seek consistency. When people hear a message that is inconsistent with what they believe or want, they will find ways to restore that consistency. Messages may offer no conflict because they are irrelevant to other ideas formerly held or could be consonant with previously held beliefs, which would tend to reinforce each idea. However, messages can be inconsistent or mutually exclusive with current beliefs. While climate change is backed with solid scientific evidence, it may still contradict other ideas like remembering a cold winter, trusting a leader that says climate change shouldn’t be a concern, or thinking that the expense of climate solutions would be a worse hardship than any impacts from a changing climate.

People are compelled to resolve any inconsistencies between ideas and beliefs. It is easier to reduce dissonance by changing one’s mind than by changing one’s behavior (Gifford, 2011). That being the case, there are several strategies to eliminate the conflict between ideas. First, they can change one of the ideas to bring it in line with the other. A person can be convinced by the evidence and change their position so that they believe that anthropogenic climate change is occurring and needs action to be
taken now. Or they can change their belief that scientists are trusted experts. If you disregard the expertise of scientists, any facts they produce are no longer considered convincing evidence. Secondly, a person can reduce the importance of one of the ideas. Climate change is happening, but it is naturally occurring, so it is nothing to worry about or the impacts won’t be significant. Thirdly, a person can introduce a third idea into the equation that brings the conflicting beliefs into balance. Climate change is occurring and is caused by humans, but God will always provide and so no action is needed (Smith Jr. et al., 2014a). A final strategy would be to actively seek information that validates and supports the person’s original beliefs, and conversely avoid information that contradicts their beliefs. This final strategy is consistent with the cognitive process of motivated reasoning, which I will discuss further after explaining the Elaboration Likelihood Model.

THE ELABORATION LIKELIHOOD MODEL

The Elaboration Likelihood Model (ELM) states that messages are processed through one of two routes: The central route or the peripheral route. When an audience member receives a message and uses their own logic to elaborate on the ideas of that message, the message leaves a more permanent idea with that audience member. The central route is used for content-based messages using logical processing. A message that takes the peripheral route relies on a spokesperson, or music, or graphics or some other way of appealing to the audience. A message received through the peripheral route is not as strong since they are evaluating meaning based on a quick glance rather than through deliberation (Borchers, 2004).
The route that a message takes depends on the audience member’s ability to understand the information within the message as well as their motivation to listen to the message. Is the message relevant to them? Do they have a need that this information may fulfill? Are they being held accountable for this information? If they do not perceive the significance of the message or if the information is in a form they cannot understand, then the audience will rely on peripheral understanding of the message and it will not result in strongly held beliefs or motivate them to action.

While centrally routed messages may seem to be the strategy scientists use to convince the American public that anthropogenic climate change is occurring and requires action on their part, it requires the individual to be motivated to process through the information and the knowledge to logically build on the information given. A centrally routed message means that audience members elaborate on the content themselves using their own logic, but it does not mean that the result of the process will be the conclusion the communicator was hoping for. As is seen in the cognitive process of motivated reasoning, the audience can create their own conclusion contrary to the evidence presented in the message through their elaborative process.

**Motivated Reasoning**

Motivated reasoning theory states that people’s prior preferences affect how they process new information. In many cases, the counterarguments that are triggered when receiving a preference-inconsistent message (which occurs when climate skeptics receive scientific message stating climate change is a significant concern for all), actually allows the person to elaborate more and, thus, strengthen those counterarguments previously held in their head rather than opening their mind to new information (Jain
and Maheswaran, 2000; Taber and Lodge, 2006). Those that already disbelieve in the idea of anthropogenic climate change will read any study and find the faults (no matter how few or insignificant) and use that as reasons to discount the study.

As mentioned in the ELM description, how one processes information is dependent on their motivation when seeking the information. A peripherally routed message may use simple heuristics such as “length is strength”, “consensus is correctness”, or “complexity is expertise.” However, a person will elaborate on a message if they have incentive to do so. Motivated reasoning literature identifies three types of motivation: Accuracy goals to discern valid arguments and correct conclusions; defense goals to bolster existing beliefs and deny counterarguments; and impression goals to express attitudes that will satisfy interpersonal and social goals (Agrawal and Maheswaran, 2005). For accuracy motivated audiences, a strong argument may provide enough incentive to persuade them; however, for others, an argument consistent with their social values and beliefs is all that is needed to persuade them. In fact, usually the incentive and motivation to read a message is to find an argument consistent with their beliefs. In this way, individuals do elaborate on the message more, but they do so by interpreting the facts to match their own prior preferences.

People tend to not be aware of their prior attitudes and believe that they are being objective and fair minded; however, studies show that they actively seek out information that supports their preferred view and ignore or argue against preference-inconsistent messages (Taber and Lodge, 2006). Despite scientific evidence, prior beliefs compel audiences to process information in such a way so as to justify their belief rather than have them be sure that belief is based on evidence. Taber and Lodge
(2006) suggest that this compulsion is a result of emotional responses associated with messages. They suggest that if an individual were to consider changing a previously held belief, they may consider all the time and effort that was invested in forming and updating those beliefs a waste of time. Nobody likes to consider their investments a waste, and so a negative association is made with messages inconsistent with their original beliefs.

A study done by the Yale Cultural Cognition Project (Kahan et al., 2011) sought to answer the question of whether people disagree with the prevalent climate science because they do not know enough science, are not able to rationally work through the data and arguments, or are guided by cultural norms. They concluded that it is indeed cultural norms that filter information. In fact, they showed that the more informed the audience and the higher their ability to reason, the more polarized they became towards the beliefs of their particular cultural group. The literature shows that literacy-based messages will not work for those who have already made up their minds that climate change is not anthropogenic and not a threat that deserves national attention.

AUDIENCE DESCRIPTION

Preconceived beliefs affect how an audience assimilates messages, even when those messages are based in scientific fact. The literature based in communication sciences and social constructionist theory explains that for more effective communication of climate change adaptation and mitigation strategies, a tailored message to target audiences sensitive to their perceptions and attitudes is needed (Weber and Stern, 2011; Gifford, 2011). In order to create such messages, there is a
need for focused ethnographic analyses of various audience segments. In this section I discuss the literature describing the audience targeted in my research.

**Doubtfuls and Dismissives from the Six Americas Project**

The Six Americas project is conducted by the Yale Project on Climate Change Communication and the George Mason University Center for Climate Change Communication. Using data from a nationally representative survey, researchers sorted Americans into six audience groups or “Americas” based on their climate beliefs, concern, behaviors, and policy preferences (Maibach et al., 2009). Figure 1 shows the percentage of Americans that falls into the six audience segments since the initial survey in 2008 (Leiserowitz, Maibach, Roser-Renouf, Feinberg and Howe, 2013).

![Figure 1. Global Warming’s Six Americas -2008-2012 (Leiserowitz et al., 2013)](image)

The Alarmed segment is the most committed to addressing the anthropogenic causes and consequences of climate change. They are convinced global warming is happening, that it is caused by humans, and that it is a serious and imminent threat.
They are making changes in their own lives to combat climate change and support government action on the subject. The Alarmed is the third largest audience segment, and the most likely to take political action on the subject, although only about a quarter have done so. This group tends to be more representative of middle-aged, college-educated women.

The Concerned audience is the largest of the Americas. Members of this audience segment are also convinced anthropocentric climate change is happening and support national policies, but are less likely to take personal action. They believe that a changing climate is more a threat to other nations or future generations and as such, they support societal action but are unlikely to engage in it themselves since they don’t perceive global warming as a direct threat. Concerned individuals tend to be moderate Democrats. Together, the Alarmed/Concerned segments make up almost half of the American public (45%). Two of my sample population fall into this category.

Those individuals who make up the Cautious segment are not completely convinced that the climate is changing or what the cause of any change might be. They tend to believe anthropocentric climate change is occurring but easily change their mind. The Disengaged audience segment has thought the least about the topic and admit they do not know much about climate issues. These two audience groups make up the middle of the spectrum of the Americas. They represent one in three Americans (34% of the American population). Members of these groups tend to be politically moderate, but also politically inactive. Climate literacy campaigns target these audience segments that lie in the middle of the Six America belief spectrum with the belief that with more information these individuals would become more concerned about climate
change. However, they are the most inactive of the six audience segments, and inspiring action does not come automatically with convincing someone of facts. I focus my research on the Doubtful/Dismissive audience segments which have shown that they are just as politically active as the Alarmed/Concerned audiences, although they work towards different goals.

The Doubtful group can also be called climate skeptics. Doubtful audience members are evenly divided on whether they believe climate change is happening, not happening, or they do not know either way. Many believe that if it is happening, it may be a natural phenomenon that poses a minimal threat and requires little if any societal action. They fear that any action taken by the government to address climate change would prove to be more costly than beneficial. Doubtfuls are more likely to be older, white males with higher education levels and high incomes. The large majority of my sample population (17) fall into this category.

Dismissives are climate deniers. They typically do not believe that global warming is happening at all. They are politically conservative, support relatively unrestrained free market capitalism, and claim that public policy actions to limit greenhouse gases would be economically catastrophic. Dismissives have though a lot about the issue and don’t believe they need any more information to their stance on the subject. Dismissives are least likely to affiliate with liberal environmental groups and most likely to advocate for delaying any action to curb greenhouse gas emissions. Importantly, while Dismissives are the smallest of the populations identified in the Six Americas report, they are also just as politically active as the most concern or motivated group, the Alarmed. As active groups, if common ground can be found between the
Alarmed and Dismissive ends of the spectrum, a critical mass of active Americans will be unified to bring about the changes needed for a sustainable future, including both climate and economy. Four of my sample population are a part of this audience segment.

Dismissives are not simply ignorant of the scientific facts on climate change. On the contrary, a follow up to the Six Americas report (Leiserowitz and Smith, 2010) assessed the climate knowledge of each category population and showed Doubtful/Dismissives to be knowledgeable about atmospheric science. The Alarmed and Concerned groups demonstrated a more comprehensive understanding of the climate system, causes and consequences of climate change, and policy solutions; however, the Dismissive and Doubtful groups outscored the Alarmed and Concerned groups in correctly understanding that the greenhouse effect refers to gases in the atmosphere that trap heat, and they are less likely to incorrectly associate the greenhouse effect with the protective ozone layer. Common misconceptions that the Alarmed and Concerned audiences embrace, such as the idea the aerosols in spray cans and the hole in the ozone layer are significant contributors to global warming, were more accurately understood by the Doubtful and the Dismissive groups.

As Schulz (2010) and others show, communication strategies that focus on enhancing peoples’ science literacy ignores the fact that people process facts based on their previously held beliefs, meaning that there needs to be a change to the principle communication strategy used by the science community and proponents of climate change solutions. Instead of a literacy-based strategy, a more effective strategy may be to understand the perceptions and beliefs of the target audience and discover where
climate change adaptation and mitigation strategies correspond with those perspectives. The crucial question, then, for climate change science and public policy advocacy is: Can the attitudes and beliefs of Doubtfuls and Dismissives be incorporated into messaging about climate change solutions in ways that garner support from these groups, and, if so, how?

POLITICS

In this study, I follow research that suggests the primary factor shaping Doubtful and Dismissive attitudes toward climate change lies not in individual personality or cognitive deficiencies, but in the way that climate change solutions are associated with values through communication strategies. Climate change messages threaten political ideals held by Doubtfuls and Dismissives (Goodman, 2011). I argue that messages that are sensitive to the communal beliefs and political attitudes of target audiences will create more support for climate change mitigation and adaptation than literacy-based messages.

Gifford (2011) explains how ideologies can be psychological obstacles to accepting anthropogenic climate change. Political ideologies are a significant obstacle. As researchers measure the knowledge, beliefs, and attitudes of Americans it becomes clear that more and more Americans are viewing climate change through a political lens (Leiserowitz et al., 2009; Pew Research Center, 2010; Safi, 2011; Safi, Smith Jr., and Liu, 2012). Naomi Klein, author and journalist, explains that no matter how scientists explain the climate change issues, conservative members of the public, like Dismissives, always see climate as a political issue (Goodman, 2011). The idea that conservatives view climate change as a strictly political issue is supported by the Six Americas Project.
and the parallel study with meteorologists (Maibach, Witte, and Wilson, 2011). Klein explains that key political objections to climate change policies stem from the fact that mitigation policies are seen as examples of an over-reaching, big government (regulation, taxes, international treaties, threats to free trade, and even socialist ideas of redistributing wealth through localized economies and polluter pays schemes).

Moreover, climate change is often reported as a political issue rather than a science issue, which reinforces this belief for conservatives.

McCright and Dunlap have multiple publications (2000; 2011a; 2011b) describing the conservative movement’s counter claims to anthropogenic climate change. Their article in the Sociological Quarterly (2011) explains that the political polarization of the American public includes the scientific issue of climate change so that there is a now a “culture war” where the American conservative movement defends the current economic system by challenging the scientific community, environmentalists, and liberal policymakers that would advocate regulatory strategies to resolve climate issues. McCright and Dunlap (2011a) explain that it is “conservative white males” that contribute significantly to the high level of climate change denial in the United States through their influence and affiliations with conservative political and industry organizations. An academic research paper by Theda Skocpol has gained some notoriety by blaming environmental advocates for being politically naïve and underestimating how the polarized public eliminates the critical mass needed to create change (Goldenberg, 2013). Skocpol recommends going beyond professional political bargaining in the nation’s capital by building organizational networks across the country that will address the values and interests of the citizens directly. My research shows
how the values and interests of the politically conservative can be addressed on a local, regional scale rather than with national political rhetoric.

Psychology of a Climate Skeptic

*American Psychologist,* the flagship journal of the American Psychological Association (APA), has published a special issue on “Psychology and Global Climate Change.” In the special May-June 2011 issue Robert Gifford (2011) outlines what he terms as the “Dragons of Inaction,” which refer to psychological barriers to the behavioral changes that are needed to confront and mitigate climate change. It is important to learn more about which of these obstacles are relevant to climate skeptics so that they can be overcome. Among these barriers are some of the obvious issues that fall into the category of Limited Cognition: ignorance of the problem, discounting of future and distant impacts, and optimism biasing that allows people to think bad things will never happen to them personally.

Social norms and comparisons are another psychological barrier to behavior change. Conservative groups have strong social networks and often go to family and neighbors for information more than they go to experts. As such, there is a reinforcing wall formed through a circle of friends that keeps one’s behavior conformed to the social norm. Any behavioral change to mitigate climate change would risk judgment by others and could cause a lowering of self-esteem. Moreover, climate change has become a form of social identity (Doherty and Clayton, 2011). By admitting whether or not a person believes that anthropogenic climate change is occurring, they are publicly identified as belonging to one faction or another. Conversely, the social group
one identifies with can embed within them the belief of whether climate change is happening and what could be causing it.

Efficiency and frugality are commonly held values. As such, a psychological barrier that they might be particularly sensitive to is the idea of lost investments or sunk costs (Gifford, 2011). People invest money in things and expect a payoff at the end. The truck is paid off, why trade it in now for a more gas efficient model? How long will the payback be on costlier proposed solutions like solar panels or new wind turbine technology? An investment of time is also expected to provide an efficient payoff. It takes so much time to read labels and research products. Is it worth it? Many of the habits that are formed that are so hard to break are a result of evolved time efficient processes.

The public perceives uncertainty completely differently than how scientists use the term. The public sees uncertainty as a justified reason to ignore whatever data is associated with it (Gifford, 2011). Scientists use probability to gauge uncertainty, but most people tend to perceive uncertain events with an affective response (Weber and Stern, 2011), meaning risk is associated with an emotional response; fear, dread, anxiety. This is an evolutionary response; it is a fast and automatic cognitive process, unlike logical processing. If a risk is not immediate, then it may not trigger the emotion needed for action. For climate deniers or skeptics, they expect the climate in the future to behave the same as climate in the past; it will be familiar, normal, and has a low risk factor with it (Weber and Stern, 2011; Smith Jr. et al., 2014a). Denying climate change, is a way to alleviate distress caused by the perceived risk to physical well-being or the risk associated with changes to their economic prosperity (Doherty and Clayton,
In fact, the Six Americas report shows the strongest emotion associated with climate change among the Dismissives is not fear or anxiety, but disgust and anger. *American Psychologist*, Weber and Stern (2011) state that “success in dealing with climate change in the long run on a global scale will depend in part on developing a better understanding of cultural differences in values, beliefs, and goals that influence climate change perceptions and actions.” My research is a response to the literature stating the need for insights into targeted audiences.

**Rural Characteristics Affecting Perceptions of Climate Change**

I chose a rural county in Northern Nevada to gain insights from a conservative population for my case study. Urban environments tend to be populated by young liberals whereas rural areas tend to be made up of older, conservative citizens (Alm and Witt, 1997; Huddart-Kennedy, Beckley, McFarlane, and Nadeau, 2009; Safi et al., 2012; Liu, et al., 2014). Figure 2 shows the breakdown of political ideologies by county from a 2012 presidential election poll. As the map indicates, rural voters are reliably Republican and enjoy high levels of control over governorships and state legislatures (King Jr., 2012). In addition to being primarily politically conservative, and thus more likely to be doubtful or dismissive of anthropogenic climate change, there are other characteristics of individuals in rural areas that may make them less inclined to believe scientific reports attributing a changing climate to human practices.
Despite being at risk from climate change because of their economic dependency on natural resources, the social dimensions of rural communities limit their potential to perceive climate change as a risk or have the capacity to adapt to it (Davidson, Williamson, and Parkins, 2003; Safi et al., 2012; Liu et al., 2014; Smith Jr. et al., 2014a). Vulnerability to climate change is as much a function of values, history, and other local socio-economic and political considerations as it is a function of biophysical processes (Safi, 2011; Gautam, Chief, and Smith Jr., 2013). If the rural residents do not perceive climate change as a risk, then they are not likely to plan for infrastructure changes to adapt to the changed climate. Climate change is a global problem that is
attributed to large fossil fuel corporations more than personal behavior. Living in a small town with small economic or political contributions to the world or even the state at large would make the residents feel that this is a problem removed from their control and therefore not a problem for them to deal with (Davidson, Williamson, and Parkins, 2003).

Localized impacts from climate change can appear as pre-existing or isolated events, so that even communities that are experiencing climate change would not recognize it (Davidson, Williamson, and Parkins, 2003). For most of Nevada, expected impacts include warmer nights, warmer winters, more variability in weather, and increased duration and intensity of droughts (Redmond, 2013; Tahoe Environmental Research Center, 2013; Western Regional Climate Center, 2014; Coats et al., 2013; Guida et al., 2014). None of these impacts would be considered unusual on their own. It is only when we look at the pattern of these events over time that we see a changing trend. Farmers in Nevada are not strangers to drought or extreme heat. My research shows that they do recognize warmer local winters, but since the water supply comes from snow packs in other areas, they do not see their observations of warmer winters as a negative impact.

Climate change messages are often associated with environmentalism, which rural, resource dependent communities often perceive as an oppositional political force (Davidson, Williamson, and Parkins, 2003). This opposition is usually fueled by the perception that environmentalism harms economic growth and jobs due to state and

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3 Climate change and droughts are often referred to as creeping hazards. Creeping hazards occur so slowly, with no distinct beginning or end, that they are often not recognized as occurring at all (Tobin and Montz, 1997, pp. 13-14).
federal regulations (Cox, 2010; Alm and Witt, 1997). Since rural areas are resource
dependent, regulations that impact the exploitation of those resources threaten the
well-being of the whole community. The feud between farmers and ranchers and
wildlife conservationists is not new to Nevada. In fact there is a long history of
contention between these two factions over water right allocations that will be
discussed in more detail in a later chapter.

An individual’s level of concern for climate change is influenced by the source of
climate change information. Closed social networks tightly coupled to industry interests
typically dominate information sources in rural areas (Davidson, Williamson, and
can inhibit a community’s resilience to climate change. They explain that the “bonding”
ties found in rural communities are strong ties that limit an individual’s willingness to
seek information outside their social network. Rural communities tend to be dominated
by older, white males and by industries that are also dominated by older, white males
like forestry, farming, and mining. As such, the dominant social view perceives climate
change as a political issue that does not pose an immediate threat to the community,
nor does it require action to counteract it. If that is the message being spread through
the closed social network, the bonding ties of rural communities would prohibit other
messages from being disseminated through the network. In their research Smith,
Anderson, and Moore (2012) contrast bonding ties in rural communities with bridging
ties that are more common in urban areas or in other contexts. Bridging ties allow
information and opportunities from one social network to be available to a member of
another network. Individuals with access to outside networks can act beyond the
constraints of social norms with the support of the outside network. Members with bonding ties in a closed social network, like those found in rural communities, may still have access to outside networks through formal networks like churches, civic organizations, and professional organizations. From my research, I do believe that the use of formal networks from professional trade organizations can act as bridging ties to rural networks. In agricultural communities, there are professional organizations that produce journals and newsletters that are read by industry and community leaders.

EXPERTS AS MESSENGERS

Most Americans experience climate change only indirectly through media representations and social interaction with others. Even extreme weather events are attributed to climate change by scientists and communicated to the public through news programming and journalism. Climate change is, then, a mediated phenomenon, which means that who the messenger is, is just as important to how people perceive climate change as the actual content of the message (Safi et al., 2012; Weber and Stern, 2011). However, the “expert” is a socially constructed title as well. Scientists are considered experts because of their credentials based on years of specialized training, but the role of an expert may be filled by a trusted family, friend, neighbor or colleague based on their experience or their history of good advice.

The public places a certain amount of trust in science. Whyte and Crease define trust as “deferring with comfort and confidence to others, about something beyond our knowledge or power (2010, p.412).” Government does this when science is used to determine safe levels for drinking water and air quality standards. There are issues with trust and distrust involved with public controversies that impede decision-making and
the ability for science to deliver benefits to the public. Whyte and Crease (2010) explain that while an expert may have the credentials and training to be trustworthy as a source of information that the public should defer to, the credibility of an expert is dependent on social variables. Jakob Arnoldi (2007) explains that the public’s reception of expertise is, at least in part, socially constructed. In this way, knowing the facts does not make you an expert, the public must recognize and trust you as an expert and be willing to defer to you. Smith, Anderson, and Moore (2012) argue that trust in an information source requires some form of social ties, whether informal through social networks or formal through professional networks. People tend to surround themselves with likeminded people and trust them as sources of information, especially for issues that are complex or create dissonance. The Six Americas report (Maibach et al., 2009) shows that the Dismissive and Doubtful groups do consider friends and family as primary sources of information whose knowledge and opinions they hold above all others.

When technical expertise is presented on both sides of an issue, those experts may act to cancel each other out in the public’s perception, leaving people to rely on other belief systems and/or trusted sources for a means to decide what they accept as true and what actions should then be subsequently expected of them (Frakena, 1983). When people believe that there is still a debate within the scientific community about the existence of climate change and what is causing it, then they are less likely to believe that it can be solved by any policies or technologies that have been put forth (Ding, Maibach, Zhao, Roser-Renouf, and Leiserowitz, 2011). The scientific community has been presented to the public at being at odds with its self with regards to climate change since there are contrary scientists that have spoken out against scientific climate
change claims, although they are minorities in the scientific community (Plimer, 2009; Lahsen, 2013). As such, scientists are losing their status as authoritative experts. Although surveys (Nisbet and Scheufele, 2009; Maibach et al., 2009) continue to show that science is held in high regard by the public, scientific facts are doubted. Society’s deference to the scientific community is undermined in controversial issues involving values and perspectives beyond knowledge (Jordan & Davidson, 2000). Whyte and Crease (2010, p. 418) argue that in cases where distrust in experts is an explicit element of scientific and technical issues, “there is no hope for a technical argument to succeed.” Rather than scientists, individuals turn to their political ideology, community leaders, or respected family members to tell them what the truth is. Climate skeptics tend to put more faith in their peers than in scientific experts (Maibach et al., 2009; Nisbet and Scheufele, 2009). Without personal experience or direct impact to their personal values, people are forced to rely on peer groups that filter and mediate information for them (Binder, 2010).

By siding with one side of what is perceived as a social debate, some commentators label scientists as activists. One could argue that all scientists are actually activists for their discipline. They compete for scarce funds by describing why their research is important and should be funded, knowing it is at the expense of other research projects. Scientists would not study the topics they choose without having a personal interest or ethical belief that deems that topic to be important (Bernard, 1994). There are scientific justifications for studying the role of species and how they interact, and when the connection between species extinction and potential threats to human health was made by Rachel Carson, she became the mother of modern environmental
movement. However, the title of activist did not change the facts of her research, nor did it diminish the impact of the message. The role of activism does make a scientist vulnerable to accusations of manipulated conclusions based on biases. Neuman’s text on methods of social research (2011, p. 100) quotes Richard Harvey Brown as saying, “To the degree that a positivist theory of scientific knowledge has become the criterion for all knowledge, moral insights and political commitments have been delegitimized as irrational or reduced to mere subjective inclination.” As such, scientists strive to be objective researchers but know true objectivity is impossible. Even the choice of which topic to research shows bias (Lele & Norgaard, 1996). As a means to avoid attacks on their objectivity, scientists communicate research findings in peer journals using technical jargon and avoid taking specific stances on issues that could be deemed controversial social subjects. Isolating their communications to within their own community has created a void in public communication on climate change.

Scientists are typically not well trained to communicate their findings outside their circle of peer experts (McCall, 1988; Weber and Stern, 2011; Pidgeon and Fischhoff, 2011). To the lay person, scientific discourse often sounds overly-technical, unintelligible, and fraught with uncertainty (Etkin and Ho, 2001; Weber and Stern, 2011). The tone of scientific communication implies sole authority, which lay persons may interpret as condescending and disempowering. Successfully communicating scientific understandings to larger publics requires strategies that understand how non-scientific groups filter and judge the information they receive. In fact, Kahan et al. (2011) suggest that science communicators’ disregard of cultural values is what has made the country so polarized with regards to climate change policy.
Whyte and Crease (2010) have shown that when scientists are perceived as excluding the knowledge and input of lay people, then members of the public will exclude the scientists’ conclusions. Historically scientists have used communication methods that only transmit their knowledge one way. This method degrades the public to be just passive receptors, which has created a backlash from the public (Nisbet and Scheufele, 2009; Pidgeon and Fischhoff, 2011). The public wants to be involved in the formation of what is considered to be true or factual, which is why two-way dialogues and public engagement are being recommended to science communicators (Cooper, 2011). Cooper (2011) explains in an article in Bioscience that the deficit model is the traditional way that scientists communicate knowledge to the public. In this model, expert communication flows one-way from scientists to the masses couched in a technocratic tone of authority. Cooper argues that for such a complex and widely important issue as climate change, scientists must transform how they translate climate change science and the public policy implications. They need to engage the public in personal, interactive, face to face communication that incorporates public involvement through events such as town hall workshops and online social media. In short, climate change scientists need to hear from the public as much as the public needs to hear about the science. Pidgeon and Fischhoff (2011) explain that this two-way mode of communication will help scientists hone their communication skills as well as provide more relevant information based the public’s responses. They argue that traditional science communication needs to be transformed through multi-media communication and use scientific discourse that is non-persuasive but “translates results to decision relevant terms.” Most climate change models lack the extra and important step of translating data in ways that help the public understand relevant impacts. This
translation stage is missing because it steps beyond the scientists’ traditional roles of data collectors to interpreting and communicating that data for a value-laden society. In short, scientists tend to ignore what every good communicator knows: all communication is audience specific.

Despite the preponderance of scientific fact and a majority in public opinion that climate change is real, caused or exacerbated by humans, and requires changes to public policy, the persistence of Dismissives can be better understood by examining the audience members’ personal perspectives rather than their grasp of climate knowledge. Kathryn Schulz, in her book On Being Wrong (2010), explains how a person reacts to those that disagree with their rational argument. They are considered ignorant, stupid, or malevolent. In this same manner scientists typically presume that Dismissives simply do not have all the facts and need to be educated on the “truth,” or that Dismissives have the facts but do not understand them, or Dismissives understand all the facts and have some ulterior motive for still not agreeing. But Schulz offers another explanation: Dismissives just don’t see and experience the world in the same way, so the same facts that convince some of climate change can be interpreted by others to indicate that present climate conditions are the normal state of affairs. The gap between scientists and the public is not as much a knowledge gap, but a difference in how different groups understand and perceive the world around them. The public does not have the training that scientists do, and develop different ways to understand complex issues using frames and mental models. The largest percentage of the Doubtful and Dismissive groups of the Six Americas have a mental model of the earth’s climate system that is random; meaning that they view climate as unpredictable, always has been and will
continue to be. With a random model of the climate, Doubtfuls/Dismissives do not believe in trends; rather they believe that patterns can be found anywhere. If scientists look hard enough, they will find trends, but it is a coincidental pattern.

As the communication sciences have shown, scientists and climate policy advocates cannot keep confronting members of skeptical audience groups head on with phrases and ideas that contradict their beliefs, identities, and political ideologies. There is a need to tailor communication strategies specific to these audiences and allow for two way communication to occur to empower them to be a part of the climate science dialogue. Co-production of knowledge is an approach aimed to overcome multiple obstacles in scientific research and communication. Partnering with lay professionals allows for a large amount of data collection. To get comparable numbers of data points could potentially require large research grants. Additionally, the non-scientists would know to trust the scientific results since they collected and helped interpret the data themselves. Involving conservatives in the research would re-instill their trust in the science and create the forum for two-way communication.

RURAL COMMUNITIES ADAPTING TO CLIMATE CHANGE

In this section, I summarize the impacts of climate change and how it will effect farmers. One of the major impacts of climate change on farmers is diminished water supply and demand for water increases. I describe water conservation options that are considered climate adaptations, but I also point out policy obstacles that may inhibit the implementation of those adaptation strategies. I explain the current competition over water use in the west and how water banking could be an adaptation strategy that most appeals to farmers.
CLIMATE CHANGE IMPACTS TO NEVADA FARMERS

Climate change is occurring now and its impacts on Nevada include rising temperatures, decreasing snowpack, and earlier snowmelt with reduced stream flow into major Sierra Nevada reservoirs (Sierra Nevada Alliance, 2010). Earlier snowmelt from higher spring time temperatures means that more storage is needed for runoff since the warm season storage capacity of a snowpack is compromised (Kapnick and Hall, 2010; Pulwarty, 2003). Rising temperatures means an increase in evapotranspiration, which would mean a higher demand for water for farming regions (Hanak and Lund, 2012). A severe decline in reservoir levels is expected across the region due to higher evaporation rates and increased water demands (USDA, 2014). The resulting impact to the region is higher temperatures, lower summer water supplies, and an increase in water demand. With these impacts, all water users along river systems will be looking for even more water in the future.

Farming in Churchill County relies primarily on surface waters, even the wells in the county are primarily reliant on surface water to recharge the aquifers (Churchill County Nuclear Waste Oversight Program, 2013; Churchill County, 2010; Churchill County, 2014). All of the surface waters in Nevada have been allocated for most of the 20th century (Welden, 2003), so there is no more to be claimed without taking it from someone else. In the past, the need for more water meant investments in large diversion and storage projects; however, those options have become prohibitively expensive and socially unacceptable (Pulwarty, 2003). In the future, additional water supplies are expected to come from conservation investments and underground storage
as cheaper and more feasible options (Ward, Michelsen, and DeMouche, 2007; Hanak and Lund, 2012).

**Climate Adaptation Strategies for Farmers**

The range of choices for adaptation strategies depend on culture and institutions, which permit, prohibit, or discourage a given choice (Pulwarty, 2003). The degree to which farmers believe climate change is occurring is an obstacle that could prevent farmers from implementing water conserving strategies. Although it can be argued that climate change is impacting Nevada already (Sierra Nevada Alliance, 2010; Garfin et al., 2014; Guida et al., 2014), natural variability could mask farmers’ ability to detect that change (Schneider, Easterling, and Mearns, 2000). Farmers are constantly adapting to new conditions and incorporating new strategies. Even if they don’t believe in anthropogenic climate change, they do believe in farm improvements that could help them overcome weather variability (Biello, 2013). Talking to farmers about adapting to droughts is an example of what Hanak and Lund (2012) describe as a “No Regrets” policy. It is a policy that can be justified without climate change, but is still useful to adapt to or mitigate climate change impacts.

Howden et al (2007) describes water efficient farming strategies. In general, farmers could alter crop varieties to those that are better suited to temperature extremes and variability. Irrigation practices can be changed to alter how water is transported, how much is applied, and when it is applied. Soil conservation practices can increase moisture retention in the soil. Water use can also be decreased by changing farming income altogether to activities that are not as water intensive like farm tourism or hunting activities. Land that becomes fallow due to water scarcity can
be used for solar panels to supplement incomes while simultaneously mitigating climate change (Hanak and Lund, 2012).

It may seem like simple logic that farmers should implement water conservation practices, especially in arid regions where water is already a scarce resource. However, most farmers and ranchers are already water conscious and all the ones I contacted have implemented some measure of water conservation. Moreover, water policies in the West act as disincentives for farmers to invest in further water conservation efforts. Under the “use it or lose it” rule of prior appropriation that governs water use in the West, conserved water could be considered as forfeited water and result in a loss of the farmer’s water allocation (Ward, Michelsen, and DeMouche, 2007; Huffaker, Whittlesey, and Hamilton, 2010). Water conservation policies are meant to maximize the current use of water, not for ensuring water for future use. Policies need to adapt to assure farmers they will have enough water to continue farming for generations to come.

In addition to these policy obstacles are very real concerns that water conservation could further decrease water availability in the whole system (Ward, Michelsen, and DeMouche, 2007). Inefficient flood irrigation techniques, like those commonly used by alfalfa farmers in Nevada, mean large return flows further downstream or significant recharge to groundwater reservoirs that are later used for multiple purposes (Huffaker, Whittlesey, and Hamilton, 2010).
THREE WAY COMPETITION FOR WATER: AGRICULTURE, URBAN GROWTH, AND WILDLIFE

Maximizing the use of current water supplies is important to provide enough water for the many competing demands. Competition for water in the West is usually characterized by three stakeholder groups: Urban centers; agricultural users; and wildlife (Huffaker, Whittlesey, and Hamilton, 2010). Water is considered a public good, and access to the resource is granted through state policy. In Nevada, water claims can date back to before 1900, but at that time, as long as water was put to beneficial use, it was not necessary to leave any in the stream for other users. The biggest user groups of those days were agriculture and mining; there were no large urban centers and wildlife was not even considered.

In more recent decades, the federal government has complicated water allocation by retroactively claiming water for Native American reservations and wildlife habitat (Cronin and Fowler, 2012). With the passing of the Endangered Species Act and the Clean Water Act, new allocations have made changes to historic water uses. Traditionally, the rule of Prior Appropriation has governed water policy in the West. Prior Appropriation follows the “first come, first served” rule. It says that senior water claims (the oldest on the system) are guaranteed first in times of scarcity, even if it means that newer claims cannot be fulfilled. Growing urban centers are the newest claimants to the water systems in Nevada, and these urban centers have political power. Changes in population centers and new technologies means that the Prior Appropriation rule is now being considered outdated (Huffaker, Whittlesey, and Hamilton, 2010; Mulroy, 2013), which makes the older agricultural claims vulnerable to being
reallocated. There is a trend in the West for courts to uphold current water users over traditional rules of senior claims (Benson, 1998). Water policy is designed to maximize the use of water for the competition for water between agricultural users, wildlife habitat and growing urban populations, but the current policies do not take into account future changes in climate. The Third National Climate Assessment projects decreasing water supplies in western regions will increase competition between agricultural users, cities, and ecosystems to the point that some rural communities will suffer from job displacement (Garfin et al., 2014).

AGRICULTURAL WATER FLOWING TO CITIES

There is precedent (Welden, 2003) and further expectation (Tanaka et al., 2006; Hanak and Lund, 2012) that rural, usually agricultural water supplies will be transferred to urban, municipal uses as population growth and climate change increase demand for scarce water supplies. Large scale studies have been done for California’s water system incorporating both climate change and population growth (Tanaka et al., 2006; Hanak and Lund, 2012). Both of these studies conclude that California’s overall economy can survive even extreme climate changes, but at a cost to the environmental and agricultural sectors as available water will be diverted to urban areas. Similar strategies can be expected across the West.

An assessment of the Southwest region of the United States was prepared for the National Climate Assessment projects urban population growth in all the western states, even as those regions are expected to get warmer (Garfin et al., 2013. In order to keep up with population growth, Tanaka et al. (2006) and Hanak and Lund (2012) expect urban water supplies to be dependent on wastewater reuse, desalinization,
conservation practices, and large transfers of water from agricultural uses. Agricultural water deliveries are expected to decrease 30%-50% due to reallocation to urban areas, and agricultural demand is also expected to decrease due to land fallowing from water scarcity or increased salinity (Tanaka et al., 2006; Hanak and Lund, 2012). Agricultural demand for water is also expected to decrease due to changes in crop mix and irrigation technology becoming more water efficient. Additionally, water will become more valuable than the crops it was meant to grow, so it is expected that farmers will sell their land and water to growing urban centers that will need both.

Agriculture accounts for seventy-seven percent of water use in Nevada (Hanak and Lund, 2012; Welden, 2003; Singletary, 2005). As the largest water users, farmers will be the hardest hit by water scarcity issues stemming from climate change. There is the potential that longer growing seasons will allow for double cropping, but only if water is available. Hanak and Lund (2012) admit that some communities could be threatened by less agricultural deliveries, even to the point of their very existence, due to reallocation of water rights to meet the increasing demand for water because of population growth and climate change. The University of Nevada Cooperative Extension states that despite protection under Prior Appropriation Doctrine, farmers and ranchers are forced to consider the possibility of changing resource allocation decisions (Singletary, 2005).

RENEWABLE ENERGY DEVELOPMENT

Renewable energy is generated from clean, free, naturally regenerating fuels like sunlight, wind, heat from the Earth, biomass, and water currents. Despite the benefits of the fuel sources, renewable energy plants are expensive and require a lot of
This section explores the support and opposition of siting and building new renewable energy power plants and the Nevada state policies meant to encourage the growth of the clean energy industry in the state.

**Support for Renewable Energy**

A previous survey (Safi, 2011; Smith Jr. et al., 2014a) of Nevada farmers and ranchers showed the population to be predominantly conservative and skeptical about climate change, but with a majority of them (69%) supporting clean, renewable energy, a primary technology to address climate change problems. Among the Doubtful and Dismissive populations across the nation represented in the Six Americas report, only 30% showed strong support for a national renewable energy policy (Maibach et al., 2009). However, the high support for renewable energy development by Nevada’s conservative population is undermined by their lack of support for the incentives and taxes that would finance that development. Policies like various taxes, regulation, treaties, and incentives received only 2%-40% support in the Nevada farmers and ranchers survey (Safi, 2011).

Past studies suggest that renewable energy support is highly variable, often subject to local variations on issues such as where the technology will be located, who will benefit, and who will bear the costs. For instance, although renewable energy receives strong support from the public at large (Pew, 2010), there is often controversy over where to actually build these projects (Hartford, Stafford, and Reategui, 2011). Not-in-my-backyard (NIMBY) responses are common scenarios in siting decisions for solar projects and wind farms. NIMBY controversies stem from worries over issues such as how intrusive these new renewable energy plants, and the transmission lines that
necessarily connect them, will be to private property and animal habitat (Smith and Klick, 2007). For example, environmental groups oppose solar power projects in the California Mojave desert due to expected habitat damage and worries about property values and declining quality of life (Maloney, 2008). Opponents who contest the site of renewable energy developments can create delays and higher cost estimates of projects to the extent that they are no longer desirable. Despite national support for renewable energy by environmentalists, they can be among the opposition of individual renewable energy projects based on siting issues. One of the most notorious examples of this contradiction of support is the opposition from Senator Kennedy, a lawyer and activist with the National Resource Defense Council, to the Cape Wind project off the coast of Cape Cod (Aster, 2010).

Opposition to renewables also comes from those who do not believe that a push for renewable energy is as important as it is presented in the media (Aster, 2010; Harrison, 2011). Smith and Klick (2007) demonstrate that opposition to wind farms and other renewable projects may increase when the projects are communicated as a carbon-free energy alternative to address climate change (Smith and Klick, 2007).

**STATE POLICIES**

Renewable energy projects are often proposed in rural areas where there is abundant land as well as the particular natural resource being harvested. This makes the Midwestern and Western states particularly desirable for renewable energy projects and the Western Governors’ Association has been actively mapping zones with the highest potential for renewable energy development and making plans to link them with transmission lines (Western Governors’ Association, 2009). All the western states,
except Wyoming, Utah and Idaho, have a Renewable Portfolio Standard mandating that a specified portion of the energy in their state must come from renewable energy (US Energy Information Administration, 2012). With these strong state-level initiatives, more and more rural lands in the West are being targeted for renewable energy development. The cost of the technology involved with renewable energy is still prohibitive without policies that provide incentives. State Renewable Portfolio Standards are considered one of the main drivers behind the development of renewable energy projects (Murray, 2011; Leon, 2013). Additional policies include green purchase agreements, loan guarantees and various federal and state tax credit programs. These policies are needed to help level the high costs of building renewable energy projects against the cheaper price of coal or natural gas powered plants whose construction costs do not take into account the annual fuel and mining expenditures that are associated with them.

Nevada in particular has vast potential for renewable energy, ranking among the top states for solar thermal, geothermal, and photovoltaic resources (Clean Energy Project, 2010). Nevada has an aggressive Renewable Portfolio Standard of 25% by 2025 and has been hoping to diversify its state economy with research, product manufacturing, energy exports, and project construction and maintenance; all from the renewable energy sector. According to the Database of State Incentives for Renewables and Efficiency (www.dsireusa.org), Nevada has a policy that would abate 55% of the property taxes of a renewable energy plant that produces over 10 megawatts for 20 years. Another policy is in place for large scale renewables that reduces sales and use taxes in Nevada to 2.25%. Of the 18 projects on the U.S. Bureau of Land Management’s
(BLM) renewable energy priority list, six are in Nevada (Bureau of Land Management, 2011). Four of the six BLM fast track projects for Nevada are geothermal projects in Churchill County, the location of my case study. Churchill County is also home of the nation’s first hybrid renewable power plant with solar installation on an already existing geothermal plant (Demirjian, 2011).

**TRANSMISSION LINES AND ENERGY MARKETS**

Renewable energy resources tend to be located in rural areas that are not supported by transmission lines. As such, building the necessary transmission connections to distribute the energy generated adds a significant cost to a renewable energy project and could impede the development of a project altogether (Vadari, 2010; Fama, 2008). California’s 2006 Renewable Portfolio Standard calling for 20% of the state’s energy to come from renewable energy by 2010 initially started the idea neighboring states could develop renewables in their own state and sell the energy to California (Maloney, 2011). In 2010, California increased their Renewable Portfolio to 33% by 2020, furthering the demand for clean energy to be imported, but that means that renewable projects need to be able to connect to California’s grid (Sullivan, 2010). Existing connections already exist from Southern Nevada to California because of the power generated by Hoover Dam and the now defunct Mojave power plant in Laughlin. These existing grid connections have made the El Dorado valley near Boulder City, land owned by the city that has been declared a renewable energy zone, prime real estate for developers that wish to sell to California. Connection to transmission grids is not available throughout Nevada and other rural regions. Nevada Energy’s One Nevada Line (ONLine), completed early in 2014, is meant to connect the rural regions of Nevada to
the state’s energy grid, but without an increase of demand for renewables within the state (through an increase in Nevada’s Renewable Portfolio or a retirement of coal plants in state) that transmission line will really only act to facilitate the exportation of power to other states (Robinson, 2010; PR Newswire, 2014).

RESISTANCE

There are opportunities to develop renewable energy from a myriad of resources including solar, wind, geothermal, biomass, and various forms of hydro power (tidal, wave, micro-hydro). All of these resources may not be available in every location; but some combination of them is possible for most places. Some locations, due to their abundance of resources, are more desirable for large scale renewable energy developments. For instance, the near constant wind that exists along coastlines makes offshore development of wind an attractive proposition. High deserts have both cloudless skies and high altitudes that make them an obvious choice for solar developments. However, despite the amenities of these locations there are also obstacles to siting renewables.

Renewable energy developments face opposition to projects based on cultural and political reasons. Large developments have often faced resistance from environmental groups in the past based on irreversible damage to beloved landscapes. A famous example would be John Muir’s battle over the Hetch-Hetchy dam in Yosemite. In addition to objections from the environmental movement, there is often resistance to development from local, Not-In-My-Back-Yard (NIMBY) groups. The Not-In-My-Back-Yard (NIMBY) sentiment is characterized as a local opposition to a specific project and is characterized by distrust of project sponsors, concerns about risks, limited information,
and emotional responses to local values without concern for larger implications or benefit to the public (Michaud, Carlisle, and Smith, 2008). The environmental movement has often joined forces with local NIMBY movements in the late twentieth century as issues involving toxins came to light. More recent and local examples of the environmental movement joining forces with NIMBY activists includes the siting of a coal plant near Mesquite, Nevada. Defend Our Desert is a group based out of Mesquite that formed in 2004 by local citizens concerned with environmental and community impacts from the proposed Toquop coal plant (Challinor, 2010). It was joined by a coalition of groups, including the Sierra Club, to block the construction of a 750 MW coal plant, and it was successful. The project plans have since been converted to a natural gas power plant (Tavares, 2010). Environmental movements and NIMBY forces have been so closely involved that objections based on attitudes of environmentalism are often attributed to NIMBY attitudes. The concerns of both NIMBY and environmentalists often overlap since the threat to the local community can be the threat to the local environment when it comes to siting conventional energy projects (Michaud et al., 2008).

Since past objections to conventional energy developments were based on environmental and health risks, it was thought that environmental groups would not object to renewable energy projects, but that has not proven to be true. The Cape Wind project proposed a wind farm in Nantucket Sound and was promptly blocked by local residents, including then Senator Kennedy, a lawyer and activist with the Natural Resources Defense Council (Aster, 2010). Environmental groups like the Alliance for Responsible Energy Policy say that there is no need to disturb pristine desert habitat for
solar power projects when there are millions of acres of rooftops that can be used (Maloney, 2008). They acknowledge the need for renewable energy development, but think that federal lands should be available for multiple uses by the public rather than leased to energy companies. They advocate the use of Feed-In-Tariffs to make rooftop solar a more feasible and attractive option (Maloney, 2008). While rooftop solar exists on developed land and requires no water, utility-scale solar developers argue that it does not have the efficiency to provide the same amount of power. The number of roofs needed to equal the Bright Source concentrated solar plant being constructed in Southern Nevada would seem to make the point moot. Carl Zichella, the western renewable projects director for the Sierra Club, stated in a New York Times article that “at the current rate of adding 200 megawatts of rooftop solar power a year, it would take 100 years to meet the 20% renewable target California” had to meet by 2010 (Maloney, 2008). Renewable energy projects create tension within the environmental movement as people are torn between rival values: the love of local and wild places that was the impetus to the creation of groups like the Sierra Club, and the development of clean energy with all that it represents including climate stabilization, stopping mountain-top removal for coal mining, and acid rain reduction.

Resistance is also still felt from NIMBY activists towards renewable energy projects despite the fact that they are clean technologies. Protests based on NIMBY sentiments follow the same pattern as any protest to nuclear plants or toxic waste incinerators despite the difference in the specific objections (Glickel, 2004). NIMBY resistance arises when locals feel that there is an outside threat. That threat could be to their health, their economy, or the local values they have invested in the landscape.
NIMBYs distinguish themselves from environmentalists in that the arguments are more centered on self and local interests rather than environmental degradation as a principle (Smith and Klick, 2007). If the local community does not recognize that there is a direct benefit to them, they feel that an injustice is being done to them by the intrusive development and the protests begin following the same pattern as any justice movement.

Specific objections, from either NIMBYs or environmentalists, may vary with the technology being proposed, but some local resistance can be expected to any site proposal (Pasqualetti, 2011). Geothermal plants can produce malodorous hydrogen sulfide emissions and the potential to disrupt local groundwater systems, but they are less visibly intrusive than solar and wind farms. Wind farms disrupt view sheds and can be harmful to wildlife. Noise levels can be comparable to a nearby highway, and they are perceived to cause lower property values, though studies show no decline in the value of nearby residences (Hartford et al., 2011; Aster, 2010.) Large scale solar projects are located on sensitive desert habitat and need water that is scarce to the region. They are also visibly conspicuous and take up extremely large tracts of land. Because of the huge amount of land required for solar and wind development, they often conflict with cultural resources. Native American and historical preservation societies have moved to block several developments due to locations of burial grounds, historical trails and ceremonial sites (Harrison, 2011; Maloney, 2008; Pasqualetti, 2011).

Even though resistance can be expected by renewable energy developments, the more a developer works with the local community, especially in advance during the planning stage, the more it can mitigate or even eliminate that resistance. In order to
cooperate with local communities, the local attitudes towards the landscape and the benefits the community can expect from the project need to be understood, remembering that these perspectives are project and location specific. In a national Pew Research Center (2010) poll, renewable energy development gets overwhelming support, but when asked to consider projects details that support proves to be superficial. In Utah, a wind project was met with mixed views by residents; while some called the proposed wind farm an ugly blight on the landscape, others explained that a clear view of the mountains with windmills was better than smog that would prevent a view of the mountains altogether (Hartford et al., 2011). The clean aspects of renewable energy may be celebrated by some, but one study found that when a proposed wind project was framed solely as a clean technology that would mitigate climate change, it lost support since there was no direct benefit to the community and not everyone recognized climate change as a problem (Smith and Klick, 2007).

CASE STUDIES OF LOCAL PERSPECTIVES ON ENERGY PROJECTS

Often local government permits are required for some aspect of construction or operation of these energy plants and offer a venue for local opposition to manifest into action. A wood-burning power plant was effectively blocked in Michigan by a local opposition group when it could not get the permit to burn from the local community board (Frakena, 1983). The opposition to this renewable energy plant was that it would also be able to burn solid waste, so there were health concerns. Additionally, there was concern over competitive uses of the nearby woodlands. Wood was the primary heating fuel used by the local communities, and it was perceived that additional demand for wood fuel would impact the woodlands that were considered a local
amenity to the community. The energy project failed because it did not account for local perspectives and practices.

More recent case studies of renewable energy development in the Southwest show how collaborating with the local community can help bring projects to fruition. A wind farm that would produce electricity for a town in Utah was not approved for construction by the local county government when citizens thought the development would impact their property values due to their visible disruption of the landscape and expected noise (Hartford et al., 2011). The developer initially picked a site that would be less visible and was already developed previously as a gravel site, but the county showed concern that local hydrology could be impacted. The developer picked another site, closer to the community, but residents did not like that. Eventually, after two years of ongoing discussion and a study by an outside engineer, the gravel pit was designated as the site of the project. Hartford et al. (2011) found that by working with the county, both the wind developer and the community benefited from the development: the county waived 75% of the property taxes to help make the project more affordable, and even with the reduced taxes, the site now produces twenty times more revenue for the local school system that it previously did as a gravel pit. The community now hosts an annual kite and wind festival and tours are offered at the wind farm (Hartford et al, 2011). The Imperial Valley of California is known as a rich agricultural region, but it also can boast huge geothermal potential. It was long thought that development of geothermal would disrupt the local water systems, but with research and community collaboration, an energy zone was declared and geothermal plants now exist as a local industry alongside agriculture (Pasqualetti, 2011).
SITING ENERGY PROJECTS ON FEDERAL LANDS

Most of the literature exploring siting issues revolve around wind farms established on private lands. A notable difference that distinguishes energy development in the West is the extent of public land that exists there. Roughly 80% of Nevada is owned by the federal government. Davis (2011) explains that counties with large amount of federally owned land may be more resistant to energy developments in their counties. Unlike the environmentalist arguments about habitat loss, these counties are resistant because of economic impacts. Federal land management agencies have historically paid Payments in Lieu of Taxes (PILTs) or royalties to the county when developments are done in their jurisdictions. Rural areas with lots of federal lands may get little in the way of property taxes to fund services the local community provides to the developments such as road maintenance and emergency services. Without the ability to generate property taxes, local communities may prefer to keep the land undeveloped. Renewable energy is expected to benefit rural counties through economic diversification, but full time, long term employment in those areas is associated with the current use of federal lands (either through extraction industries or recreation), and renewable energy developments can offer few long term employment opportunities operating the power plants. In the study area, where 85% of Churchill County is federally owned or managed (Churchill County, 2010), the restriction of income from federal lands and the reduced tax income due to state policies incentivizing clean energy means the development of renewable energy may not present a boost to local economies. The local resistance to energy developments in Churchill County is not necessarily out of fear to environmental degradation or impacts to private property
values, but because of skepticism towards the financial benefit the project may provide the community or its impact to their traditional uses of the public lands.

The next chapter discusses my research methodology to explore the questions brought up by the literature. On what grounds do Nevadans support renewable energy projects? Do they see an economic benefit from these projects to themselves and their locale? Do they acknowledge potential benefits to climate change mitigation that these projects represent? From what sources do they get their information regarding climate and renewable energy issues? Does their support for renewables extend to broad national energy and climate change policies or is support limited primarily to local efforts?
CHAPTER THREE: CASE STUDY METHODOLOGY

Communication studies and cognitive sciences demonstrate that people with preconceptions about controversial issues, such as climate change, tend to process messages about those issues according to their pre-existing preferences on that topic. In the case of climate change, people who have already decided whether the climate is changing or whether humans are responsible for that change will then filter any new information through the lens of those preferred beliefs or preconceptions. As a consequence, for messages that challenge those preconceptions to resonate, they must be thoughtfully tailored to intersect with the ideas and attitudes of specific audience groups. Understanding how to tailor climate change communication requires research to recognize precisely what preconceived notions groups hold, the information sources they attend to most, and how they process information. I chose an ethnographic case study approach to develop an in-depth understanding of the Doubtful and Dismissive perspectives as a means to work towards climate change solutions.

Specifically, I chose Churchill County, Nevada to develop a community case study among a population predominantly populated by people who reflect doubtful and dismissive attitudes toward climate change. My qualitative case study approach relied on interviews, participant observation, and documentary analysis. This multi-form data gathering approach allows for triangulation (Denzin, 1978). Since no single method of data collection is uniformly superior, as each form has its own special strengths and weaknesses (Denzin, 1978), I triangulated among different forms of data to help corroborate insights and insure the validity of the overall study (Ridenour and Newman,
CASE SELECTION

The goal of my study is to further our understanding of people who are doubtful and dismissive towards climate change and to identify and communicate possible points of connection between this population and strategies responding to the scientific concerns of climate change impacts. I sought to work with a population that reflected the attributes of “Doubtful and Dismissives,” as defined by the Six Americas Project. I selected Churchill County, Nevada.

When selecting a case and population for study, it is common to rely upon a statistical profile of the population to estimate its attributes and usefulness for one’s research questions (Denzin 1978). Voter information for Churchill County showed it to be primarily Republican which is an indicator of Doubtful and Dismissive beliefs according to the Six Americas report (Nevada Secretary of State, 2012; Leiserowitz et al., 2009). Moreover, statewide surveys done by Safi (2011) of farmers and ranchers in Nevada provided some additional data and confirmed the predominance of Doubtfuls and Dismissives in the county. For instance, Safi found that the majority of the survey responses that he received from Churchill County were from conservative Republicans who did believe the climate was changing, but that any change was naturally occurring as opposed to caused or influenced by human actions.
Churchill County is also the site of several large-scale renewable energy power plants with the resources for the development of many more plants. The county’s master plan (Churchill County, 2010) described the geothermal industry as one of the main pillars of the local economy. According to Safi (2011), while many Churchill County residents reflect Doubtful attitudes toward climate change, they were also largely favorable toward government policies that promoted renewable energy technology. I wanted to understand this seemingly contradictory combination of attitudes and actions.

MY RELATIONSHIP TO CC/FALLON

In the reviewed literature in Chapter Two, I discussed Smith, Anderson, and Moore’s (2012) research that explained the strong, but closed social networks common in rural communities. I expected a similar social network in Churchill County, but through previous experiences in Fallon, the county seat, I had a few initial contacts that would allow me entrée into the community. I had visited every so often since my uncle moved there in 1990. As Denzin (1978, p. 364) describes:

“Qualitative fieldwork includes any source of personal familiarity with a setting or group to be surveyed. This knowledge may be derived from nonprofessional sources such as family members or previous work experience. These sources can provide insights and privileged information that can make a major contribution to the development of meaningful research.”
I grew up in a rural setting myself in Northern California, which means that in addition to familial ties with the community, I also shared a cultural background, style, experiences, language with my subjects. During previous visits to Fallon while visiting family, I have camped at Lahontan Reservoir, swam in irrigation ditches, driven off highway vehicles at Sand Mountain, and dressed as an Easter Rabbit for the Navy officers’ family barbeque. My tendency to drive trucks, wear jeans and boots, and my identification as the niece of “Big John Kirch” went a long way towards my credibility with local farmers who tended to be older men that were skeptical of younger, urban dwellers, especially those with a university project to pitch.

I also admit that my cultural connection to the research subjects biases me towards empathizing with their fear of losing their rural way of life. However, the privileged information shared with me strengthens this study more than any biases may hinder it. My ethnographic training, constant conversations with my dissertation advisor, and reflexivity as a researcher helped me see where my biases might shape interpretations and enabled me to locate consistencies and contradictions in their claims and beliefs.

LEVERAGING PREVIOUS SURVEY WORK

Researchers analyzing national level surveys typically sort individuals into broad categories, such as Republican or Democrat, Doubtful or Dismissive. Such surveys are coarse tools, and subjects’ complete thoughts about an issue, idea, or experience may not match the survey response categories. As Denzin (1978) describes, surveys do not capture situations where variables cannot be easily or accurately quantified; moreover, the varying meanings of the same words to different groups of people elicit answers
that are liable to misinterpretation when analyzing survey data. Omitting questions that would be helpful in accurately interpreting other questions is another way of limiting responses leading to incomplete interpretations (Denzin, 1978).

Despite their limits to providing in depth answers to research questions, surveys can help guide further investigations. The typical survey is exploratory, and I was able to leverage the findings of previous surveys to conduct an in depth qualitative investigation of the targeted audience. Survey results can be validated and clarified through observations and interviews in the field (Denzin, 1978). Part of my explanation of research to participants was explaining that I was “ground truthing” or clarifying previous studies done that used only surveys. Denzin (1978) explains that surveys are good for establishing frequencies of occurrences, but interviews are better for learning institutionalized norms, and my study is meant to understand norms for Doubtfuls and Dismissives.

I have drawn upon a survey of Nevada farmers and ranchers that showed a large percentage supported renewable energy (Safi, 2011). The respondents’ support for renewable energy despite their politically conservative beliefs goes against expectations based on national surveys (Pew Research Center, 2010). What we do not know from this finding, however, is precisely why these farmers support renewables or how they express and manifest that support. The surveys conducted by Safi (2011) were a useful first step to gauge perceptions among farmers and ranchers. My study aims to extend their initial investigations to elaborate and clarify findings with ethnographic data. Have the farmers and ranchers voted in support of renewable policies in the past or do they plan to do so in the future? Do farmers and ranchers favor renewables in general, or do
they prefer renewables over other forms of energy production, or do they actually prefer other forms of energy despite their support of renewable energy?

INTERVIEWS

Researchers use qualitative interviews when they want to gain in depth cultural knowledge from participants (deMarrais and Lapan, 2004). I used interviews to learn what is meaningful and relevant for rural Nevadans’ and their attitudes, knowledge, and perceptions of climate change and climate adaptation and mitigation strategies. For this project, I used the semi-structured interview. In the semi-structured interview, a specific set of questions are specified, but the interviewer has the flexibility to seek further information by prompting additional or follow-up questions when unexpected information is revealed during the course of the interview (Hay, 2005). The semi-structured interview format allowed me to seek clarification and elaboration on any given response. I was able, then, to discover additional information by entering into a dialogue with interviewees to expand the range of ideas and make connections among issues we discussed. Additionally, the semi-structured interview allows respondents to answer more on their own terms than the format of a standardized structured interview permits (where all interviewees are asked only the same questions in precisely the same way), but still provides consistency and a structure for comparability (Bernard, 1994). I primarily employed open ended questions and probes to give respondents opportunities to tell me what is important to them; allowing them to elaborate on themes they define as central to the questions asked (deMarrais and Lapan, 2004; Mertens, 1998).
I prepared an interview guide to provide organization to the interviews and used some of the questions from the national and state-wide surveys already conducted for comparison purposes (see Appendix A for the full interview guide). As deMarrais and Lapan (2004) explain, although an interview guide is developed, it is not necessarily the protocol for each interview since each participant’s knowledge is unique and may steer the conversation in new and unexpected directions. I tried to keep to the guide and ask the same questions of everyone, but in reality, the respondents did not answer each question. They were indifferent or unknowledgeable about some questions and were eager to provide long or tangential answers to other questions. I did have a few additional questions for those people who were representing the military population regarding the extent to which energy efficiency or renewables was a common value in military institutions. While respondents didn’t hesitate to answer questions, meaning they didn’t find any particularly off-putting, they did express doubts about whether they may be correct in their knowledge of specific things like the definition of greenhouse effect versus global warming. Although when given the opportunity to ask me questions at the end of the interview, the large majority did not ask me any questions about climate science or policy.

Some subjects were originally hesitant about the interview itself, but after some discussion and questions of their own regarding my agenda, how I would use the information obtained through the interview, and any bias I may have, they all agreed to be interviewed and agreed for that interview to be audio recorded. The interviews were digitally recorded, and downloaded to my computer each night. I interviewed twenty
five people in April 2012. The interviews lasted between 40 and 100 minutes. All interviews were recorded and transcribed.

I used transcription software from Inqscribe to transcribe the interviews when I returned from the field. The Inqscribe software allowed the interview audio files to play with keyboard short cuts that allowed to control the speed of the interview playback and insert time stamps and interview subject names each time the speaker changed during the dialogue. The Inqscribe files were converted to rich text format. I printed out each interview to allow me to highlight and code responses in the margins.

As I read through each interview, I consulted the corresponding notes in the field notebook and my daily calendar to add additional insights. Interview segments, along with the corresponding name and time stamp, were cut and paste into a Word document allowing me to aggregate responses by theme. These documents were re-read again and further organized into sub categories. I discuss my method on analysis in more detail below.

Twenty-one of the twenty-five interviewees also agreed to allow themselves to be identified in this paper, and I list and describe them below. Four of the interviewees preferred to remain anonymous. I refer to them as Anon1, Anon2, Anon3, and Anon4. Their description below is purposefully vague to protect their identity. I interviewed informants in person in Churchill County. Ages and years in residence are current as of April 2012 when I conducted the interviews.
The goal of this study is an in-depth understanding of climate change issues among a specific audience group that is not sympathetic to climate change issues. As such, I did not employ probability sampling, which uses randomizing mechanisms that assure selection independent of subjective judgments (Bickman and Rog, 1998). Rather than interview randomly chosen Churchill County residents, I needed to know that every interview in my small sample would allow an in-depth investigation into the attitudes and beliefs of Doubtful and Dismissives. Moreover, the population of Doubtfuls and Dismissive in rural Nevada, were expected to be hard to engage for in-depth interviews due to the tight social network found in rural communities and the fact that they are not expected to be motivated to assist a climate change research project. For these reasons, I expected the population to be hard to access, and so I appropriately employed a snowball sampling strategy to populate my list of participants (Bernard, 1994; Bickman and Rog, 1998; Mertens, 1998). Several participants admitted that they would have not spoken with me had I not been referred to them by a friend, so the snowball sampling technique allowed me access to participants that I would not have been able to recruit otherwise.

Snowball sampling is done by starting with key informants who are viewed as knowledgeable about the community and are asked to recommend other people to be included in the sample (Mertens, 1998). With snowball sampling, you start with a small list that grows to include your entire sample. By asking for referrals for others who are informed on the issue to interview, my referrals should include any local messengers that are propagating specific messages about climate change solutions.
Snowball sampling requires initial entrée into the network where you make contact with a few key informants. My initial entrée into the population came from family ties, friends of friends, and past professional acquaintances. Key informants are people who know a lot about their culture and are, for reasons of their own, willing to share all their knowledge with you (Bernard, 1994). One of my key informants was Erica Hybarger, the executive director of the Lahontan Valley Environmental Alliance (LVEA). The LVEA was established in 1993 through an inter-local cooperative agreement between Churchill County, City Fallon, the Truckee-Carson Irrigation District, the City of Fernley, the Stillwater Conservation District, the Lahontan Conservation District, and the Fallon Paiute Shoshone Tribe. The mission of the LVEA was education and preservation advocacy of agricultural and natural resources in the Lahontan Basin on behalf of these local agencies. The Alliance was formally disbanded in November of 2011, a couple months before my interviews were conducted, when local governments were no longer able to fund the organization. I had participated in an event with the LVEA while working for the Sierra Club’s Beyond Coal Campaign seven years ago. Erica and I have had discussions in the past regarding net metering practices in Nevada and the possibility of writing grants for dairies to implement waste digesters to produce methane as alternative energy. During a previous family visit to the area, Mrs. Hybarger allowed me to be a guest judge at a mule show being hosted by the LVEA. Mrs. Hybarger was able to put me in touch with local government leaders at both the county and city level, and she also helped me find a place to stay with a local ranching family. Mrs. Hybarger took me out on several social outings and introduced me to several of her friends that represented the younger generation of farmers in the area, although only one agreed to be interviewed. I did not formally interview her, but she gave me a lot of
background on the county and helped fill in knowledge gaps regarding farming operations, relationships between people, layout of the county so I did not get lost, and countless other bits of knowledge that helped construct my understanding of Churchill County.

Mr. John Kirch, my uncle, was a second key informant. I formally interviewed him since he met the criteria of a Dismissive in Churchill County. He was able to give me initial contacts with the military base because of his long time employment with the Naval Strike Air Warfare Center. He gave me additional referrals to several local business owners and older farmers. His referrals were separate from Erica’s as they represented an older age group employed in the agricultural and military sectors.

A third contact came from an old classmate. Her husband’s family settled in Fallon, Nevada several years ago, and she asked on my behalf if they would be willing to participate by being interviewed. They fit the description of Dismissives and represented a completely different social network than my uncle. With these three contacts I was introduced to two generations, employed across all the economic sectors, with separate social networks, and given the opportunity to be a participant observer.

For my research, I purposefully requested introductions to members of the local county and municipal governments and local residents that represent the economic foundation of the community. Agriculture, military presence, geothermal energy and local business owners are the main economic pillars in Churchill County (Churchill County, 2010), so I sought referrals for members of these economic sectors as part of a purposive sampling process. Purposive sampling is when you purposely choose specific members of the community who have the knowledge that meets the needs of the
research study (Bernard, 1994). Churchill County community identifies itself as an agricultural community in that even if a resident is not a farmer, they are benefiting from the open spaces, wildlife, views, and stable economy that agriculture provides (Churchill County Master Plan, 2010). As such, I definitely wanted the agriculturalist’s perspective. Moreover, farmers are more vulnerable to climate change and more sensitive to weather due to their profession. In a rural community, many people wear multiple hats, so some participants were both farmers as well as county leaders. Table 1, below, demonstrates how the informants represent the different occupational sectors in the county.

<table>
<thead>
<tr>
<th>Professional Sector Represented</th>
<th>Number of Participants</th>
<th>Local Government (including education and economic development)</th>
<th>Farmers and Ranchers</th>
<th>Military</th>
<th>Geothermal Developments</th>
<th>Business Owners (excluding agriculture)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>9</td>
<td>12</td>
<td>4</td>
<td>2</td>
<td>7</td>
</tr>
</tbody>
</table>

**Table 1. Occupational Sectors Represented by Study Participants. Note that many participants fulfill more than one role. Also note that while there were a lot of veterans in the study, the table only reflects those currently working with the local base.**

One potential limitation of a small sample is the elite bias where the observer may assume the perspective of only a few members in an organization, especially since initial contact is often with elite members of the population or “gatekeepers” like government officials (Denzin, 1978, p. 374). I do believe that most of my respondents were of an elite class; they were community leaders and successful business owners,
most with a higher than average income. However, the demographics of both Doubtfuls and Dismissives describe them to have higher incomes and education levels than national averages (Maibach et al., 2009).

Six Americas show that both Doubtfuls and Dismissives in the United States are more likely than average to be white, male, conservative, Republican, and religious. Smith Jr. et al. (2014a) also found that Republican males were more likely to be climate skeptics and deniers. To fit with these demographics of Doubtfuls and Dismissives, all of my informants were of Caucasian descent, and twenty-two of the twenty-five contacts were men4. Twenty of the interviewees were registered Republicans, one was Independent, and one was registered Democrat. The average household income was over $120,000. The sampling was close to evenly split between those who identified with a religious congregation (40%) and those who did not see religion as an influencing factor in their lives (60%). Comparing demographic information, the subjects in my sample did meet the general description of Doubtfuls and Dismissives, and as I will explain further in the analytic chapters, my findings demonstrate that my interviewees’ beliefs did indeed fit Doubtfuls and Dismissives categories. Table 2, below, compares the demographics of national population, Doubtfuls, Dismissives, and my study participants using categories described by the Six Americas Project.

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4 The primarily male sample of this study was designed to fit with demographics that describe Doubtfuls and Dismissives (Maibach, 2009; Smith Jr. et al., 2014a; McCright and Dunlap, 2011a). However, this gender biased sampling also acts as a limitation to the study. In future studies, I will incorporate more female respondents.
<table>
<thead>
<tr>
<th>Demographic</th>
<th>National Average</th>
<th>Doubtful</th>
<th>Dismissive</th>
<th>Study Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethnicity (Caucasian)</td>
<td>69%</td>
<td>89%</td>
<td>87%</td>
<td>100%</td>
</tr>
<tr>
<td>Gender (Male)</td>
<td>48%</td>
<td>60%</td>
<td>63%</td>
<td>88%</td>
</tr>
<tr>
<td>Political Affiliation (Republican)</td>
<td>27%</td>
<td>56%</td>
<td>64%</td>
<td>80%</td>
</tr>
<tr>
<td>(Independent)</td>
<td>21%</td>
<td>24%</td>
<td>19%</td>
<td>4%</td>
</tr>
<tr>
<td>(Democrat)</td>
<td>38%</td>
<td>36%</td>
<td>3%</td>
<td>4%</td>
</tr>
<tr>
<td>Political Ideology (Conservative)</td>
<td>33%</td>
<td>61%</td>
<td>76%</td>
<td>63%</td>
</tr>
<tr>
<td>(Moderate)</td>
<td>40%</td>
<td>33%</td>
<td>20%</td>
<td>25%</td>
</tr>
<tr>
<td>(Liberal)</td>
<td>27%</td>
<td>6%</td>
<td>3%</td>
<td>4%</td>
</tr>
<tr>
<td>Attend Religious Services At Least Once a Month</td>
<td>44%</td>
<td>49%</td>
<td>67%</td>
<td>60%</td>
</tr>
<tr>
<td>Education (High School)</td>
<td>32%</td>
<td>28%</td>
<td>24%</td>
<td>4%</td>
</tr>
<tr>
<td>(Some College)</td>
<td>28%</td>
<td>26%</td>
<td>33%</td>
<td>25%</td>
</tr>
<tr>
<td>(Bachelor’s Degree or Higher)</td>
<td>28%</td>
<td>33%</td>
<td>35%</td>
<td>67%</td>
</tr>
<tr>
<td>Income ($40,000 - $60,000)</td>
<td>23%</td>
<td>27%</td>
<td>32%</td>
<td>8%</td>
</tr>
<tr>
<td>($61,000-$84,000)</td>
<td>17%</td>
<td>23%</td>
<td>20%</td>
<td>12%</td>
</tr>
<tr>
<td>($85,000 and up)</td>
<td>23%</td>
<td>27%</td>
<td>32%</td>
<td>79%</td>
</tr>
</tbody>
</table>

Table 2. Comparing Demographics Across Audience Groups
Typically, older Americans have Doubtful and Dismissive beliefs. The Six Americas Project (Maibach, 2009) describes Doubtfuls as being older, meaning 75 years and older. There is actually a fairly even range of ages amongst the Doubtful and Dismissive audience groups. However, other surveys do suggest that older generations tend to be more conservative. A 2014 Gallup poll (Saad, 2014) shows that while not all skeptics are older, most people age 50 years and older are climate skeptics. Pew Research Center (2011) published a breakdown of political typology that shows that Republicans aged 50 years and older are more likely to be staunch conservatives as opposed to mainstream Republicans. Political ideology is a significant indicator for climate beliefs, so it is reasonable to assume that older conservatives are more likely to be Doubtfuls or Dismissives. Lahsen (2013) describes skeptics within the scientific community as near or past retirement age. My informants’ ages ranged from 30 to 68, with an average age of 55. Twenty of the twenty-five participants were over age 50. The age range of participants fits not only with the expectation of Doubtfuls and Dismissives based on the three survey studies just mentioned, but also represents the agricultural industry where the average age in farming communities continues to get older (Kusterbeck, 2013).

I conducted my research with limited funding, which limited the amount of time I was able to spend in the field. More time in the field would have allowed me to collect more interviews. The separate social networks did keep returning similar answers for questions regarding climate adaptation and perception of the climate science community. Consistent answers from separate social networks led me to believe that those answers are representative of the targeted audience group. However, the sample
population was evenly split on answers regarding energy technology. If I had the opportunity to include more interviews in the sample, it may have led to a predominant opinion within the case study community regarding energy technology preferences.

During my snowball sampling, I was repeatedly referred to the same individuals, particularly Monte Morrison, Charlie Frey, and Brad Goetsch. The repeated referrals indicate that these were highly respected local community leaders and their beliefs and messages have great influences among my interview participants.

LIST OF INTERVIEW CONTACTS:

- Brad Goetsch – Mr. Goetsch, 56, was the current county manager at the time of the interviews, but has since retired. He has been in Churchill County since 1998, first while commanding at Naval Air Station Fallon and then as county manager.

- Misha Stojicevic – Mr. Stojicevic, 58, is the capital projects manager for Churchill County, and had lived in the county for 5 years. He is originally from Yugoslavia. Several county leaders referred me to Mr. Stojicevic as someone they discussed climate issues with, but he does not participate in American politics.

- Ronald Juliff – Mr. Juliff, 68, is the county emergency manager. He has only lived in Churchill County for 4 years. He moved from California, where he had experience in the energy industry and as a county manager, to get away from all the government restrictions and taxes.

- Rick Lattin – Mr. Lattin’s family has been farming in the area for over 100 years. He owns a large farm with specialty crops that he has converted to a certified organic farm. He has a produce basket business and bakery as part of his agricultural enterprise and is the management consultant for the Small Business Development
Center with the County Economic Development Authority. Despite being an organic farmer, his political views tend to be ultra conservative.

- **James “Zip” Upham** – Mr. Upham, 46, has been in Fallon since 1991 when he was assigned to the naval base there. He is now the civilian public affairs officer for the base. He is not a farmer, but does have a hobby ranch in the county with 14 horses.

- **Mike Berney** – Mr. Berney, 54, is the local realtor and has lived in the area all his life. As a real estate broker he is aware of current trends in land values for both residential, commercial, and agricultural lands in the area.

- **Jim Johnson** – Mr. Johnson, 54, is a retired Certified Public Accountant who was running for County Commissioner at the time of the interview. He has lived in the area all his life, except for when he went away for college. He is a farmer himself with about 20 acres of irrigated land.

- **John Kirch** – Mr. Kirch, 65, has lived in the county for 22 years working multiple jobs with the naval base. Prior to moving to Fallon, he worked in nearby counties as a range manager for a cattle ranch and for the Bureau of Land Management. He was one of my initial contacts in the community.

- **Tom Inglis** – Mr. Inglis, 54, has lived in the area all his life and operates the family farms which include about 60 acres of irrigated land along with some pasture land for their cattle. Additionally, he is a licensed contractor for both commercial and residential construction.

- **Ed Rybold** – Mr. Rybold, 51, has lived in Churchill County for 12 years. He is a planning manager at the naval base.
• Susan Boadella – Ms. Boadella, 58, owns a café in town and tried to buy from local farmers when possible. Her beliefs tend to align more with a liberal perspective, but she admits to not being very knowledgeable or strongly opinionated on issues.

• Jess and Cheryl DuShane – The DuShane family (63 and 52 years old, respectively) moved to the area 9 years ago from California. They like Nevada due to the lower cost of living resulting from lower taxes and less regulations. They are retired now with a small hobby ranch consisting of a couple horses and pigs. His father and their daughter and granddaughter also live with them. Mr. DuShane wears an unconcealed pistol on his belt and often contacts his political representatives to tell them his opinion on topics.

• Bill Christoph – Mr. Christoph, 61, has been a local dairy owner since 1976.

• Lance Gomes – Mr. Gomes, 30, is still learning the family dairy business from his father. Their family has had a working dairy in the area since 1932.

• Dr. Stuart Richardson – In addition to being a local optometrist, Dr. Richardson, 60, is also chairman of the county planning commission, president of the Newlands Water Protection Association, founder of the Lahontan Valley Land and Water Alliance, and farms his own alfalfa fields. He has lived the area for 31 years.

• Kathy Minner – Mrs. Minner, 62, explains that their family business consists of not just farming their own land, but also lasering and leveling, disking, putting up hay and farming land for other people as well. They have lived in the county for 36 years. She admits she doesn’t not know much about climate and energy policies because most people focus on raising families here.

• Gary Imelli – Mr. Imelli, 66, was born in Fallon and lived there all his life except for his college years. He is retired now but still consults for the local school districts.
after a career as a teacher, principal, and superintendent. He also owns farm land that rotates between corn, alfalfa, and Sudan grass.

- Monte Morrison – Mr. Morrison, 48, is the Country Manager and Vice President of Operations for Alterra Power Corp, which owns one of the local geothermal plants. He has lived in the area for 22 years.

- Charlie Frey – Mr. Frey, 64, has retired from farming after turning the whole operation over to his son. He purchased his father’s farm in 1980 and expanded the dairy and garlic farm operations. He had diversified into an experimental vineyard in 2001 with the help of the University of Nevada Reno as a means to research crops for the area that would use less water. His son is continuing with the vineyard operation and looking at expanding the distillery to include operations for creating vodka from their own grains. Mr. Frey believe that farming is a calling to be a steward of the land.

- Ernie Schank – Mr. Schank, 62, is a local farmer and president of the board of directors for the Truckee-Carson Irrigation District. I interviewed him while he was watering new land he had just leased. He has lived all his life on the same farm his grandfather purchased in 1939, except for his years away earning his Bachelor’s of Science in Animal Science and his two year church mission in New Zealand.

- Chris Henning – Mr. Henning, 35, was born in Fallon. His family has owned businesses in the area for three generations, including several car dealerships and two furniture stores.

- Anon1 – Anon1 is a dairy farmer who had resided in the area for several decades.

- Anon2 – Anon2 has lived in Churchill County for over a decade holding jobs with experience in the energy, water, and military industries.
• Anon3 – Anon3 has worked and lived in Churchill County for over a decade.

• Anon4 – Anon4 has worked for both the military installation and civilian business in the county for more than 5 years.

PARTICIPANT OBSERVATION

Participant observation is a mode of research investigation wherein the researcher actively participates in the social situations studied (Bickman and Rog, 1998). The participating observer is an outsider who participates in some aspects of life around them and records what they can (Bernard, 1994). Participant observation can reveal more in actual beliefs and behaviors rather than the beliefs and behaviors that are reported in interviews; however, it requires more time in the field. For the duration of my research, my key informant, Erica Hybarger, arranged for me to live with a local family on their ranch of 100 acres where they raised mules, chickens, pigs, and beef cows. By living in the town of Fallon for a month, I was able to observe and learn more about their implicit attitudes towards renewable energy and climate change through informal social interactions. I attended local little league games, enjoyed happy hour at local bars, patronized local cafes and coffee houses (where half the interviews occurred), tagged along with some young wives, and helped feed cows and build chicken coops. Years of visiting have added to observations and data collection beyond the one month investigation.

I took copious notes on the experiences and informal conversations that I had as a participant observer. I recorded notes on my observations and conversations in my field notebook as soon as I returned from the field that day or the first thing the next morning. Mornings on the ranch included a routine of greeting the animals, a morning
run, and reviewing notes. As I formed impressions and suppositions from my observations, I would discuss some of them with my key informant, Erica Hybarger.

My participant observation notes revealed the extent to which all decisions were measured against economic return, not out of greed but out of concern for securing a way of life for future generations. I also saw the stereotypical expectations of Rush Limbaugh literature, but in conversations, people don’t cite Rush Limbaugh or Sean Hannity, they cite their friends, family, or neighbors. The rural community revolves around the local universe. Restaurants sell local food, businesses support local 4-H projects, and family connections in the area are traced back generations. Topics need to be traced back to the local universe to be relevant.

ANALYSIS

The interview guide was created with short answer questions from previous surveys (Safi, 2011; Maibach, 2009; Pew Research Center 2010; Pew Research Center, 2011) for comparability including basic demographics, political ideology, and questions about faith. I also asked the informant about their beliefs and concerns regarding anthropogenic climate change as a means to gauge which of the Six Americas the participant belongs to. Short answer questions were also asked about the individual’s support and preferences regarding policies, technology, and information sources. The information from these short answer questions was entered into a spreadsheet. Descriptive statistics were generated that can be used for comparison with surveys from the literature review. The tables and graphs that appear in this dissertation were generated from that spreadsheet.
Open ended questions in the interview guide were generated from the research questions. I asked questions about general support for renewable energy, the various energy technologies, and policies that support renewable energy. I asked questions about the local energy developments and local plans for adapting to a changing climate. I also asked about questions regarding information sources and perceptions of climate change experts and data. The data collected from these interviews were analyzed using a grounded theory approach.

Data analysis in qualitative studies is an ongoing process. It does not occur only at the end of the study as is typical of quantitative studies. Mertens (1998, p. 350) describes the process as this:

“Read all the data and then divide it into meaningful units. Data is organized into segments derived from the data itself. Some guiding research questions can be formulated at the beginning of the process; however, additional categories or themes are allowed to emerge from data. The main analytic process is comparison. Comparison is used to define, categorize, and realize patterns. Those categories are further refined and results are compared with other studies.”

Payne and Payne (2004, p. 36) described the process in a similar way: the text of the transcribed interviews are read for initial impressions, summaries and notes are made in the margins, and significant phrases and passages are identified and sorted into broad
groups. Both of these methods describe the Grounded Theory method of data analysis (Dey, 1999; Charmaz, 2005). Grounded Theory is a process by which theory is generated from data acquired from fieldwork and interviews. Dey (1999) summarizes the method as identifying categories and connecting them, with further data collection conducted based on emerging concepts.

After transcribing the data, I read through the text and formed my initial impressions. Significant categories were identified: Concern for future water supplies; renewable energy support; and relevant expertise and communication sources. These categories emerged from participant responses to the questions from the interview guide. I re-read the interview transcripts and thematically coded responses following those three themes. I collated responses along those themes and then refined coding to include sub categories. Comparing responses within these categories, the data was further refined and analyzed. When generating categories and coding, a researcher has to be rely on their theoretical sensitivity (Dey, 1999). Dey (1999) describes theoretical sensitivity as having knowledge of many theories regarding the research subject, but not letting any of that foreknowledge shape the analysis. Having that prior knowledge helps generate the initial umbrella categories, but the sub categories must emerge from the data.

Dey (1999) explains in Grounded Theory, collecting, coding, and analyzing data then lets the researchers know what further data needs to be collected. As analysis of the coded data revealed a narrative of the local perception, it also highlighted the need for more data. I collected data from county documents, state and federal legislation, and conducted a follow up phone interview with the President of the Board of Directors.
of the local irrigation district. I also expended my literature review and compared participant responses with relevant theories regarding climate impacts, benefits of climate change solutions, water policies and models, and participatory science.

Adapting to a drier climate became a significant analytic inquiry for the study. There were only a couple questions in the interview guide, but the responses from the participants showed that local perceptions were not as expected. Responses that referred to water supplies, threats to water security, changes in precipitation, or water conservation were all coded as part of that umbrella category of water adaptation. The coded responses were collated, and re-read allowing for a comparison of responses to develop a narrative from the perspective of the participants that can be compared with the literature regarding water adaptation, water demand, water conservation, western water policy, and legal opinions from the long history of litigation over water rights in the local watershed.

Inquiries into support for renewable energy started with gauging the informant’s preferred energy technology, but then the underlying rationale for supporting or criticizing that technology was compared and coded into sub categories. Sub categories included technology limitations, siting on public lands, policy, and cost. Again, comparison among the responses created even further levels of categorization. The data guided me to review state and federal legislation that supports different energy technologies and guides the generation and distribution of revenues from energy development.

As I reviewed responses for informational sources and perspectives of experts, sub categories emerged: the perception of experts, local messengers, and trusted
sources. After reviewing and coding the responses in these categories, I reviewed scholarly literature on co-produced knowledge and boundary organizations, but I also explored the non-scholarly sources of information the study participants referred to in their interviews. Appendix __ shows a diagram of the emergent themes and the sub categories that were used for coding as part of the process of analysis.

VALIDITY

Validity is built into a case study through triangulation of multiple methods (Hancock and Algozzine, 2006; Bickman and Rog, 1998; Ridenour and Newman, 2008) but perhaps the most powerful strategy to confirm a report’s findings is sharing the results with those examined in the study (deMarrais and Lapan, 2004; Hancock and Algozzine, 2006; Bickman and Rog, 1998)). In December of 2013, I wrote a letter to the 25 interview subjects outlining my conclusions and asking for their responses. I got one email back stating, “it was well written and to the point. In a way that all farmers/ranchers will understand. Hope some others in your community read your report (Kirch, December 12, 2013).” I also did a follow up phone interview after sending the letter with Ernie Schank, a local farmer and president of the board of directors for the Truckee-Carson Irrigation District. He validated my theory that water banks were a policy strategy that would incentivize climate adaptation since farmers would be able to directly benefit from any water savings they achieved. He said they were currently investigating their ability to implement a water bank in the future, but there are policy constraints that need to be overcome before a water bank strategy can be implemented.
I used a case study approach to extend and deepen the knowledge gained from previous survey work regarding the beliefs and attitudes of Doubtful and Dismissives towards climate change solutions. My qualitative methods have their own limitations, but provide an in depth description of a target audience as called for by the psychological and communication fields as discussed in the literature review in Chapter Two. In the next chapter I provide a detailed depiction of Churchill County where the case study was conducted. Following the description of the case study context are three analytic chapters that will discuss the main research questions regarding adaption to a drying climate, obstacles to support for renewable energy developments, and communicating climate strategies to an audience that is not inclined to listen.
CHAPTER FOUR: CHURCHILL COUNTY, THE OASIS OF NEVADA

Driving Eastbound on Highway 50, coming from Reno to Fallon, you drive through desert scrub and start seeing the signs of a town up ahead: a ranch supply store on the left, a billboard advertising the Burger King two miles down the road. Upon arriving in town, I see a fighter jet mounted on a pole outside the car dealership reminding me that this is a military town. The U.S. Naval Air Station is located 7 miles southeast of Fallon, the Churchill County seat, surrounded by high desert farm lands. The Air Station is hardly noticeable except for the occasional military convoy and the new faces that stream through town as military personnel rotate through three week training assignments. As I turn to head south on Highway 95, I slow down for the tractor that is also heading for the alfalfa fields south of town. The slower pace lets me look around. Fallon is a small farm town, but not one that plays on nostalgia and tourism. It is not known for its antique boutique shops or bed and breakfasts. Fallon is an old, sun bleached and sand blasted town. Many of the houses I drive pass have peeling paint and old cars or swing sets rusting in the back. Yet, there are also a few larger houses matching painted barns and manicured yards symbolic of the rural community’s income disparities. I pass the sign for the Air Station and follow the directions I had been given to reach the ranch where I will be staying for the next month: “Take a left onto dirt road; right at the big haystack.” The dirt track dead ends at the ranch where a family has agreed to let me stay in the trailer formerly occupied by their ranch hand. A yellow lab comes up to greet me as I park my truck next to the horse corral where a lame mare
and a retired draft mule are shedding their winter coats by the handful. Tufts of hair blow across the yard and stick in the fences.

This chapter describes Churchill County, Nevada, home to 24,000 residents and the setting of my case study. I begin by briefly describing the county’s geographic location and then explain the federal water project that provides much of the county’s water, the area’s economic base, the wildlife reserves that are significant landscape features in the region, and the social features of the community.

GEOGRAPHY

Churchill County is located 60 miles east of Reno, Nevada, at the intersection of where US highway 50 crosses US highway 95. Of the county’s 3.14 million acres, 85% are federally owned or managed (Nevada Division of State Lands, 1985). The Bureau of Land Management oversees most of those federal lands, but the Fish and Wildlife Service and Department of Defense also manage significant portions of the county. The county seat moved to Fallon in 1903, but the city of Fallon did not become incorporated until 1908 after the town had grown and prospered with the irrigation waters provided by the Newlands Project.

Churchill County is the natural drainage point for the Carson River. Water flows east out of the Sierra Nevada snowpack to support communities with an accumulated
population of more than 150,000 residents across Douglas, Carson City, and Lyon Counties before reaching Lahontan Reservoir. In addition to its function for water storage, the reservoir is a popular recreation site ranking as the second most used facility in the Nevada State Park system (Churchill County, 2010). The Lahontan Dam creating the Lahontan Reservoir has the capacity to generate up to six megawatts of hydroelectric power. After the reservoir, the water flows through a series of diversions and canals irrigating approximately 130,000 acres of Churchill County farmlands and providing water for the 24,000 (Bureau of Land Management, 2013) county residents before finally draining to the Stillwater National Wildlife Refuge.

Churchill County also depends on diverted waters from the Truckee River, which flows out of Lake Tahoe in California. As it passes through Nevada, it is diverted to support the Reno/Sparks metropolitan area. The Reno/Sparks area of Washoe County has close to half million residents and is an expanding industrial hub for west coast distribution. East of Sparks, near Fernley, one third of the Truckee River is diverted through the Truckee Canal to Lahontan Reservoir as part of the Newlands Project. The rest of the river flows north to Pyramid Lake. Pyramid Lake is completely within the Pyramid Lake Paiute Tribe reservation. It is the home of endemic threatened and endangered fish and is a popular recreation destination.

Figure 4 depicts a map of the study area. The map shows Churchill County in context of the two river systems and the Newlands Project that provides the water for the agricultural region.
NEWLANDS PROJECT

Nevada Congressman Francis Newlands sponsored the National Reclamation Act of 1902 (Bureau of Reclamation, 2013). One of the first projects the new Reclamation Service built was the Truckee-Carson Project that became known as the Newlands Project. The Newlands Project was developed to supply Churchill County with surface water for irrigation, but it also provides water for aquifer recharge, recreation, and wildlife (Simonds, 1996). Work began on the Newlands Project with the building of the

![Map of Study Area within the Truckee and Carson River Basins](http://commons.wikimedia.org/wiki/File:TruckeeRivermap.png)

**Figure 4. Map of Study Area within the Truckee and Carson River Basins. Source: KMUSser, Using USGS Date, Available at http://commons.wikimedia.org/wiki/File%3ATruckeerivermap.png**
Derby Diversion Dam on the Truckee River in 1903 (Truckee Canal White Paper Working Group, 2009). Below the Derby Dam, the Reclamation Service built the Truckee Canal to convey a portion of the Truckee River water from the Truckee River to the Carson River to be used to irrigate lands throughout Churchill County. The first of those diverted waters reached the Carson River during the summer or 1905 (Simonds, 1996). As the population grew and farmed the sandy, well-draining soil, demand for more water prompted the construction of the Lahontan Dam and Reservoir in 1911 (Simonds, 1996). The infrastructure provided by the Derby Dam, the Truckee Canal, the Lahontan Reservoir and the various smaller reservoirs and conveyance canals allowed for the U.S. Reclamation Service to sell farm land for the price of the water rights (Truckee Canal White Paper Working Group, 2009; Christensen, 2013). The water for those allocations was advertised in a 1914 government flier as being supplied from a “permanent and assured” source to encourage homesteaders to settle in the West (Truckee Canal White Paper Working Group, 2009; Christensen, 2013). The water delivered from the Newlands Project and the wetlands resulting from the sink at the end of the Carson River have allowed Fallon to be nicknamed “the Oasis of Nevada (Shetter, 1997).” The agricultural communities throughout Churchill County are still dependent on the Newlands Project infrastructure.

**ECONOMICS**

Unlike many rural Nevada communities, Churchill County developed around agriculture rather than mining. According to the 2010 Churchill County Master Plan, the three economic pillars for the county are agriculture, the military presence of the U.S. Naval Air Station in Fallon, and the renewable energy industry. The significant military
and contractor workforce that supplies the naval base has historically buffered the local economy against the rapid fluctuations that affect state and national economies (Churchill County, 2010). Agriculture and the geothermal industry provide 25% of the overall employment in the county (Churchill County, 2010). The influence of agriculture in the community can be seen at the local high school whose mascot is the Green Wave, alluding to the green wave created when the wind blows across the alfalfa fields.

AGRICULTURE

Settlers have farmed and ranched the Lahontan Valley since the late 1800’s (Simonds, 1996). Today there are more than 130,000 irrigated acres of farmland, with the majority dedicated to alfalfa, grain, and some pasture for feed for the dairy and cattle industries. Some farmers have also diversified to produce cantaloupes, other fruits and vegetables, and wine grapes. In 2007, agriculture contributed more than $175.4 million to the county with dairy products and beef cattle among the leading economic exports (Churchill County, 2010). In 2008, Lahontan Valley dairies produced more than 34.5 million gallons of milk (Truckee Canal White Paper Working Group, 2009).

All of the dairies in Churchill County are members of the Dairy Farmers of America (DFA) cooperative. The local dairies are family businesses with several hundred cows in each operation. As part of their agreement with the DFA, dairies are not allowed to use bovine growth hormones or antibiotics as part of the daily regimen of feed and care to the cows. DFA broke ground on a new milk ingredients plant in Churchill County while I was conducting field work in the spring of 2012. Dairies hope to increase production to supply the new demand created by the plant, and local farmers
are hoping that will lead to an increase in demand for corn and alfalfa to feed the dairy cows.

While the number of farms remains stable, the size of farms and number of irrigated acres continues to decline (Churchill County, 2010). Since 1978, there has been an average of 500 farms in the county, but the average farm size has decreased from 730 acres to 250 (Churchill County, 2010). The county identifies itself as an agricultural community and has made it a goal to protect and promote the agricultural way of life. The county has adopted a Right to Farm Ordinance stating in the county’s Master Plan (Churchill County, 2010):

“The right to farm all land is recognized to exist as a natural right and is a permitted use in all land use districts. This includes all uses and activities associated with generally accepted farming practices. Examples are the use of large equipment, aerial and ground spraying and seeding, application of fertilizer, insecticide and herbicide, all for the purpose of producing agricultural products. Noise, odors, dust and fumes may be caused by these practices at any time of night or day, and day of the week. Whatever nuisance may be caused by such uses is more than offset by the benefits from farming to the neighborhood and community, and to society in general, by the preservation of open space, the beauty of the countryside and clean air.”
Moreover, as a means to protect agricultural lands, the county has adopted an open space plan that encourages agricultural easements and promotes density growth within city limits rather than encroaching on agricultural lands.

In addition to protecting agricultural lands from development, there are also efforts to protect agricultural water rights from development. The cumulative impact of federal actions has reduced the water supply to the Newlands Project over the last forty years. In 1990, legislation authorized the purchase of agricultural water rights for wildlife wetland habitat (Public Law 101-618). Purchases from competing interests by the Pyramid Lake Paiute Tribe, mandatory levels of efficiency in the conduits of the irrigation water delivery system, reduced flows through the Truckee Canal, and the US Fish and Wildlife Service requirement to obtain and maintain 25,000 acres of wetlands has led to reduction in water delivery and irrigated farm lands. Water rights have been removed from productive farmlands, creating unsightly acreages of weeds, dust hazards, and declining wells due to lack of aquifer recharge. Ground water recharge results directly from the small amount of precipitation that naturally occurs in Lahontan Valley (1300 Acre Feet Annually), but most of it is from the infiltration of Newlands Project irrigation water (70,000 Acre Feet Annually) (Churchill County, 2010). The County’s 2010 Master Plan states that it supports programs that retain water rights in Lahontan Valley and specifically objects to any transfer or loss of water rights from agricultural lands, especially to upstream development. The county’s municipal water supply is dependent on agricultural water rights that recharge the local aquifer (Churchill County, 2010).
In general, agriculture is an aging industry. The average age of farm operators in the county is 58 years old (http://www.city-data.com/county/Churchill_County-NV.html). Traditionally, farming is a way of life that you inherit, along with the land. Even though I spoke with several farmers who were grooming one of their sons to take over the farm, most of their kids left the community to find jobs in cities. The attrition of farming families leads to a declining and aging population. The larger farms have been successful because of a family legacy.

**Renewable Energy**

There are seven geothermal plants in Churchill County that produce more than 100 megawatts, approximately one third of the geothermal power produced in Nevada (Churchill County, 2010). The Enel Green Power Stillwater Hybrid Power Plant is the first to combine renewable energy technologies to supplement the base load power from geothermal resources with the peak capacity potential of solar photovoltaics. The two technologies together give the plant a 60 megawatt capacity.

The county’s master plan (2010) repeatedly declares renewable energy is one of the main pillars of the community’s economy, and yet, it also states that there is no real long term benefit from renewable energy developments due to low numbers of positions needed to operate and maintain facilities as well as state legislated tax abatements. Many of the geothermal operations are on properties managed by the Bureau of Land Management, but in accordance with federal law, Churchill County maintains the right to regulate and approve all renewable energy projects proposed within the county. As a policy, the county encourages and supports the development of renewable energy and geothermal activity, which benefits the county, but is wary of
adverse impacts to the community and surrounding environment. In addition to concerns regarding economic impacts, both the county government and local residents are concerned about how geothermal developments could impact local water resources.

Property taxes are the second greatest revenue resource for the county, but property tax revenues are influenced by state imposed abatements on renewable energy construction (Churchill County, 2010). County leaders are hopeful that future development of the vast renewable resources in the area will not be restricted by state tax abatements and allow for more revenue to the county. Indeed, there is vast potential for future geothermal development, along with opportunities for solar and more hybrid energy projects (Think Geoenergy, 2009). However, county leaders are reluctant to just agree to any proposed renewable energy plan if the county does not directly benefit from the exploitation of those resources. In addition to taxes, geothermal and other renewable developments on public lands generate income for local counties through bids on leases and from rents and royalties on leases that are developed. For the 2011 fiscal year Churchill County received more than $800,000 from geothermal lease revenues, more than any other county in Nevada (Bureau of Land Management, 2013).

In a June 2012 workshop hosted by the BLM, Churchill County stakeholders listed renewable energy development as one of their top priorities for public land developments, however they also listed it as one of the development options with the most constraints (Bureau of Land Management, 2013). Churchill County leaders believe that renewable energy, geothermal developments in particular, can provide benefits to
the county, but they are not blind to possible economic and environmental impacts the developments can have in their county.

The small county is looking for ways to develop the economy without succumbing to pressures of urban growth that would compromise their agricultural land and way of life (Churchill County, 2010). Churchill County leaders and residents compare farming and geothermal industries with the mining industry in that they all are forms of building an economy through the use of local natural resources. Residents view resources located within their county as being locally owned regardless of whether they exist on federal or private property. In counties like Elko, the mining operations pay taxes and royalties and make large contributions to the local communities in variety of ways. Churchill County leaders expect similar support from geothermal developments. Similarly, they compare the construction of a new milk plant with the benefits offered by the energy industry with regards to overall community benefits. The milk plant will pay taxes for decades and provide stable employment to 40 or so employees compared to the new geothermal plants that will have taxes abated and employ only a handful of permanent employees after the initial construction phase. Looking at renewable energy developments through the lens of these comparisons, the energy developments are not seen as the windfall they are touted as in the national media.

**Naval Air Station Fallon**

Naval Air Station Fallon (NAS Fallon) was built during World War II and has grown to become the home of the Naval Strike and Air Warfare Center (NSAWK), which now includes the Navy Fighter Weapons School (TOPGUN) relocated from NAS Miramar in California. As a training center, the naval base does not host a large population of
permanent military residents in the area. Most personnel rotate through on a structured three week training schedule. While the military base has a large impact on local economics, it does not make up a large portion of local permanent population. However, I wanted to include the military perspective in my interviews to capture a broad swath of the community. To do so, I focused on people with a permanent position at the base or who became part of the local community after retiring from the military.

The Department of Defense’s investment in operating and training space produces jobs with economic stability and brings over $200 million per year into the local economy (Churchill County, 2010). In addition to the employment opportunities provided by the base, the influx of up to 20,000 personnel annually that come to the base for short term training rotations increases the revenues and taxes generated throughout the community (Churchill County, 2010). Moreover, the base has contributed to the local leadership with trained officers who retired in the county.

The agricultural community is an attractive location for the Department of Defense operations because it provides the low population and space needed to surround the Fallon Range Training Complex. The base has created a buffer of land around it and placed it into agricultural conservation easements. The perimeter of irrigated agricultural land acts as a redundant safety feature for fire concerns from the base and buffers the threat of any urban encroachment incompatible with NAS Fallon operations (Churchill County, 2010).

WILDLIFE

Among the public lands managed in or near Churchill County are several large wildlife habitats based at the natural ends of the Carson and Truckee Rivers. With the
diversion of water for the Newlands Project, the reduced flow of the rivers greatly impacted the wetland habitats. Competition for water to sustain critical habitat in the Carson Sink and Pyramid Lake has reduced agricultural water rights for Churchill County farmers.

The Carson River naturally sinks into the desert east of Fallon, Nevada creating critical wetland habitats including the Stillwater Wildlife Management Area, which consists of the Stillwater National Wildlife Refuge and Fallon National Wildlife Refuge. They support a variety of habitats, including marshes, riverine riparian areas, alkali flats, salts desert shrub lands, and sand dunes. These diverse habitats attract nearly 400 species of wildlife, including over 260 bird species or water fowl and shorebirds and other migratory birds (Churchill County, 2010). In many years, up to 70% of Nevada’s migrating waterfowl rely on Lahontan Valley wetlands (Clark County, 2010). The Western Hemispheric Shorebird Reserve Network has designated the Stillwater National Wildlife Refuge as a Site of International Importance, the National Audubon Society calls it an Important Bird Area, and the American Bird Conservancy names it a Site of International Importance (Stillwater National Wildlife Refuge, 2014). The wetlands get seasonal flushes of snowmelt allowing it to transform throughout the year from a shallow lake of clear, fresh water to brackish marshes with high salinity levels. This range of ecological conditions in one area provides habitat for a diverse wetland community, with over 450,000 individual birds visiting throughout the year (Paez, 2002). With all the diversions and users upstream, the reduced flow of water to the terminal points not only means that this habitat is shrinking, but that naturally occurring trace
elements such as arsenic, boron, lithium, molybdenum, mercury, and selenium, are now concentrated at toxic levels (Paez, 2002).

The Truckee River terminates approximately 50 miles northwest of Fallon in Pyramid Lake. The lake is entirely within the Pyramid Lake Paiute Tribe Reservation and holds cultural and economic significance for them (Gautam, Chief, and Smith Jr., 2013). Pyramid Lake is a popular recreation destination for water sports in the desert, including fishing. The Pyramid Lake Paiute Tribe operates and maintains fishery facilities at Pyramid Lake and the lower Truckee River for the purpose of enhancing endemic populations of endangered Cui-ui and threatened Lahontan Cutthroat Trout, while also managing natural resources to create a balance which reflects the social, cultural, economic, and natural resource values of the Pyramid Lake Paiute people (Guatam et al., 2013). Almost immediately after the development of the Newlands Project, the lake began shrinking (Gautam et al., 2013). By the mid 1930’s, the lake had receded to the point that the endemic fish populations could no longer reach the river to spawn (Paez, 2001). For decades, the United States government on behalf of the tribe and wildlife have been in some form of litigation or negotiation for more water rights to supply the lake habitat (Gautam et al., 2013; Springmeyer, 2011).

POLITICAL AND RELIGIOUS ATTITUDES

Politically, county residents are conservative with 70% of the voters casting their ballots for Mitt Romney in the 2012 presidential elections (city-data.com, 2012). Nevada was part of the sagebrush rebellion, a movement that gained momentum in the 1960’s that wanted control over federal lands to be relinquished to the states (Blakemore and Erickson, 1981). Overall, the Sagebrush Rebellion reflected a belief that the federal
government was managing the land without regard for the Western states. The anti–
federal sentiment can still be readily found in Churchill County. There is both fear and 
resentment of the federal actors and policies, especially towards the US Fish and 
Wildlife Service and Senator Reid and his involvement with the competition between 
agriculture and tribal water rights. There is disagreement between the US Department 
of Agriculture policies regarding water conservation and the local belief that any water 
lost to inefficiencies irrigation methods are necessarily charging the local aquifer. 

Whether talking about authority figures, college credentials, or scientists, a popular 
sentiment from residents is that no one knows their life like they do, and so they 
discount those with experiences that differ from their own.

A third of the population is affiliated with a religious congregation, which is 
lower than the national percentage (city-data.com, 2012). In my interviews, 40% of the 
respondents identified with a religious congregation, and I was able to ask them about 
how religion influenced their thoughts and decisions regarding environment. Despite 
being from different churches, responses to my questions had a common theme: to 
trust in self and God over others and react to the obstacles as tests. Religion did not 
seem to be a main indicator of climate beliefs, but I did notice that religious participants 
reflected an attitude that was more reactionary and less proactive with regards to 
climate policy and adaptation.

INCOME AND EDUCATION

There is one junior high school and one high school in the county. Both 
campuses are surrounded by billboards with anti-drug campaigns specifically aimed at 
methamphetamine use. According to the Churchill Community Coalition, 15% of
Churchill County high school students have used meth and 90% of drug crimes in the area are associated with methamphetamines specifically. The high school class has an 85% graduation rate, which is higher than the state average of 70%, but it has a lower percentage of the population with a college degree than the state average (Bureau of Land Management, 2013; city-data.com, 2012b). In addition to the dance club, the chess club and the drama club, the high school also offers a rodeo club and a chapter of the Future Farmers of America.

As part of the preparations for a Carson City District Resource Management Plan, the BLM prepared a socioeconomic report on counties in their planning district. They used 2010 census data, which showed that the median annual household income for Churchill County was $51,597, which is below the state median household income of $55,796. However, it also had a lower percentage of the population, 8.8%, below the poverty level than the Nevada state percentage of 11.9%. When comparing incomes in the county that were earned from labor with income earned from investments or retirement, Churchill County has the largest percentage of income from labor among the 11 counties in the BLM study. Despite the older community, most of the income comes from labor and self-employment rather than retirement.

OBSERVATIONS FROM THE FIELD

Churchill County as an economically depressed area with half the store fronts of downtown Maine Street empty despite a recent attempt at reviving the historic street. There are some new restaurants with dishes that feature locally harvested ingredients like the Maine Street Café and the Slanted Porch along with the fast food chains that can be found anywhere like Jack in the Box and Burger King.
There appears to be a mix of affluence and extreme poverty in the county. Many residences show tendencies towards hoarding with lots of old stuff stacked in yards. One area I mistook as an abandoned neighborhood by day, proved to be full of residences and had a popular bar that came to life at night. People seem to have a stubborn pride in that they refuse to not be proud, but they are not fixing up homes or blighted areas. Despite the small, older homes that seemed to concentrate in the City of Fallon, the back roads through alfalfa fields and dairies showed a lot of newer, large home with painted fences and matching barns.

Socially there are several bars ranging from the country bar with the long saloon, no dance floor, and horse shoes out back to the all-inclusive Boomer’s. Boomer’s has a dance floor, a karaoke room, and was serving drinks to farmers, military personnel, and members of the local motorcycle club. Even though all the variety of life in Churchill County could be found in the same bar, they kept to their own groups rather than mixing together. The younger cowboys did not like the military guys hitting on local girls. It is important to remember that most of the military personnel are only in town for a couple of weeks. Stockmen’s is a large local casino that not only provides entertainment, but also employs a lot of people.

I was invited along to a girl’s night in, where a group of friends - all young wives in their early 30’s - drank cocktails, talked, and enjoyed classic board games without their children or husbands. Most of the women had children, and the conversation turned to health care. The local hospital has only a handful of doctors to perform certain procedures. For any other procedures that may be needed, people are referred to
hospitals or doctors in Reno. Many locals would rather go to Reno with the idea that the big city doctors can provide better care, although there is nothing to say that is true.

Rural living offers experiences that are to be shared with the whole family. Passing on traditional activities like camping, riding, hunting are important, and people expressed the need for open space to be able to teach their kids the skills they learned living in the country.

Several informal conversations revolved around the state of the world, and the very real expectation for a societal decline, civil war, or some other need to rely on their knowledge of the land for survival scenarios. As people who live more in tune with the weather and the land, many residents know how to survive without electricity, where to get water and food, and how to protect themselves. Their self-reliance is a source of pride and a skill set they do not expect in urban dwellers. People expressed an isolationist attitude as a reactionary response to the world’s woes. Despite their fatalism, climate was not cited as a possible cause of a collapse of the modern system we all depend on. Climate disasters in the form of extreme weather events are simply seen as isolated incidents beyond their control. They view their own daily lives are hard enough to not have to worry about flooding or strife somewhere else.

Most participants see themselves as talking more, giving more information, and knowing as much or more than their neighbors. These answers align with the idea of them seeing themselves as powerful, self-determining agents and not deferring to others. They do their own research and make their own decisions.

The next three analytic chapters explore the responses of the interview subjects with respect to the topics of climate adaptation, renewable energy development, and
climate communication. First, I synthesized participants’ perspectives with literature on water policies and climate adaptation to create the argument that current water policy acts as a disincentive for any water conservation efforts. Investigating claims of renewable energy as a possible burden to local counties despite the benefits they are reported as bringing led me to follow up literature and policy reviews that show that as technology evolves, the policies that guide that technology also needs to evolve to make sure that costs and benefits are felt equitably by the American public. The third analytic chapter focuses on how to communicate these climate policies and solutions to a rural, conservative public that tends to discount suggestions from academia.
CHAPTER FIVE: CLIMATE ADAPTATION IN CHURCHILL COUNTY, NEVADA

Churchill County is most importantly identified as an agricultural county. An examination of climate models, water supplies, and water demand shows that agriculture, especially in the already arid climate of the American West, is particularly vulnerable to climate change due to increasing demand for water and decreasing water supplies (Safi, Smith Jr., and Liu, 2012; Tanaka et al., 2006). As one of the driest states in the nation, Nevada’s surface water systems have all been fully appropriated for most of this century (Welden, 2003), and many of the groundwater basins are designated as closed or restricted. Water scarcity is not new to the region, but the farmers’ ability to deal with past droughts has allayed their fear of any future droughts that are expected due to a changing climate. Despite the fact that most interviewees in this rural community agree that the climate is changing, they believe the threat to their water supply and economic well-being is due to politics and resource competition rather than from climate change. They trust that the water allocations they currently hold, along with the infrastructure system that stores and delivers that water, will allow them to overcome any future droughts or heat waves just as it has in the past.

My research question asks whether county residents plan to strategically adapt their ranching and farming practices to conserve water if they believe the climate is changing, and, if so, how? I asked informants how concerned they were about future water supplies and what plans they are pursuing to prepare for those threats. Nevada farmers and ranchers have produced food in the desert for over a hundred years. Out
of necessity, they have adapted practices for water conservation such as crop rotation, low till planting, timing of planting, water efficient crops, and lining irrigation canals. While these practices can all be considered climate adaptation strategies, they are being employed by farmers who feel that their water resources are a scarce commodity that is being threatened by competing water users, including upstream urban development and downstream wildlife protection. They do not conserve water because they believe anthropocentric climate change is a real or direct threat.

With climate change imminent, further water conservation measures are needed and future water supplies are uncertain. However, based on Nevada water laws, water conservation efforts that would reduce the use of water by the agricultural sector could threaten farmers’ water rights. Conserving water would simply mean they would have access to less water now rather ensuring adequate water supplies when future droughts hit. Current water policy in the state allows any conserved or unused water to remain as a public good and be available for non-agricultural uses. This use it or lose it policy is a disincentive to any water efficiency or conservation endeavors practiced by the agricultural community. Policies need to be adapted to reward farmers that have invested in new technology or practices by securing a portion of the conserved water for their future use.

In this chapter I discuss how water policy needs to be adapted to incentivize climate adaptation for Nevada farmers. The ongoing litigation for agricultural water rights is perceived as a more immediate threat to Churchill County residents than impacts due to climate change, so messages to farmers pertaining to climate adaptation need to account for the risk of losing water to urban and/or wildlife demands. I begin by describing the current water delivery system that has allowed farming in Lahontan
Valley for the past century. I then explain the competition for water in the area by wildlife, urban, and agricultural sectors, including the farmers’ perceptions of these competing interests. I will also explain how conservation efforts that are being promoted to the farming community are not necessarily considered beneficial for the farming community. I will conclude by suggesting that changing water laws could provide appropriate incentive for farmers to prepare for a changing climate by showing them that conserving and banking water can also help protect against increasing competition amongst water users.

LACK OF CONCERN REGARDING CLIMATE CHANGE

My informants are representative of Doubtfuls and Dismissives according to their climate beliefs and lack of concern. While 17% of my informants don’t believe the climate is changing in any notable way, a large majority (74%) of my informants believe that the climate is changing (Figure 5). They refer to winters from their childhood when they could skate across the ice on the local canals and reservoirs as proof that winters used to be colder. Despite their belief that the climate is changing, they do not believe in anthropogenic climate change (Figure 6). Half of the participants believe that the changes they notice are part of natural cycles. Almost another half (41%) don’t know what they think is causing change or increased variability in the weather, but they are definitely not ready to accept that human actions are influencing the global atmosphere. This is representative of farmers across the nation5. Because they believe

5 A recent survey of Midwestern farmers and agricultural agents mirrored my results with 66% of farmers believing the climate is changing, but only 8% attributing that change to human activities. Many of the farmers in that survey also thought the climatic changes they were noticing were a result of natural shifts in the environment. Even more said there was not enough evidence to say anything one way or the other with regards to causes and impacts of climate change (Prokopy et al., 2014).
that the changing climate just reflects natural processes, my informants were not concerned that climate change could impact them personally. For a farmer, climate and weather is just something you react to; you can’t control it.

**Figure 5. Informants' Beliefs in a Changing Climate.**

**Figure 6. Informants' Beliefs in Cause of Climate Change.** Note the smaller sample size excludes dismissives who do not believe change is occurring.
Living in Nevada, dry conditions and fluctuating precipitation levels is normal, and desert residents do not really notice increased temperatures. Dr. Stuart Richardson explains, “When it gets past 100 degrees and you are out harvesting your fields, it doesn’t seem to matter at that point. It is so hot that whether it is 100 or 110 it’s miserable out there (April 30, 2012).” Since most of the state’s population and agriculture relies on surface water diverted from out of the state to provide water, there is no local difference between drought years and non-drought years, other than the reservoir levels. Ed Rybold understands that there have been periods of droughts during his time in Churchill County, but they are not concerning. He explains, “Have we had low capacities at Lahontan Reservoir? Yes, I would gladly say that. A drought? I would not consider that a drought (April 26, 2012).” Most of my informants agree with Mr. Rybold that it would take an extended period of low reservoir levels to actually raise concerns regarding climate change effecting water supplies. Cheryl DuShane said, “I think we are in a drought now, but I don’t think it is too serious (April 27, 2012).” Chris Henning echoes Mrs. DuShane’s level of concern:

“We live in a desert, so there is always concern of a drought, but I don’t know that that concern is any greater than it has been in the past. We seem to have some sort of seven to eight year tend where we go through seven or eight years of wet weather and then we will go through droughts, but I can’t say that it is any worse than it has ever been (May 3, 2012).”
Gary Imelli describes how the farmers react when a drought reduces the amount of water available, “We have gone through years where out of 40 acres, you don’t have enough water to do the whole thing, so you can only irrigate 30 acres of your property (May 1, 2012).” Despite the dry 2011-2012 winter, the reservoir levels were full in the spring of 2012 due to a heavy winter snowpack from the previous winter, so water supplies weren’t a concern for anyone I interviewed.

The Sierra Nevada snowpack feeds the Carson and Truckee Rivers. Informants were unaware of any changes in Sierra snowpack trends despite a report for stakeholders published by the Sierra Nevada Alliance (2010) that states “in most cases, total annual stream flow into major Sierra Nevada reservoirs is projected to drop about 10% to 20% before mid-century and 25% to 30% before the end of the century.” Mike Berney suggested that it would take a dramatic change in snowpack, like a consistent 40% reduction in snowpack over a ten year period, to lower the reservoir to a point that would cause alarm that climate change could have detrimental impact on the community’s water (April 24, 2012).

Some informants even believe that climate change could be beneficial for the farming community. Rick Lattin explains, “Climate change has been very, very good for us. It has given us a little more heat and a little more growing days and made it possible for us to grow crops that 50 years ago wouldn’t grow in the valley (April 23, 2012).” Mr. Lattin acknowledges that if global warming effected the snowpack, then those benefits would be nullified, but he does not believe that will happen. Dairyman Lance Gomes things that climate change may even increase water supplies. He says, “Just last year we actually surpassed Alaska in snowfall. I don’t know if that was a fluke or what, but it seems global warming seems to bring on the snow a little more (April 28, 2012).”
The interviews took place in April 2012, after a very warm winter with significantly a less than average snowpack and few freezing days. Despite the warm winter, that April was abnormally cool for the area. Interview subjects would reference the warm winter and cool spring as a way to show that the variation in weather was increasing or that there is definitely change in the climate. The 2010-2011 winter the year before was an unusually high snow year for much of the country, so farmers were not yet worried about water or drought due to high reservoir levels from the year before. Farmers know that weather will vary year to year. It is “a big problem for farmers, but it is common,” explains Charlie Frey (May 2, 2012). The key to having a constant supply of water from one year to the next, despite the flood or drought conditions that may occur, is to extend a bit of control over the water resources with dams and reservoirs and conveyance systems. Ernie Schank believes that “if the rivers and streams and the dams and the reservoirs can be utilized as they once were intended, then I think that man has to a large degree overcome the natural cycles (May 2, 2012).” Any concerns these farmers and ranchers may have had regarding the changing climate is dispelled by their faith in the century-old infrastructure that has delivered their water to their fields for generations.

THE NEWLANDS PROJECT

The Newlands Project refers to the century old water infrastructure of ditches, canals, dams, and reservoirs that carry water from the Truckee and Carson rivers to the Lahontan Valley for irrigation, aquifer recharge, recreation, and wildlife. Nevada Congressman Francis Newlands sponsored the National Reclamation Act of 1902, so it is not surprising that one of the first projects the new Reclamation Service built was the
Truckee-Carson Project that became known as the Newlands Project. The plan was to divert waters from the Truckee and Carson Rivers to irrigate farm lands in Lahontan Valley and encourage growth in the area. The infrastructure provided by the Derby Dam, the Truckee Canal, the Lahontan Reservoir and the various smaller reservoirs and conveyance canals allowed for the US Reclamation Service to sell farm land for the price of the water rights. The water for those allocations was advertised as being supplied from a “permanent and assured” source (Truckee Canal White Paper Working Group, 2009).

LOCATION

Churchill County is the natural drainage point for the Carson River. It flows east out of the Sierra Nevada snowpack to support communities, with an accumulated population of over 150,000 residents, in Douglas, Carson City, and Lyon Counties before reaching Lahontan Reservoir. After the reservoir, the water flows through a series of diversions irrigating approximately 150,000 acres of farmlands and providing water for the 55,000 Churchill County residents before finally draining to the Stillwater National Wildlife Refuge in the Carson Sink (Truckee Canal White Paper Working Group, 2009).

The Truckee River is located north of the Carson River. It drains Lake Tahoe and flows northeast out of California to Washoe County with the second highest population in Nevada. The Reno/Sparks area of Washoe County has close to half million residents and is an expanding industrial hub for west coast distribution. East of Sparks, near Fernley, one third of the river is diverted through the Truckee Canal to Lahontan Reservoir as part of the Newlands Project. The rest of the river flows north to Pyramid Lake. Pyramid Lake is completely within the Pyramid Lake Paiute Tribe reservation. It is
the home of endemic threatened and endangered fish and is a popular recreation
destination for northern Nevada residents, with cultural and economic significance to
the Pyramid Lake Paiute Tribe (Guatam et al., 2013). Figure 7 shows the Truckee and
Carson Rivers within context of the Newlands Project courtesy of the Bureau of
Reclamation.

**Figure 7. Map showing Newlands Project and Truckee and Carson River Systems.**
**Source:** Bureau of Reclamation. **Available at:** [HTTP://WWW.USBR.GOV/MP/PA/TRUCKEE/MAP_1300.JPG](HTTP://WWW.USBR.GOV/MP/PA/TRUCKEE/MAP_1300.JPG)
WATER RIGHTS CONFLICT

Climate change has not created a concern for decreased water supplies because Churchill County residents believe that the Newlands Project provides a buffer for periods of drought, but they ever vigilant of their water rights for fear that competitors along the water system may impact future water rights. “In the West, we have a good water supply and we have a good system that protects us, for the most part, from drought. It is people who want to change the historical use of the natural resources ... that is more of an issue to me than climate change problems (Ernie Schank, May 2, 2012).” Water has always been a contentious commodity in the region, and climate change only aggravates the tension between users (Gautam et al., 2013).

THE NEWLANDS PROJECT AND THE SETTLEMENT ACT

Fighting over the Newlands Project waters started shortly after the completion of the project early in the 20th century. The case of the United States of America vs. Orr Ditch Company et al. began in March, 3 1913. Disputes emerged from competing claims for Truckee River water among municipal interests, agricultural, and the wildlife and fishery needs for the Pyramid Lake area. The case took 31 years to complete, and was signed on September 8, 1944 (Buschelman and Ricci, 2013). With the completion of the court case, the claims along the Truckee River were officially and permanently decreed by the Supreme Court. The United States, on behalf of the Pyramid Lake Tribe and the United States Fish and Wildlife Service, argue that while agricultural rights were set aside for the Pyramid Lake Tribe, not enough water was set aside to sustain the fishery and wildlife needs of Pyramid Lake (Guatam et al., 2013; Paez, 2002). This argument was rejected by the Supreme Court, but that has not stopped appeals and other efforts
to change the water allocation for the Truckee River system. The US v. Orr Ditch Company, et al. decree allows the Truckee-Carson Irrigation District to divert a flow of water up to 1500 cubic feet per second from the Truckee River through the Truckee Canal for storage in Lahontan Reservoir. The decree established historical precedent assuring water for Lahontan Valley, but there has been continuous litigation regarding water use in the Lahontan Valley region (Guatam at al., 2013; Springmeyer, 2011).

During the last 30 years, the debate over water use in the Lahontan Valley has focused on the degrading state of the lakes and wetlands that mark the end of the Carson River and Truckee River drainage basins. In 1990, Congress addressed the years of contention regarding the over-allocated water in this region by enacting the Truckee-Carson Pyramid Lake Water Rights Settlement Act. The Settlement Act requires the Secretary of the Interior to acquire water and water rights from willing sellers to sustain 25,000 acres of wetlands in the Lahontan Valley (Public Law 101-618). Historically, the wetlands would get seasonal flushes of snowmelt allowing it to transform throughout the year from a shallow lake of clear, fresh water to brackish marshes with high salinity levels. This range of ecological conditions in one area provided habitat for a diverse wetland community, with over 280 bird species documented consisting of over 450,000 individual birds visiting throughout the year (Paez, 2002). With all the diversions and users upstream, the flow of water to the terminal points not only means that this habitat is shrinking, but that naturally occurring trace elements such as arsenic, boron, lithium, molybdenum, mercury, and selenium, are now concentrated at toxic levels (Paez, 2002).

The Settlement Act acknowledges that the easiest way to get water for the wetlands is to buy it from willing sellers with agricultural water rights since they are the
largest source of surface water rights. As the biggest water rights holders in Lahontan Valley, farmers will be impacted the greatest by these water transfers from agricultural use to wildlife use (Paez, 2002). The Secretary of the Interior has proceeded to buy agricultural lands for their water rights leaving a patch work of fallow fields in the Lahontan Valley. The agricultural lands, now without water rights attached to them, have little value. The families that sold off their land have left the county. The agricultural sector is considered to be responsible for the “crucial, stable, tax-producing part of the economy. Any reduction in the amount of water to be delivered under Nevada law would diminish these advantages” (Truckee Canal White Paper Working Group, 2009). The Truckee Canal White Paper Working Group (2009) provided Figure 8 illustrating the percentage of water rights by user group in Lahontan Valley.

FARMERS IN COMPETITION WITH TRIBES AND WILDLIFE

These struggles over water allocations have created animosity between the local community and tribal and federal authorities. One county leader describes the Fish and Wildlife Service as “a competitor for water rights that began killing agriculture, taking acreage out of agriculture, destroying the economy because they were killing business and ag here (anon3, April 19, 2012).” Local farmer Charlie Frey relates that within a two-mile radius of his farm, there are over ten farming properties that have had the water pulled off of them by the Fish and Wildlife Service. He asks “how stupid is that? Take ten big farms, you take them out and permanently reduce down the economics of the whole area. How ridiculous is that (May 2, 2012)?” According to him and his wife, taking water off farmland also produces a landscape of dust and noxious weeds around their property.

Lahontan Valley farmers are quick to point out that they love wildlife; they even provide habitat and food on their own lands for the birds that use the Fallon area as a stop on the Pacific Flyway. Many of the farmers described themselves as stewards of the land. Charlie Frey described the desert with all of its creatures and plants as his church. When asked about public land issues, county residents stated it was important that habitat be preserved for wildlife viewing and hunting opportunities. Rick Lattin, an organic farmer who has been farming a large acreage in the area for generations and is a consultant with the county’s economic development authority, explains:

“...our ground is in wildlife habitat kinds of things. They (industrial agriculture) are taking all wildlife out because wildlife could bring a disease into the product. They are essentially growing in a sterile
environment, but the small family farm is never going to be able to do
that, so I think there has just become a real come together of
environmentalists and family farms saying hey, we want the same thing
(April 23, 2012). “

Farmer Charlie Frey explains that farming is a calling to be a steward of the land as much
as it is a vocation providing a commodity for markets, illustrating the amount of respect
that farmers have for the ecology of the open spaces where they live and work.

Despite their respect for wildlife, local farmers disagree with and government
policy supporting any reduction in water for agricultural production in the area.
Churchill county residents cite Swingle Bench as an example:

Swingle Bench “is kind of a little community off to the right, a bunch of
little farms. The Pyramid Tribe bought up most of the irrigation rights
(surface water) out there because they were off the Truckee Canal, so
they could transfer them (the water rights) down the Truckee River to
Pyramid. (Berney, April 24, 2012).”

The farmers feel politically marginalized since environmentalists and Pyramid Lake
Paiute Tribe are supported by several federal agencies. Admittedly, that support is
dependent on unreliable federal budget allocations (Guatam et al., 2013). Litigation
amongst Lahontan Valley water competitors involve federal funds from Bureau of Indian
Affairs and US Fish and Wildlife Services to support Tribal and wildlife claims against
farmers, irrigation districts or city and counties. Springmeyer (2011) describes the
Pyramid Lake Paiute Tribe’s strategy to protect and gain water rights as a means to enhance the endangered fish populations in the lake:

“To protect its resources, beginning in the 1980s the Tribe protested and litigated many applications seeking to change the place or manner of use of other Truckee surface water rights, most notably in the Newlands Project. The Tribe’s position was that much of the water rights held in the Project were paper rights, never used, and arguably forfeited or abandoned, and whose actual use would detrimentally affect Pyramid Lake, the Tribe’s surface water rights on cui-ui and Lahontan Cutthroat Trout. The battles on this front spanned decades and resulted in multiple decisions from the Ninth Circuit Court of Appeals relating the law of forfeiture and abandonment as applied to the Newlands Project.”

The Tribe has been successful in their strategy with some of the court decisions (Guatam et al., 2013), and the lesson Springmeyer took from their actions was that “relentless commitment to litigation, if necessary,” is a proven strategy and gives negotiators more leverage for pursuing non-litigation solutions. Because agricultural water is viewed as supporting the economics of the whole community, as well as charging groundwater wells, all of the informants, not just the farmers, seemed to regard the Tribe as a threat due to the relentless litigation against Newlands Project water.
TRUCKEE CANAL BREACH

In January 2008, the Truckee Canal breached its banks in Fernley, Nevada. Repairs required the canal to be closed, meaning water Lahontan Valley could not get Truckee River water. In essence, the lack of flow created an artificial drought for the farmers in Lahontan Valley, as well as the Lahontan Wetlands, and the various municipal users. Due to concerns that the canal may breach again, even after the repairs were completed, only a reduction of less than half the normal flow was allowed to be diverted through the Truckee Canal. A study was done to evaluate the risks of opening the Canal to its historic flow as well as the impact of this reduced flow on Newland Project water users. In addition to surface water scarcity, the lack of water in the canals and on the fields affects groundwater infiltration, which recharges shallow domestic wells in the area. Five years after the breach, the flow through the Truckee Canal is still less than half the decreed amount. The Bureau of Reclamation is looking at alternatives to supplement the water flowing through the Truckee Canal. Alternatives include: bringing groundwater in from the uninhabited Dixie Valley to the east of Lahontan Valley, reducing agricultural allocations, and making structural changes to the Canal to allow the full diversion flow again (Bureau of Reclamation, 2013). Farmers in Churchill County compare the decrease in flow through the canal with the Endangered Species Act and the Clean Water Act; they are all government regulations meant to reduce their water supply in favor of Pyramid Lake and the Tribes (Ernie Schank, May 2, 2012).

UPSTREAM URBAN DEVELOPMENT

Conservation efforts are driven by fear of urban development rather than climate change. Reno/Sparks area is the second largest urban area in the state, local
residents naturally draw parallels between it and Las Vegas. With the approval of a pipeline that will deliver groundwater from three rural counties in Eastern Nevada to Las Vegas, Churchill County residents wonder whether their own water rights are secure enough to defend against the growing demands of Reno or Las Vegas. Cheryl DuShane, a Clark County resident with a small ranch complains that “in a drought situation, I don’t think there is much the government can do unless they go steal water from somewhere else, like Las Vegas is trying to take our water (April 27, 2012).” Although diverting Truckee or Carson River water to Las Vegas may never actually happen, the perceived threat is looming on the minds of the county residents.

Not only is the Reno area population growing (US Census, 2012) and requiring more water for municipal purposes, there is also an active campaign to draw more industrial activities to the Interstate 80 corridor just outside of Reno. The Tahoe Reno Industrial Complex (TRIC) is an industrial complex boasting more than 100,000 acres with onsite power plants that can provide 900 Megawatts of electricity to industrial and manufacturing businesses that wish to locate to the West Coast. Tesla, the electric car company, is siting their new gigafactory at the TRIC. The gigafactory itself is a huge development, but TRIC Principal, Lance Gilman, describes the anticipated growth of the center as a “tsunami that’s going to come behind Tesla (Nelson, 2014).” In addition to the industrial growth, the manufacturing factory also represents population growth. Gilman expects the number of full time workers at the center to double within his lifetime, reaching up to 150,000 workers (Nelson, 2014). Downstream residents view the TRIC as a source of growing water and energy demand. One county leader states, “Individuals who own surface water rights on the Carson River are now wanting to sell those water rights to Storey County (where the TRIC is located). If indeed the state
engineer approves it, all the surface water rights owned along the Carson River could potentially be sold upstream (anon3, April 19, 2012).“ The TRIC states that its water supply comes from well water and not the Truckee River, but it is less certain where the power plants acquire their water from (Baumer, 2007). Moreover, whether or not TRIC water comes from the Truckee River, the perception of more competition from upstream development is enough to keep the focus of a threat on local water supplies away from climate change.

Farmers and local governments are reluctant to enter into any negotiations over water allocations due to the fact that precedent is on their side. Farmers have senior water rights, so the rights are secured if one is willing to defend them in continuous court battles. However, as Mr. Morrison relates, “some people, I think, got tired. They got tired, why do it anymore? If it has value, I will sell it and move on (May 1, 2012)”. Former County Manager, Brad Goetsch states, “We have chosen to keep agriculture as a main part of our economy and of our culture. We are dedicated to that and are in court and in constant contention over the water rights that this project has and ensuring that the irrigation water continues to flow down here (April 13, 2012).” Another county employee expounds, “Most of our time seems to be taken up with concerns of the politics and litigation going on, I mean that is where the concern is now, the millions of dollars being spent on litigation (anon3, April 19, 2012)”. The President of the Board of Directors for the Tahoe-Carson Irrigation District explains that “with the irrigation district, it seems that we are always in litigation because it seems that everybody wants our water (Shank, May 2, 2012).” When deciding where to place the area’s resources of time, money, and political capital, the constant litigation over water supplies supersedes the long term threat of climate change.
Interviews with Churchill County residents show that history plays a larger role in their deliberation process when it comes to adaptation and planning for scarce water resources than any new studies done by climate experts. Interviewees perceive climate change as a long term threat that is uncertain and not immediate. In contrast, residents and farmers in the Lahontan Valley have had to continuously defend their water rights against upstream development and wildlife concerns. Everyone is fighting to hold on to their piece of the pie knowing that there are not enough pieces to go around in an over-allocated water system. The ongoing struggles over water rights have proven to the local community to be a more certain and immediate threat than climate change, and therefore they invest any resources they have for water security to the fight for water rights rather than climate adaptation. Any adaptation strategy regarding water resources in the region needs to address these water conflicts that exist already and place them in a future context that could include higher water demands and less water availability due to more frequent and intense droughts.

NEVADA WATER LAW – POLICY IMPACTS ON CONSERVATION EFFORTS

Western water law follows the doctrines of beneficial use and prior appropriation. These traditional policies are at the core of the modern threats to agricultural water rights. The foundation of the beneficial use rule is use it or lose it. If farmers reduce their water use through conservation efforts, they could lose their water rights and the ability to use that water in the future. Prior appropriation gives priority to the oldest water rights claims, even if it means reducing or denying water to junior claimants. However, those junior claims are typically coming from urban and industrial developments. The combination of increased demand and political power from urban
centers threatens the security that the rule of prior appropriation has traditionally
granted to agricultural water rights.

**Beneficial Use – Use it or Lose it**

Nevada water law is based on the doctrine of prior appropriation; a doctrine
that was developed in the semi-arid West where large scale infrastructure was built to
divert water to be used for irrigation or mining on lands far from the water source
(Welden, 2003). The doctrine is originally based on the principle from John Locke that
states that when a common resource is scarce, the individual who invests the labor and
capital into making it available for a beneficial use is the one who can claim the resource
as their own (Anderson, 1983). The doctrine of prior appropriation is built on the basic
principle that water is a publicly owned good that is owned by the state. Water rights
can be owned, but they only grant the holder access to the water, not the full ownership
of the water itself. As such, that access to water is granted only if it is put to beneficial
use. In Nevada, examples of beneficial use can include: irrigation, mining, stock
watering, recreation, commercial, industrial, municipal, and wildlife purposes (Nevada
Department of Conservation & Natural Resources, 2013). If it is not put to beneficial use
or is not used to its total sum, the access to the water is taken back by the public
(Welden, 2003).

According to the use it or lose it principle, any savings in water due to
conservation efforts, can be considered water that is not used, and thus abandoned,
under the prior appropriation doctrine (Huffaker, Whittlesey, and Hamilton, 2010). As
climate change progresses, less water is expected to be available to all users in the
water system, and thus it is prudent for agricultural users who have such a high demand
for water to start implementing more stringent water conservation measures. However, under current policy, that would simply free up more water for other users to appropriate now without consideration for adapting the whole system to a future that includes less water for all. The state of Nevada has already allocated all the surface waters, and the current practice is that any water freed up through conservation measures is then put to beneficial use by someone else, so the system as a whole has not adapted to future climate change. Climate change projections suggest it is not enough that water in the state is maximized to its full beneficial potential; there is a need for a buffer system in place that would allow for those water users to withstand future periods of increased drought and higher water demands. Water conservation measures must be paired with guarantees against abandonment or forfeiture of water rights, or potentially a water banking system, so that those with the foresight to conserve water now will see the benefit by having access to those water savings in times of future drought.

**First in Time, First in Right**

The prior appropriation doctrine also includes a rule of priority or senior claims in times of shortages, meaning that the earliest claims to the water are honored in total during water shortages and newer water appropriations are at risk of being temporarily denied if there is not enough water to supply all allocations. While historically the denial of junior water claims in favor of senior claims may have been the practice, a more modern society has had to adapt the system to allow for water in new urban centers and endangered species (Huffaker et al., 2010).
One example of the paradox of the “first in time, first in right” rule of the prior appropriation doctrine is the in stream use of water by wildlife. Water allocation for the Newlands Project was originally meant for farmers to develop irrigable lands, and it was assumed that as long as the water was put to beneficial use, there was no imperative to leave water in the stream system for wildlife (Huffaker et al., 2010). Almost immediately after the Newlands Project started diverting water from the Truckee River, the terminal Pyramid Lake started to shrink and endemic fish were no longer able to reach the river to spawn upstream (Bureau of Reclamation, 2013b). With the emergence decades later of federal laws such as the Endangered Species Act and the Clean Water Act, the federal government is now clashing with the security the state has granted senior water rights holders (Huffaker et al., 2010). The US Fish and Wildlife Service resorted to suing senior water claimants, but the US Supreme Court held up the rule of western law stating that the Service could not simply take the water rights, but was required to buy water transfers from willing sellers in the agricultural community (Paez, 2002).

The rule of “first in time, first in right” provides the residents of Churchill County a degree of security since the Newlands Project that supplies them with water was one of the first Reclamation projects in the country and was built before the state grew to its current urban status. However, agriculture no longer holds the same stature and rank in the state’s economic development that it once did, and litigation is constantly threatening that security. A little over 90% of Nevada’s population lives in an urban setting and uses 13% of the state’s water while agriculture uses are estimated to account for 77% of all the water used in the state (Welden, 2003). This may seem like an inequitable disparity, but Americans consume on average 8 times more water in their
food than they do for daily household uses like washing and cooking (Imperial County Farm Bureau, 2013). As the population in urban centers grows, so does the political capital of those metropolitan areas, most of whom are junior water rights holders on the river systems. Less than 1% of the American population is farmers, they farm mostly smaller farms, and are growing older each year (Kusterbeck, 2013). Interviewees from Churchill County fear that as city populations grow upstream, agricultural communities will lose the political support needed to maintain the historical water rights set forth by the prior appropriation doctrine. This fear is expressed by Monte Morrison when he explained:

“It is difficult to compete with the Bureau of Indian Affairs and the Pyramid Lake Tribe. They have the federal government supporting them as a source for funding and legal counsel. And then Reno and Sparks, and Washoe County as far as being the second wealthiest county and cities in Nevada. We have to fight them. We have and we have won, but I think there is great concern that eventually the water will migrate westward back to Reno/Sparks and back to the tribe (May 1, 2012).”

Despite holding senior water rights, Christensen (1995) describes farmers as “fighting and steadily losing a legal and bureaucratic war of attrition” with the Pyramid Lake Paiute Tribe and the federal government. Huffaker et al. (2010) argues that the doctrine of prior appropriation is an outdated legacy of the old West that needs to be made more flexible for the more
modern societal setting that includes ecological values, urban development, as well as agricultural innovation that allows farmers to grow more with fewer resources. In the past, the solution to increased water demand has been to increase water supply and storage capacity through large infrastructure projects and technological innovations, but as the limits of finite water resources are being felt, the doctrine of prior appropriation is being reconsidered (Andersen, 1983; Mulroy, 2013). In spite of the policy disincentives to conserve, farmers in Nevada realize that water is a scarce resource and do practice conservation on a scale that provides maximum benefits to them.

CONSERVATION EFFORTS

Strategies for water conservation are dependent on local conditions like, types of crops grown, pricing and distribution mechanisms for water, soil types, and climate. Most farmers in Churchill County are growing feed for livestock, so there is usually a rotation of alfalfa, corn, barley, rye, oats, and/or wheat. As grasses and grains, these crops are typically flood irrigated through simple water diversions. Farmers, by nature, use an adaptive management approach to their fields and there are several strategies that can be employed to maximize their water efficiency, but there is variable costs involved with water conservation.

Water can be conserved one year by simply not using it. A field can be left fallow for a year or for a rotation. However, by leaving a field fallow, a farmer is giving up the profits of the crop that could have been growing there. If weather or economic conditions mean that a year’s harvest may not provide profits, a farmer may decide that water could be better spent stored in a reservoir for another year or temporarily transferred for use elsewhere.
Technological advancements can also optimize water use on a farm. Lasers can be used to level fields to the optimal grade for water transport; too steep a grade and the water flows right off the field, but too shallow a grade and the water will only reach one part of the field drowning those plants while leaving most of the field without water at all. Laser leveling needs to be done every couple years to maintain the right grade. Technologies like sprinklers and drip systems can also provide an efficient alternative to flood irrigation. While technology provides modern agriculture with a variety of strategies to reduce the amount of water needed, it comes with a significant cost.

Alternative crops can make a large impact in water demand. Since different crops require different amounts of water, simply rotating crops allows for periods of water conservation. Moreover, progressive farmers are testing teff, an Ethiopian grass, as a replacement for alfalfa in crop rotations. Teff grows fast in warm climates providing an opportunity for multiple harvests over the summer and requires less water than alfalfa (“Teff as an Irrigated Alternative Forage,” 2012).

Grapes are a water conserving alternative because they allow for the use of drip irrigation systems. Row crops take more work, have specific soil requirements, and drip systems are expensive investments, so they are not alternatives that are available to all farmers. Additionally, they do not fill the need of supplying a feed stock to the local ranching and dairy industry. Charlie Frey has spent years researching the potential for growing grapes in Churchill County as a means to conserve water and expand into new markets. Since grapes are watered using drip systems rather than flood irrigation, they require only a quarter of the water that an alfalfa crop would need. Working with researchers from the University of Nevada Cooperative Extension, Mr. Frey has invested a substantial amount of money into converting part of his farm into vineyards and a
winery. He is still in the pilot project phase, but hopes to be creating a profit from his wine products within a couple years. Now that a significant portion of his acreage is using less water, Mr. Frey could potentially lose those water rights unless he transfers them off the vineyards to other acreage. Using a GPS, he marked exactly where the rows of plants are getting watered. The land he marked retains its water rights. He removed the water rights from the area between the rows that do not get watered and transferred them to new farm land that he bought. As water becomes even scarcer, farmers may consider converting to other crops that are drip irrigated and put that conserved water in a water bank or on previously abandoned land.

Lined irrigation canals are encouraged for water conservation on lands that use flood irrigation. The Truckee-Carson Irrigation District considers large-scale lining projects of Newlands Project Canals financially unfeasible because of the high cost in relation to the dollars saved (Truckee-Carson Irrigation District, 2010). Farmers do not receive a monetary benefit from the water saved through the lining; they cannot transfer or sell the water, so the cost to benefit ratio is high. Benefits to the farmer from lined canals include faster water transport with more reliable calculation of water delivered, less water lost to seepage, and less occurrence of debris snagging on vegetation and slowing water currents. These benefits are insignificant compared with the cost of lining the canals.

The Truckee-Carson Irrigation District (TCID) manages the delivery of Newlands Project water. They have a water conservation plan in place that aims to increase conservation through the installation and upgrading of equipment to include automated meters with high accuracy readings (Truckeer-Carson Irrigation District, 2010). This equipment is expensive though, so they have a slow roll out planned, starting with
canals and gates that deliver to the largest farms first to maximize the volume of water measured. They also have pricing incentives in place based on how much of a user’s total allocation of water is consumed within a year; there is an extra fine if the maximum amount of water is consumed down to the last two acre-feet, there is a credit if less water is used (TCID, 2010). However, this pricing incentive is nominal. The TCID does not sell water to the farmers since they own their own water rights. The price of using water is associated with the operation and management costs owed to the irrigation district. As such, there is no monetary benefit to be gained by using less water, other than a credit on their account to the irrigation district.

NEGATIVE IMPACTS OF WATER CONSERVATION EFFORTS

Water policy distinguishes groundwater and surface water as being from two different sources, but farmers recognize that their surface water rights recharge their local groundwater. The recharge is considered non-consumptive use of the water, meaning it is not water the farmer is actually using for his crops, but recharging the aquifer provides groundwater for municipal, agricultural, and wildlife uses (Huffaker et al., 2010). Residents recognize that their domestic well is supplied by the water percolating through their fields. Residents are skeptical of projects that increase water efficiency by lining larger irrigation canals or through the use of sprinklers or drip systems on alternative crops because these measures could dry up the domestic wells and only serve to benefit flows to Pyramid Lake (Christensen, 1995). Fernley is a town located along the Newlands Project where the Truckee Canal diverts a portion of the Truckee River to the Lahontan Reservoir. Tom Inglis, a general contractor with clients in the Fernley area, explains:
“The canal is what recharges their wells. You may ask why they don’t put in a canal that is concreted and ducted, but if they do that, Fernley won’t have very much water. It will lower their water table down to where it will be very expensive to get any water (April 26, 2012).”

There are some technologies and practice that can help us maximize our use of water, but actually decreasing the use of water may be counter-productive.

As agriculture becomes more water efficient, it is expected that more water can remain in the river system to get to the wildlife habitats at the end, but as former the Churchill County Manager, Brad Goetsch, explains, that may not be true:

“When we put requirements to increase efficiencies in the Newlands Project, the wildlife wetlands began to dry up because the wildlife wetlands got the tail or return flows off of the flood irrigation. When everybody began irrigating extremely efficiently and lining canals and putting meters on their boxes and stopping water before it got to the end of the fields and doing it all efficiently, then the recharge water and the surface flows that used to go to the sink and to the wetlands went away (April 13, 2012).”

The efforts to preserve wildlife habitat through water conservation ended up increasing the demand for water by the US Fish and Wildlife Service. While water conservation on principle may seem to be the appropriate course of action, if it decreases the groundwater or return flows, conserving water on irrigated land may not be the best climate adaptation strategy to take.
INCENTIVIZING WATER CONSERVATION

With forecasts for snow in the Sierra Nevada Mountains projecting a decrease in storage of snowmelt (Kapnick and Hall, 2010), water policy needs to adapt to conserve water for future use not just maximize the efficiency of our current use. For Nevada, climate change means less water available to all users along the water system. Additionally, the expected higher temperatures would increase water demand in the agricultural sector due to higher evaporative losses from both soils and plants. Climate adaptation means all users must curtail their water appetites and bank that water saving rather than focus on water conservation that would just free up more water for urban development.

The prior appropriation doctrine of water policy has institutional barriers to water conservation as described by Ward et al. (2007). Prior appropriations is based on the common pool resource of water being put to beneficial use, which means that any water that is not put to use, could be considered forfeit (Anderson, 1983). Water laws need to be adapted to secure the rights to water that has been conserved. Surplus water from wet years or gained through savings may be temporarily transferred to other users or to a water bank, but these temporary transfers only maximize the use of water during surplus years, they do not actually decrease the use of water on the system as a whole or ensure water in future years when climate change could impact productivity.

Ward, Michelsen, and DeMouche (2007) describe water banks as an agency with a central banker (the state, irrigation district, or private company) that would procure water holdings by paying farmers for their rights, purchasing surplus water from irrigation districts, or paying farmers to use ground water rather than surface water.
The bank would then lease water to cities or wildlife managers. They are usually only seasonal transfers. In this manner, water banks are operating as short term water loaners rather than as a savings account where deposited water can be used during future droughts. It is thought that water banks allow farmers to make money from conservation measures they implement, but there is still a fear that water rights may be lost when temporarily transferred to the bank due to the use it or lose it nature of water policy in the West. New policies that allow longer term transfers and protection against forfeiture of water rights are needed (Hanak and Lund, 2012; Cronin and Fowler, 2012).

Washington, Oregon, Colorado, California, and Idaho have been experimenting with policy changes that would allow for multi-year transfers (Hanak and Lund, 2012; Cronin and Fowler, 2012). California and Oregon have even assigned the right to use conserved water in the future to the person who implements conservation measures. A policy that clearly secures future water rights to farmers that conserve water can be an incentive that protects farmers against an increasingly competitive water market. A water bank that acts as a savings account requires some form of carry over storage. Surplus water generated from conservation efforts can be tracked, released from a reservoir and deposited in underground aquifers to be used in subsequent dry years. Ward, Michelsen, and DeMouche (2007) explain that by adapting water policy to ensure rights for banked water to be used in the future could be the low cost measure that promotes conservation.

One obstacle to multi-year transfers or water banking for future use is storage capacity for the conserved water. Surface reservoirs cannot be used for long term storage. High evaporation rates mean high losses in water quantity. Additionally, surplus water would have to be released from surface reservoirs to allow for storage of
the next year’s precipitation. With more precipitation falling in the form of rain rather than snow and unpredictable out of season floods, there will be an urgent need for reservoirs to act as flood control rather than long term storage. Studies of California water systems predict that climate adaptation for California will rely heavily on underground water storage (Hanak and Lund, 2012). Water banks work using aquifers, which have no evaporative losses and don’t limit potential storage for the current year’s snowmelt and rainfall. Hanak and Lund (2012) explain that one of California’s main strategies for dealing with future climate change issues is to expand the capacity of underground water storage. If a local aquifer is used as a long term water bank, there may be technical challenges to measuring how much water each user conserved and deposited in the aquifer, although initial allocations and withdrawals can be monitored through well pumps and metered water gates. Oregon, Washington, Idaho, and California have all started using water banks as a new institutional tool to maximize water use efficiency and for future water use (Cronin and Fowler, 2012; Ward et al., 2007; Hanak and Lund, 2012). These states can provide technical and institutional guidance to forming water saving banks in Nevada; however, Cronin and Fowler (2012) explain that water banks are specific to watersheds and are designed to serve local water supply needs, so the local irrigation district, water managers, and water users need to be consulted on any new policy.

Once storage capacity is established, water policies need to be adapted to reassure water users that any efforts they put towards water conservation will reward them with saved water in the future. Current Nevada law does not grant real property rights to water conserved and banked for multiple years. Assigning property rights to the local irrigation district or individuals who save water could be a low-cost measure
for promoting water conservation and supplying a secure water source for future agricultural uses (Ward et al., 2007). Farmers who invest capital towards conservation measures would be guaranteed a return through their water supply instead of seeing all the water they conserved transferred to other uses. In fact, in a follow up phone conversation with Ernie Schank, he admitted that water banking options were being considered by the irrigation district. To date, the district has been tied up in ongoing litigation, but if the opportunity emerges, banking may be implemented in the county after engineering and policy innovations have been further investigated and developed.

One advantage to a water banking approach is that it would allow farmers to decide for themselves to invest in water security rather than expensive public investments in water conveyance and storage systems or litigation, which has been the historical solutions to water shortages in the West.

In their 2012 study, Hanak and Lund explain that California has pushed local agencies to take control of resources and diversify their own water sources. This localized scale of management is an important feature of climate adaptation since different regions have different resources and challenges to manage. Cronin and Fowler (2012) caution agencies that are looking at using water banks as a progressive water policy tool that water banks and resources are specific to a local watershed scale. They emphasize that the needs and expertise of local users must be engaged in the planning and operating of water banks. Working with the local population is a thematic suggestion throughout this dissertation.

Nevada farmers do not perceive climate change as a threat, so it will not serve as an impetus for water conservation measures. If policy is adapted to ensure future access to saved water, Churchill County farmers and ranchers and municipal suppliers
can invest in water conservation knowing that it helps secure water for their future regardless of whether they see the threat to their water supply coming from climate change or competing users.

The next chapter focuses on how informants perceive local renewable energy developments. Much in the same manner that local perceptions about water conservation revealed how water policy has unintended consequences, local perceptions on energy development explain how state and federal policies meant to support renewable energy developments are creating a lack of support at the county level.
CHAPTER SIX: RENEWABLE ENERGY SUPPORT: IN PRINCIPLE OR IN PRACTICE?

In this chapter, I discuss support for renewable energy development. My questions about renewable energy focus on what factors generate support or opposition for renewable energy development from climate skeptics and deniers. Drawing from my data, I explain why when given a choice, Doubtfuls and Dismissives prefer nuclear or fossil fuel energy production over renewable energy sources. Generally, they believe that renewable energy technology is underdeveloped and the industry depends on government subsidies, which stands in conflict with their free-market ideals. My respondents believe policies, such as tax abatements, that provide market incentives for renewable energy projects are a hindrance, rather than a boost, to the local economy. I argue that policy-makers hoping to encourage growth in renewable energy production need to consider how locals understand the projects’ impacts on their local economies. Support from communities located near energy project sites is vital for siting approval. Local political support is also needed for the state policies that offer incentives to renewable energy developments.

National surveys show that political conservatives tend to support traditional forms of energy production more than renewable energy developments (Maibach, 2009; Pew Research Center, 2010; Pew Research Center, 2011). Yet a previous survey of people in my study area (Safi, 2011; Liu et al., 2014) suggests that Churchill County residents say they strongly support renewable energy development. In this chapter, I look closely at this surprising finding by investigating whether residents support
renewable energy in principle (i.e., as a good thing to encourage and allow) as well as in practice by approving energy projects and supporting renewable energy policy incentives. I analyze how the study group of Doubtfuls and Dismissives perceives renewable energy development and compare supporting and opposing arguments for different energy technologies. I ask whether locals see benefits or harms from renewable energy projects.

I find that the Churchill County conservatives are consistent with typical doubtful and dismissive attitudes toward renewable technologies. When given the chance to explain their thoughts about renewables, they clearly do not give strong support to renewable energy develop. Those who do support renewable energy do so more in principle than in practice. That is, while residents think the idea of renewable energy is fine, they take issue with the strategies used to encourage development of the projects. They focus their opposition on government policies that intervene in the energy market through tax incentives, loan guarantees, and changes in payments to local governments. I suggest that support for renewable projects can be generated in politically conservative communities if direct benefits to those communities can be created from those projects.

My findings run somewhat contrary to much of the established literature on energy development and siting issues. Much of the literature regarding local perceptions of renewable energy have focused on not-in-my-backyard (NIMBY) opposition to siting wind farms in the eastern half of the United States (Walker, 1995; van der Horst, 2007). My research differs from the literature in that there is not a strong NIMBY opposition in Churchill County. Rather, residents oppose state and
federal policies governing those developments. The residents of Churchill County welcome renewable energy developments if they come without the tax abatements that negate or minimize local economic benefits to the county. Moreover, since many western states, such as Nevada, will see more renewable development on public lands rather than private land, siting issues will not reflect the same concerns as those that emerge from wind projects planned on private lands in the Midwest and East. This public-private land ownership difference shapes, for instance, how costs and benefits are shared by the local community. Thus, instead of a NIMBY response to new renewable energy developments, Churchill County residents seem much more willing to accept new developments. As I discuss below, their acceptance is not due to worries about climate change and a willingness to do their part to lower carbon emissions, but is a reflection of their pragmatic opinions on economics and public land use.

SITING

When discussing any new large scale development, it is important to assess if there is local opposition to the siting of a project. There is a large body of literature devoted to this topic, but it focuses mostly on wind energy projects and conflicts centered on NIMBY opposition (Walker, 1995; van der Horst, 2007). NIMBY is an acronym for Not In My Backyard, and is the manifestation of local opposition to new developments. The problem with the NIMBY concept is that it is widely used to describe any opposition with little examination of the sources or reasons for that opposition (Roberts and Mande, 2013). Typically, NIMBY opposition centers on the negative impacts the development will have on the local community: pollutants in the air, water, or soil; lower home values; smells, noises, or ugly views. Geothermal plants built on
public land do no pollute, and they are sited far from residences so there is little to no impact. Zaffos’ essay in *High Country News* (2005) explains that not all local opposition is the same. Churchill County residents reflect more of a pay-to-play approach to development than traditional NIMBY opposition. They welcome development that fits in with the agricultural values of their community, but expect the developments to directly benefit the local county’s economics.

Many of the developments in Churchill County are on land managed by the federally administered Bureau of Land Management (BLM). More clean energy developments are in the process of being built on public lands throughout the West (Davis, 2011). Even though these developments will be built on land that is federally owned and managed, they are still contingent upon the approval of the local county government, and the local citizens know it. Gary Imelli explains, “You have federal lands in Churchill County, but you have to apply to Churchill County to do any projects on those federal lands, so we do have control over what happens on those federal lands, to an extent (May 1, 2012).” This limited control over federal lands imbues the local citizenry with a sense of ownership over those lands, but this proprietary feeling does not manifest in the form of a strong NIMBY reaction to any developments proposed in the region.

Rural areas with significant amounts of federal lands in their borders get little in the way of property taxes to fund services, so developments on public lands may offer a way to increase revenues for the county. However, rural residents are also accustomed

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6 Ivanpah, Crescent Dunes, Silver State North and South are all solar projects located on federal lands in Nevada.
to access to these open spaces for activities such as recreation and hunting. Local industries rely on these public lands for jobs by way of outfitting equipment and guides, all-terrain vehicle sales, and livestock grazing. County Manager Brad Goetsch said, “People that come to Nevada want to recreate: they want to ride horses, they want to hunt and they want to hike, they want to ride their motorcycles and ATVS out across the land, they want to observe wildlife and all of those things (April 13, 2012).” Mulvaney, Woodson, and Stalker-Prokopy (2013) compared support and opposition of wind energy projects in three different counties in the rural Midwest. They found that opposition was a manifestation of locals’ fear of impacts to their lifestyles, such as obstruction of viewscapes of open fields, noises that interrupted the quiet of the country, or closing off access to recreation lands. Reflecting this attitude toward energy developments on public lands, Jim Johnson explained:

“I don’t have a problem with it as long as, to the best extent possible, there still remains joint use of the land; that other people have access. I get a little concerned sometimes when they go into an area and block an area excessive to what they need. They will fence it off and keep everyone out. I am not okay with that. And, I think that if those utility companies are going to use public lands, they ought to pay a fair price for it (April 24, 2012).”

Mulvaney et al. (2013) found that if projects could provide a benefit to the community while preserving the benefits of rural living, then the local communities typically support the developments. Mr. Goetsch agreed with their conclusion saying that the large
amount of acreage being rented or withdrawn for energy projects could create a backlash or negative feeling that can be mitigated if there was a greater return to the local community. As he explains:

“If you said I am going to get taxes from the geothermal plant or that solar or wind plant, and I am going to build you guys a recreation area for your motorcycles or whatever, or I am going to contribute to wildlife habitat in another area of the county where hunting and wildlife observation will get better and you are going to get an offset or return for that, then those are the ways the government should be managing this and making the public supportive (April 13, 2012).”

Ed Rybold, who has been stationed at NAS Fallon for more than 12 years, expands on the idea of benefits to the community and multiple use of public lands. As a man who has spent his career in the Navy, he has traveled a lot but has chosen to stay in Nevada. When asked if he supported renewable energy developments out in the desert on public land, he said:

“It depends on the benefit to the public. I would be concerned about where it is located. I am a big advocate of public land and public access. Out here in the West, to me, it is a perk to be out here and have all this public land and do all the recreation you want without tearing everything up. I think that is one of the
charming things about Nevada. Do I really want to see that impacted? I think there is a lot of land out there. I am sure some of it can be put to use in a positive way that can be beneficial to everyone. I would say that if the government has too much ownership, meaning it benefits them (the government) more than the public, I think there would be a problem with that (April 26, 2012).”

Mr. Rybold alludes back to the issue of how much the local community benefits from developments on public lands. If the federal government prospers over the state and local counties, those payments are not perceived as a public benefit in the eyes of rural, conservatives in Nevada. It is Nevada’s access to the land that is being compromised, so it is Nevada, and specifically the locals, that should receive benefits.

Despite these concerns about access, most of my Churchill County informants (80%) acknowledge that there is an excessive amount of public lands in the region, and as long as they have access to the areas they treasure for their recreation and traditions, then there should be enough land for energy developments that can also benefit the local county. In a 2011 presentation to the county board of commissioners, comptroller Alan Kalt showed that 180,000 acres of the 2.6 million acres of BLM land in the county were withdrawn for energy projects. Figure 9 is a graphic representation of the amount of land managed by the BLM and how much of it has been withdrawn for energy projects. One resident voiced his view, “Here in Nevada, some 75 percent or whatever of the state is publicly owned land. We are a sparsely populated state. We have wide,
vast expanses of public lands. The use of certain select tracts of those public lands for power, I think, is a good thing (anon2, April 20, 2012).”

Walker (1995) found that most conflict derived in siting issues is generated from a lack of sensitivity to the local impact of developments to either economic values or perceived values held by the local community. The local community values access to their public lands, but recognizes that there is enough to go around as long as that access is still ensured. Ron Juliff, who works with Churchill County government explains:

![Figure 9. BLM Acreage in Churchill County](image.png)

*Figure 9. BLM Acreage in Churchill County. Created with data from Kalt, 2011b.*
“As long as we are not harming the land itself, I have no issue with using several hundred acres, for example, of public lands. I mean we can just fence it off and the ATVs can just drive around instead of through it. I think we will never be in a condition where we need to fence off all of the land, so that is fine (April 19, 2012).”

It is noteworthy that in Mr. Juliff’s scenario, the local residents’ access and land use options were not altered since there is enough land for all needs. If the access to the public lands or the allowed use of the lands were to be altered based on the energy developments, then locals would consider that as an impact to their community.

Walker argues that compensation for that impact could still win favor for the development from local residents. This compensation may come in the form of taxes, rents and royalties, or payments in lieu of taxes (PILT). Zip Upham admits that there is some local concern about the geothermal developments in Churchill County, but he says that “even that is completely offset by potential economic benefits” through employment opportunities, indirect benefits from additional businesses in town, and income to the county (April 23, 2012). For instance, Vulcan Power Company, which owns and operates several geothermal projects in Northern Nevada, made a PILT payment of more than $240,000 to the Churchill County general fund (Kalt, 2013). Such payments appear to meet locals’ need for economic support from public land use projects.

Renewable energy developments have not raised as much of a controversy in Churchill County as energy siting literature would predict. It is easy to find instances of
objections to renewable energy developments on public lands (Pasqualetti, 2011; Harrison, 2011; Maloney, 2008), but scientists studying case studies of environmental opposition to energy projects (Smith and Klick, 2007; Michaud, Carlisle, and Smith, 2008) explain that these objections are not cases of localized NIMBY resistance but instances of non-local movements fueling the opposition. Resistance to siting attempts are sometimes organized by national organizations who object to public land development based on broad environmental and cultural principles.

The distinction that may explain the lack of NIMBY opposition amongst local residents in Churchill County could be the siting of projects on public lands rather than private lands. Residents appear worried about continued access to their recreation sites, but with the amount of open space on public lands, they do not feel it is yet a scarce resource that requires them to fight for its protection.

**PUBLIC LANDS VS PRIVATE LANDS**

Issues that arise in siting development on private lands in the Midwest differ from those that arise developing on public lands in the West. Mulvaney et al. (2013) explains that private land development creates conflict over who benefits from the project (the private land owner) and who bears the burden of those developments (his neighbors). Surrounding landowners who fear decreased property values and visual and noise pollution fight to create a mandatory buffer zone to surround the project site. On the large swaths of public lands in the West, rather than pitting neighbors against each

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7 Research has shown that urban residents show a higher environmental concern for wilderness and preservation as opposed to the more utilitarian view rural residents have towards land uses (Huddart-Kennedy et al., 2009; Alm and Witt, 1997; Sharp and Adua, 2009).
other, projects are more likely to be implemented in relative isolation, while the benefits can be shared by the whole community. In fact, some of my interviewees see benefits to developing on public lands that go beyond even the locale in which they are sited. Tom Inglis sees the siting of energy developments on public lands as an opportunity to make the state of Nevada an energy hub for the entire West, if not the nation (April 26, 2012). According to Mr. Inglis, Nevada could diversify its economy with energy exports. He imagines a path that would support all types of energy technologies, including nuclear, if this scenario meant large benefits to the local counties and the state at large.

Of course public lands have far more regulation than private lands. They are subject to the National Environmental Protection Act (NEPA), which allows for objections from interest groups that extend far beyond local interests. Federal lands require lengthy and expensive approval processes for permits, but the BLM is trying to streamline that process to support the multiple use of lands under its management. Monte Morrison, who is a Vice President at a Churchill County geothermal facility, explains that geothermal plants need to develop on public lands simple because of the amount of space they require and the specific location of the geothermal resources (May 1, 2012). He admits that public lands regulations makes the siting process more expensive because of the time involved in getting permits approved, but he doesn’t consider it to be prohibitive to the siting process or even that much more inconvenient than cobbling together multiple tracts of private lands.

Previous survey work in Churchill County (Safi, 2011) led me to expect high levels of support for renewable energy. I suspected that economic benefits accruing to
the county would trump other concerns about renewable energy. In contrast, literature on siting renewable energy projects suggested that there would be some form of NIMBY opposition to local developments. Neither of these expectations accurately reflected my informants’ responses. Churchill County residents do not hold classic NIMBY attitudes. They are open to renewable energy developments, but only if the county is reasonably compensated. I also found renewable energy was not the preferred energy technology amongst my study participants. The next section explores their stated preferences for energy producing technologies and the arguments supporting those preferences.

Preferred Technology

Politically conservative populations do not support renewable energy for climate change mitigation because they do not consider climate stabilization necessary in the first place. Conservatives interpret renewable energy as a liberal cause that Liberals implemented through tax abatements, rebate programs, loan guarantees, portfolio quotas and other such policy measures that Republicans consider to be government over-reach in the name of a false threat. A recent Pew Research Center study (Figure 10) shows that staunch conservatives favor fossil fuel development (75%) over renewable energy development (15%) (Pew, 2011). Based on these survey, I initially expected that Churchill County conservatives to have similar low levels of support for renewable energy development. And yet, Safi’s (2011) survey conducted that same year found that in Churchill County, where a large majority of the respondents described themselves as very conservative to conservative, 73% of respondents indicated support for renewable energy development. Safi’s survey
specifically asked, “At the national level, which of the following policies and initiatives would you support to help reduce climate change? Check as many as you would support.” Seventy-three percent of the returned surveys from farmers and ranchers in Churchill County marked the option to “develop renewable energy resources such as wind, solar, and geothermal.” In comparison, the Pew Research Center survey framed the question as an either-or option. Republicans could pick to support either fossil fuels or renewable energy. Safi’s survey question just asked if they supported the policy of developing renewable energy, it did not exclude supporting fossil fuel development. However, I was still surprised by the apparent high level of support for renewable energy returned in Safi’s survey from such a politically conservative group.

![National Survey Results for Comparative Support for Fossil Fuel or Alternative Energy Sources](image)

**Figure 10. Partisan Support Comparing Fossil Fuels and Alternative Energy Sources**

Source: Pew Research Center, 2011, Political Typology,
To more precisely gauge Churchill County residents’ support for renewable energy, I asked them to rank their preference for which energy technology (nuclear, fossil fuels, or renewables) should receive resources for further growth and development. The results (Figure 11) indicate a preference for nuclear (39%), closely followed by fossil fuels (33%). Renewables were chosen the least as a preferred energy choice (28%). There does not seem to be a clear preference overall since the results were fairly evenly split amongst the three categories, but the large support for renewables by rural conservatives seems to be more a matter of principle rather than an option they are likely to support in practice. That is to say that while they support the concept of renewable energy they do not act on that support by voting for policies that would encourage the development of the renewable energy industry. Given the option to choose amongst different energy sources, most respondents chose nuclear or fossil fuels over renewables.

8 Safi’s survey did not include nuclear power as an option for respondents to choose as a strategy for climate change mitigation. Pew Research Center did not specify nuclear in their discussion of the 2011 survey cited.
After determining that my respondents give the least amount of support to renewable energy, even in a county with geothermal developments, I investigated why respondents seem to favor nuclear and fossil fuel energy production over renewable energy. Pasqualetti (2011) explains energy research typically considers technical and economic challenges of different production technologies, while public attitudes, perceptions of risk, interference with established lifestyles, altered landscapes, and even the infringement of new projects on the local sense of propriety and justice have been overlooked. Pasqualetti predicts resistance to emerging clean energy technologies if challenges presented in the social landscape of renewable energy are not also addressed. He warns that the backlash to renewable energy technologies could be strong enough to strengthen support for the other energy producing options of nuclear, coal, and oil and gas from fracking. By examining the supporting arguments given by the informants for the different energy technologies, I find they perceive a sense of impracticality in the way renewable energy is incentivized and an imbalance in the how the costs and benefits of energy projects are distributed. They support the technology they believe offers the most benefits to them, and climate stabilization is not recognized as a benefit.

Nuclear

It is not surprising that the politically conservative population I studied support nuclear energy development. A 2010 survey conducted by the Pew Research Center (Figure 13) shows that 64% of Republicans support nuclear energy development, so support in Churchill County falls a bit short of the national survey findings. This difference could be an artifact of the research approach. The Pew survey offers a favor
or oppose choice. I offered respondents multiple energy technology choices, so they had the ability to choose a preferred technology from among several options, not just a choice of whether or not they support nuclear power. However, I still am surprised that nuclear is the preferred choice since there has been no nuclear power plants brought online since 1996 (US Energy Information Administration, 2014), and Nevada has never had nuclear power production (although energy portfolios do draw from nuclear sources). There has been an active campaign for decades declaring “Nevada is Not a Wasteland” throughout the state trying to separate the state from its nuclear legacy and potential future. Nevada is home to the former Nevada Test Site (now Nevada National Security Site) where nuclear weapons were tested from 1951 to 1992, and it is the site of Yucca Mountain Nuclear Waste Repository.

![NATIONAL SUPPORT FOR INCENTIVES FOR MORE DEVELOPMENT OF NUCLEAR POWER](image)

**Figure 125. Partisan Support for Nuclear Development**
So what is the basis for my respondents’ support for nuclear development?
Respondents explained that they believed nuclear power production to be more
efficient than any other energy source since it takes less materials than coal, offers an
abundance of fuel, is a clean energy source since the waste is contained, and is cheap to
operate once the plant has been constructed. Additionally, they believe that the
development of the nuclear industry will re-open Yucca Mountain, which could bring
significant economic opportunities to Nevada.

CLEAN AND EFFICIENT

Respondents who preferred nuclear energy indicated that they consider nuclear
energy to be a safe, efficient, and cost effective resource. Zip Upham explains his views
this way, “The amount of uranium that you need to mine to actually make nuclear
energy is relatively small compared to the hundreds of millions of barrels of oil that we
have to ship around the planet (April 23, 2012).” Bill Christoph also believes nuclear
power is more sustainable in the long term, “It is sure better than petroleum and all
that. Oil is certainly a finite source. I suppose you can say nuclear is a finite source too,
but probably not nearly as finite (April 28, 2012).” Ron Juliff, a former manager at
Southern California Edison, a former Inyo County manager, and the current emergency
manager for Churchill County explains that in his experience nuclear power is one of our
best sources of energy due to the amount of power one plant can produce (April 19,
2012). Mr. Juliff admits the construction of a new plant is very expensive, but once built
he believes they are very cost effective. Misha Stojicevic, the county engineer echoes

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his colleague’s support for nuclear as a safe and efficient power source, “I am in favor of nuclear power because it is the most cost effective system and all the talk about not safe and that kind of stuff, that can be solved. It is much cheaper and recycling can also be developed (April 18, 2012).” When asked about environmental risks, Mr. Christoph answered, “I will take my chances on nuclear any day of the week to what they are doing over there with the fracking (April 28, 2012).” Dr. Stuart Richardson also believes that the amount of power nuclear technology can produce makes it the more efficient energy source, and alludes to France’s safety record in his explanation of his support for nuclear power:

“I like nuclear energy. There are obvious dangers with it, but if you look at where it is being used in Europe, where it is being used back east, they basically put it in the areas where all the population centers are because it supplies such an incredible source of electrical energy. Is there a danger? Yes, but we should be able to make a safe method of producing energy. It is just a question of doing the research and then acting so that we protect the public from nuclear accidents (April 30, 2012).”

When comparing energy sources, these residents do not consider nuclear a risky gamble. Instead, they consider the volatile prices of finite sources, environmental damage from fracking, and the unproven capacity of renewables to be the bigger risks.
Despite the preference for more nuclear development, these conservatives believe that renewable energy is a great long-term investment industry. But, they prefer nuclear because they do not believe that renewable energy technology can provide all the energy we ultimately need from it. Tom Inglis, a local contractor who shares the view that the nuclear industry could mean an economic boost for the state of Nevada also explained, “I love (nuclear) because today it is ready to generate a large quantity of energy, but you would still be working on the renewable energy sources until we finally can get them at a parallel, and then eventually, I would say of course, step away from the fossil fuels and nuclear. But we are nowhere close to that yet (April 26, 2012).” Ed Rybold, who chose nuclear as his preferred technology for further development explained his choice by saying, “I think renewable energy is extremely new. I think it is still developmental (April 26, 2012).” Mr. Christoph argues that nuclear is a proven technology explaining that “solar is a good idea, but that is probably not going to get the job done, so the other thing beyond solar you have to look at is nuclear (April 28, 2012).”

Although each of these residents acknowledged dangers associated with nuclear power production, they have faith in technological progress. One participant (Anon4) who agrees that the production of nuclear energy is highly efficient, says, “I think you are seeing more of what I think they are calling gen 4 or gen 5 design, which has more passive safety elements. Obviously safety is a concern for people, but the new ones are safer (April 27, 2012).” The Navy has a great safety record using nuclear technology to fuel their submarines and aircraft carriers. Ed Rybold is an informant from Naval Air Station Fallon. Mr. Rybold thinks that nuclear has proven itself as a steady and safe
energy source and believes that as we continue to invest in the industry, we will continue to progress and resolve any safety issues that arise (April 26, 2012).

Informants consider nuclear technology to be a clean energy source because it contains the waste byproduct rather than emitting into the air or water. However, the World Nuclear Association states that “the disposal and storage of high level nuclear waste remains a major unresolved issue” for the United States (2014). Proponents of nuclear power often alluded to France as a model nuclear power generating country since it is able to recycle its waste and has no fear of nuclear technology. When asked about his preferred technology choice, Jim Johnson, a retired Certified Public Accountant, responded:

“I think they all have their place, but I think nuclear, personally is my top pick. They ought to explore more nuclear, but it is a bad boy and nobody will touch it anymore. It seems to me that France and some of those Europeans are heavy into nuclear. I can’t understand if they can do it, why we couldn’t do it over here (April 24, 2012)?”

Another resident (anon4) concurred:

“Either store it, or do some kind of vitrification, or realistically you could take the waste and blend it and still re-use it. Obviously there is some waste you can’t get rid of. I think one thing America ought to look at is breeder reactors. I
mean that is, it is about 1%, but you actually make more fuel than you use. I know the French do that with great success (April 27, 2012).”

Ron Juliff, the Churchill County Emergency Manager also cites France as a solution to waste management:

“I think as a country, we have hidden our faces and said that we don’t want to confront the nuclear waste aspect of it. Everyday nuclear plants are generating waste. Today they are stored in pools that look like swimming pools. They are fifteen feet deep and exposed to the elements. Duh! I think there is probably a better way to process our nuclear waste than that. There is certainly a way that the French are probably leading the way where you can recycle the waste. It is very expensive right now, but it only goes down in price if you do it and really develop the technology, and we haven’t focused on doing that (April 19, 2012).”

Nuclear generated power is not clean power. It does produce dangerous waste. Churchill County residents only considered nuclear to be a clean technology because the byproduct is contained. What to do with that waste, however, remains a dilemma that the United States has not been able to resolve. Informants expect that France has a solution that would be easy to implement; however, even France has waste that needs to be disposed, and they are finding the siting of a geologic repository for that waste to be problematic.
While technically France has not resolved the waste storage issue, it worked with the social perceptions of nuclear research compared to nuclear waste and generated a creative solution. A 1991 French law called for the development of research labs that would investigate nuclear waste disposal options, including deep geological deposits. The labs, in effect, became storage sites (Palfreman, 1997). One lab was selected to become the French National Radioactive Waste Management Agency (ANDRA) and be open to receive the nation’s high level nuclear waste for disposal in a deep geologic repository in 2025 (Butler, 2010). Despite generating most of their electricity from nuclear power, France is still developing a permanent waste disposal solution themselves.

Nuclear power is also a controversial technology due to issues with uranium mining, the fear of reactor meltdowns, and the unresolved issue of managing the highly toxic and long-lived waste. My informants believe these issues can all be overcome. They feel that the amount of power produced by each facility makes this industry worth the investments needed to overcome the safety and waste issues. My informants favor France’s strategy to re-use the waste in secondary reactors as a method of waste management. Yucca Mountain Nuclear Repository is a waste management option that will bury the dangerous waste under a mountain. Participants believe that a revival of the nuclear industry will open the Yucca Mountain facility, which would secure the waste in a safe location and bring Nevada economic opportunities that they and the state could benefit from.
Despite the support for recycling nuclear waste, the United States currently has a policy to not recycle its used nuclear fuel. Even without recycling as a waste management option, nuclear is still a preferred energy technology amongst respondents because they also support a geologic repository as a solution to waste management. In 1982, the U.S. Congress enacted a law called the Nuclear Waste Policy Act (Nuclear Energy Institute, 2014). The Act established a comprehensive national program for the safe, permanent disposal of highly radioactive wastes. The Act directed the U.S. Department of Energy (DOE) to study suitable sites for a geologic repository. The geologic repository envisioned by the Act is an engineered disposal facility located deep underground. After more than two decades of scientific study, in 2002, Congress and the President approved the development of a geologic repository at Yucca Mountain Nuclear Repository, commonly referred to as just Yucca Mountain Yucca Mountain, Nevada (Churchill County Nuclear Waste Oversight Program, 2011). In February of 2009, the Obama administration eliminated the funding for the Yucca Mountain project from the budget and directed the Department of Energy to withdraw its application to the Nuclear Regulatory Commission for a license to build the repository. The Yucca Mountain site is now effectively closed (Eureka County Yucca Mountain Information Office, 2011).

Ron Juliff states that Yucca Mountain is a safer storage solution than leaving the waste in shallow pools around the country, “We have Yucca Mountain that we have poured about 5 billion dollars into already only to say ‘Let’s not do this anymore.’ Personally, I would rather see nuclear waste 10,000 feet underground in bedrock than I would in a 15 foot deep pool (April 19, 2012).” As the Yucca Mountain project was
being developed, tours were offered to the public to demonstrate the safety
precautions that were being built into the structure and operation of the repository.

Mike Berney, a realtor in Churchill County, describes his thoughts, “I went on a tour of
Yucca Mountain. I still think Yucca Mountain is a great place to put it. It has to come
somewhere (April 24, 2012).” Bill Christoph, a local dairyman, also had the opportunity
to take a tour of Yucca Mountain with his family as part of a field trip offered to the local
high school. Mr. Christoph gives his perspective as this:

“If there is a place in this entire world where it is safe to store some nuclear
fuel, spent nuclear fuel, that is it. They got these little pellets and they are in the
hermetically triple walled stainless steel casks. I am thinking to myself, 800 feet
above the water table in solid rock is good. This waste is being stored right now,
except it is being stored in a couple hundred different locations where security
is questionable and all this other stuff, and here you got a safe place you can put
that and basically put it to rest; safe and secure and in one location. I just think
it is foolish not to take advantage of it. Technologically, what happened in the
tsunami over in japan, yeah those sort of things I suppose could happen. I
doubt it. I have a feeling we learn from the near misses like that, and we go on.
But to me, if you are looking, where else are you going to put it (April 28,
2012)?”

The belief that one fortified repository is better than many vulnerable pools is
echoed by other study participants. Yucca Mountain offers a long term waste storage
solution for an industry that can offer a long term source of power. Not only is Yucca Mountain considered secure, but there are also economic arguments for opening the repository as an answer to nuclear waste management. My informants referenced the billions of dollars already invested in the project that would be wasted if it was never opened as well as the opportunity for future revenues for storing the nation’s waste in their own state.

YUCCA AS AN OPPORTUNITY

Rather than fearing the repository as a toxic dump in their backyard, Churchill County residents compared it to the Trans-Alaskan Pipeline System and the benefits the pipeline generated for Alaska’s citizens. Monte Morrison, the Vice President of Operations for the Alterra Power Corp, which owns one of the local geothermal plants, thinks that “turning our back on Yucca Mountain is a terrible mistake. We should have treated it like the Alaskan pipeline; charged a percentage per pound for transportation and storage and funded the state forever (May 1, 2012).” Many of the participants who prefer nuclear technology agree that opening Yucca Mountain is an opportunity that could benefit the whole state. Mike Berney said:

“I don’t understand why our state didn’t take advantage of that. We were offered a lot of money to do what they are going to do anyway, but we didn’t take the money because we didn’t want it here, supposedly. We cost our state a lot of money in education and everything else we could have used it for (April 24, 2012).”
Nevada does not have a state income tax, so there are not a lot of funds for public services like education programs, state parks, or infrastructure improvements. As conservatives, my interview subjects do not advocate taxes for government revenue, but Yucca Mountain would provide potential state revenues that would fit within their political ideology. Jess DuShane hoped that they would open Yucca Mountain, and then “charge every state what we want to charge them so that we get money instead of the federal government getting money (April 27, 2012).” Zip Upham also likes the idea of creating state income from Yucca Mountain. His view is to charge the nuclear industry a rental fee for storing their waste, which would generate a financial resource for the state for “eons to come (April 23, 2012).”

Nuclear is a preferred energy technology amongst the study population of rural, conservative Nevadans. Conservatives’ preference for nuclear energy stems from the belief that nuclear energy is clean and efficient. It is a proven technology that produces a large amount of energy from a small amount of resources. Renewable energy is unproven and expensive. Nevada Republicans have another reason for supporting investment in the nuclear industry: Yucca Mountain. Nevadans who support nuclear energy believe that Yucca Mountain is a safe option for nuclear waste management, but they also see it as a potential source of a lot of revenues for the state.

**FOSSIL FUELS**

Similar to nuclear technology, Churchill County residents preferred fossil fuels over renewables because they perceive them to be proven and mature in comparison to immature and untested renewables. Charlie Frey, a prominent Churchill County farmer who diversified his agricultural activities with a wine vineyard and grain distillery to
conserve water, points to the inability to store renewable energy as the problem. “I think we need coal until we get technology to save and store the electricity (from renewable energy) and put it in a reservoir (May 2, 2012).” John Kirch, who has worked in the region as both a rancher and a contractor for the Department of Defense is an advocate of fossil fuel development. His believes that the money spent on renewable energy development could be put toward mitigating the pollution generated by fossil fuels:

“Coal is dirty. Living downwind from a coal plant, who wants to do that? So put the money into the scrubbers and filters that are the exhaust pipe of those coal plants and stop it right there instead of spending all this money on Solyndra and a Frisker (sic) car and all these other things that are a joke. Just build some big mufflers (April 24, 2012).”

His argument suggests a contradictory view of technology. He believes we can develop the pollution mitigating technology that will make coal clean, but he does not believe we can develop the technology that would make renewably produced energy as cheap and abundant as coal. He prefers coal because, “it is very abundant, it is very cheap, and it keeps a big community employed (April 24, 2012).” Similarly, Chris Henning, a third generation business owner in the area, also thinks that national resources should be prioritized so that we develop our domestic fossil fuels while private industries continue to research and develop renewable energy technologies. Mr. Henning believes that independence from foreign energy providers should be our first goal, so the United
States should exploit its abundant coal and natural gas resources to that end (May 3, 2012).

Fossil fuel proponents see the benefits as abundant, domestic, and cheap energy production, and they do not believe the burning of fossil fuels is the harmful process environmentalists claim. Charlie Frey states simply, “I don’t think the emissions from coal is as bad as they say (May 2, 2012).” Chris Henning agrees saying, “I don’t really believe the emissions that we are putting into our environment are having a large effect on our climate change, so because of that, I am not afraid of coal, natural gas, or oil (May 3, 2012).” These residents feel there’s no reason to change the current energy system because they do not associate fossil fuels with climate problems.

It is noteworthy that the arguments for fossil fuels – abundant, cheap, and good for the economy and energy independence – are also all arguments that advocates have used to promote renewable energy. These arguments could resonate with values held by the conservatives, but the renewable energy campaigns are not effectively associating those values with renewable energy development. Next, I look at what Churchill County residents who do prefer renewables say in support of the clean energy industry. Their perspectives can help to gauge how that support might be communicated and shared amongst other conservatives.

**WEAK SUPPORT FOR RENEWABLE ENERGY**

Support for renewables is not very strong, even among those participants that stated renewable energy as their preferred technology choice. No respondent was

10 These arguments are not only being professed by environmental non-profits like the Clean Energy Project and the Sierra Club, but also by the Department of Defense (Roulo, 2013).
totally opposed to the principle of renewable energy. But even the renewable energy supporters expressed concerns about cost. As one respondent (anon2) expressed, “sure, I support renewable energy. I think you ask that question and every good, red blooded American will tell you they support renewable energy. The biggest challenge, of course, with most renewable energy sources is the cost (April 20, 2012).” Kathy Minner has seen her children and grandchildren raised in Churchill County. She would rather see renewable energy developed than nuclear or fossil fuels because those technologies are based on finite resources that will run out one day. Thinking about the long term, Mrs. Minner believes renewable energy production is a good idea because she believes we need to decrease our dependence on fossil fuels and “get a cleaner, better form of energy”. She said her energy preference was for “the renewable of course, but geez, they were kind of getting the word out to everybody about wind turbines, but who’s got the money to pay for that? It’s ridiculously expensive (April 30, 2012).” Concern about cost mitigated her support for clean energy.

All the interviewees had something positive to say about renewable energy. They acknowledged that renewables increase our energy independence, wean us from finite fossil fuels, and offer a way to supplement present energy sources. But none of these positive responses were expressed as strongly or as clearly as the support for nuclear and fossil fuels. Another county resident (anon3) who stated renewable energy as their preferred technology explained their support in this way:

“If indeed they are truly renewable, and you can find a way to generate energy from them that will provide the energy needs of this nation in a way that is not
going to adversely impact the environment, then I think we definitely need to pursue it. But, you can’t go one day and say we are going to stop using all of the nonrenewable resources and switch over. It just doesn’t work like that. We need to come up with a common sense approach. If indeed we know that coal will run out, that oil will run out, it seems to make sense that we need to look for an energy source that is truly renewable, but I am all in favor of, you know, having a combination of ways to produce the energy that we need (April 19, 2012).”

Like Anon3, many respondents qualified their support with a lot of “ifs” suggesting that renewable energy might be their preferred choice if not for all the uncertainties they associate with it. Most informants expressed caveats in their remarks about renewable energy. Mike Berney, a local realtor, named renewable energy as his preferred technology for further development, but only if it is affordable:

“It has to be affordable. The other thing too, they need to be in the same playing field as the people that use the fossil fuels. What happens is, I know with geothermal plants, they get some huge breaks to get started and all that, and it seems to continue for a while. That is okay to get them started I guess, but over the long course, I don’t want the government taking my taxes, subsidizing energy and then those guys selling that energy and getting more. They need to be on the same playing field (April 24, 2012).”
Contrary to the facts, Berney doesn’t believe that traditional forms of energy production like coal and nuclear get any government subsidies or incentives. However, renewable energy developments and the policies that support them are often talked about, especially in the local communities that host such developments. Berney knows about the tax abatements for renewable energy because of discussions with other Churchill County residents about how much revenue local geothermal plants are generating for the county.

State tax abatement policies impact the amount of revenue generated for the local counties. Brad Goetsch, the county manager at the time of the interviews, advocates for renewable energy advocate but is critical of policy incentives to help the industry. He describes himself as a moderate conservative registered as an Independent, but he also describes himself as an environmentalist and a former Greenpeace activist. He whole-heartedly believes that renewable energy is the future of the energy industry. In our interview, Mr. Goetsch explained the progress made in renewable energy technology due to government funding:

“I believe that we could put money into it, like we have done lately, which has caused a rapid evolution in photovoltaic technology and solar technologies. And build those kinds of plants here and have solar thermal and photovoltaic. We've seen a huge evolution even in geothermal technologies which has gone to binary plants now...So that has all been goodness (April 13, 2012).”
Despite the benefits he sees in the progress of the technology, Mr. Goetsch disagrees with the policies that are implemented to encourage renewable energy development because he fears the economic impacts:

“This needs to be a transition that doesn’t cripple our economy or weaken us or turn people against green energy. If you impact us so great by this effort to get them to go green quickly that it kills industry and kills jobs, then people will see it as the enemy and there will be a backlash against it instead of support for it (April 13, 2012).”

Mr. Goetsch is not talking about general impacts to the national economy at large, he is referring to specific impacts to the local economy. As the county manager, he feels the pressure of Churchill County’s depressed economy lagging behind the growth the rest of the nation. With no state income tax, there are less funds available for state supported services, like education. The state hopes to diversify its economy with investments in the renewable energy industry by providing tax abatements for renewable energy developments. These tax breaks do not only impact the state budget, but also county budgets. Mr. Goetsch explains the state policies from his perspective:

“The state has taken, I can tell you, 30-50% of the funding from local counties and local cities to try to recover and fight for economic recovery and to pay
these kind of abatements that are going on. So here on one hand, just in this county under this state policy, we would abate, I am going to be a little careful here but, 300-400 million dollars in the next few years on renewable energies to companies that are making huge profits. At the same time, I am closing community colleges, we are closing universities, and laying off county employees. We are contributing rapidly to the unemployment list because all those revenues that used to support schools and used to support government aren’t there now because we are giving it away to those companies that are making big profits…we are giving away in this state alone, statewide, half a billion dollars in energy abatements and supplements and things (April 13, 2012).”

Mr. Goetsch believes in the promise of renewable energy as a clean technology with a free and abundant fuel supply, but he does not believe that we are ready to implement renewable energy at a large scale. If the government has to pay for clean energy, then funds are not available for other government funded services, and the local governments bear a large portion of that burden.

In addition to costs, there is the belief that the renewable energy industry is just too immature to be launched fully as a significant contributor to our national energy system. Monte Morrison, who works in the geothermal industry but favors nuclear development explains the very real limitations to renewable energy:
“Understanding our electricity needs in the United States, we need huge base load power plants, which comes down to nuke, coal, and natural gas. Hydro, but there won’t be any new large scale hydro, so what there is we have to enjoy and that is it. We have to rely on nuclear, and coal, and natural gas in the 10-20 year time frame. Wind is wonderful, but is as cyclic with the weather, solar is wonderful for peak, and geothermal is great but it is reaching. All of the renewables have their limitations so we are going to rely on fossil and nuclear because we have to (May 1, 2012).”

Fossil fuels dominate American energy production and there is a tendency amongst the public to expect that just one or two new technologies will replace them, and there is no one renewable energy technology that can replace coal and natural gas on its own.

Renewable energy does have some real limitations. Evans, Strezov, and Evans (2012) describe the major constraints for increasing renewable energy generation for the national grid as being intermittency and availability of the resources when needed. Energy storage technologies are needed to improve renewable energy generation to the point where it can provide baseload power and make a larger contribution to the national energy supply. These limitations of renewable energy reinforce the concept that nuclear and fossil fuel energy production are the more reliable choice. One subject explains:
“I have a tough time looking at some of these other technologies. One of the problem with renewables, particularly solar photovoltaic and wind, is you have to have back up capacity spinning while they are working. I mean you get a cloud for an hour and your solar is useless. Yet, NV Energy or whomever has to provide that power to the user, so you get a day like today that is nice and suddenly a cloud rolls in, where is that energy going to come from? It is going to come from gas or a coal plant more than likely (anon4, April 27, 2012).”

Increasing the connectivity of the grid by means of internet communications technology as well as more transmission lines would help get intermittent power to where it is needed at the time that it is available.

Renewable resources are often located far from the urban centers they support, which means new transmission lines need to be built (Clean Energy Project, 2011; Vadari, 2010). Geothermal resources may be established, but with no transmission lines to get the energy to the cities. Utilities will not enter into a power purchase agreement without an established transmission tie in, and without a power purchase agreement, facilities cannot secure funds to build transmission lines. This creates a chicken or the egg type of stale mate within the renewable energy industry since it is unclear who should build the transmission lines. Transmission lines can be more expensive and more of a barrier than establishing a new facility (Fama, 2008).

Informants support the ideals of renewable energy, but their support is weak. They are concerned over the cost of the new technology, the local economic impacts to state policies encouraging the clean energy industry, and the limitations of the emerging
technologies. The local geothermal developments have only highlighted for Churchill County residents the way state energy policies have impacted revenue streams for the local governments. Even those in the county that support renewable energy development above fossil fuels and nuclear energy are still reserved in their support because of the economic impacts of energy policy meant to develop the renewable energy industry. In Churchill County, renewable energy is not the favored industry that prior survey research suggests. I now delve deeper into the attitudes, beliefs and perceptions of local residents to discover why renewables are not seen as a wise investment into our energy future.

LOCAL BURDEN OR BENEFIT: COUNTY IMPACTS OF RENEWABLE ENERGY

In this section, I will delve into the local impacts of renewable energy developments and describe specific state and federal policies and how they impact Churchill County. Churchill County residents support renewable energy in principle because they associated it with values like self-reliance, independence, and efficiency. These values that are appreciated by conservatives more generally, so this support for renewables in principle makes sense. Some, like Zip Upham, even express pride in their local renewable production, while preferring nuclear and fossil fuels, “I am always very pleased with the fact that Churchill County is a net exporter of green energy because of our geothermal resource” since the county produces far more geothermal energy than the total amount of energy consumed by the residents (April 23, 2012).

Several other informants echoed this pride in the broader benefits of renewable technology. Mike Berney appreciates the benefits of improved air quality. During our
interview, he reminisced about a trip to Los Angeles decades ago for his senior grad
night. He described his shock over the color of the skies compared to the clear, blue
skies of his rural Nevada hometown. He acknowledges that air pollution across the
nation has decreased due to environmental regulations. While he is concerned about
the rise in utility costs due to investment in renewable energy, he also admits, “Over the
long run, as a consumer, to me it is worth it to have a better atmosphere to breathe
(April 24, 2012).” Jim Johnson states that the benefit to more clean energy “is to try
and drive more research into those areas in order to get less reliance on fossil fuels,
which hopefully will help air pollution (April 24, 2012).” But, Churchill County residents
already enjoy clean air, so environmental arguments regarding clean energy do not
resonate too deeply with them.

Renewable energy is associated with ideals that an individual can support, but
not with specific benefits to the local community. A resident of the City of Fallon
explained that he understood that renewable energy was the cleaner, and thus better,
option for producing energy. He also recognizes that government policies to incentivize
the industry would grow the technology for renewable energy further, improve it, and
make renewables the practical choice as well as the environmental choice (anon2, April
20, 2012). But, while these broad statements in support for renewable energy are
understood and believed, they do not seem to carry the same weight with conservatives
as arguments against renewable energy.

Participants feel that renewable energy is being developed for the greater good
or as an answer to the problem of climate change, but aside from these altruistic
arguments, the clean energy developments need to be shown to provide a specific
advantage to the communities that host them. Informants believe that they are being asked to pay a premium for an expensive technology because it is a feel good solution to global warming, but they don’t believe global warming is a problem that needs a solution. “People are less likely to pay a premium to do the right thing if they are struggling with everything else,” explains Monte Morrison (May 1, 2012). Molnar (2010) explains that the distribution of rewards from climate change mitigation is broad and diffuse, whereas the distribution of costs is focused in the rural community, so there is not much of an argument for local development. Monte Morrison, who is a Vice President at a geothermal company, describes support for geothermal development in Churchill County, “I think we are more practical about it, but we are not chanting or beating the drum to do it out of good stewardship (May 1, 2012).” County Manager, Brad Goetsch, describes local perception of renewable energy projects under current policies as feeling as though someone else is changing their “culture and life to make things better for the greater good, but it is not making anything better” for them personally (April 13, 2012). Zip Upham echoes this sentiment by saying:

“It is one of those things that if the economy was roaring, if the economy was doing well and everybody was doing well and you told them this is one of things that we are going to do because it was good for the planet, people will be like, okay. When the economy is restrictive and people are worried about their day to day paycheck existence, and you tell them it is good for the planet and it is going to cost you more, guess what their response is going to be? I mean their
day to day reality pretty much defines the level of altruism they are willing to put up with (April 23, 2012).”

Some may celebrate the clean aspects of renewable energy, but Smith and Klick (2007) found that when a proposed wind project was framed solely as a clean technology that would mitigate climate change, it lost support since there was no direct benefit to the community and not everyone recognized climate change as a problem. Interview responses show that my informants in Churchill County hold similar attitudes.

Study participants are not against renewable energy development so much as the policies that limit benefits that could accrue to the county. Locals feel that they should receive a lion’s share of the money from the exploitation of local resources. Additionally, the county does incur a real cost to support the geothermal projects through providing infrastructure and services like roads, emergency response, and education. Beyond the level of county benefits, Mr. Goetsch questions the benefits for the state of Nevada. The increased production of energy does not decrease the cost of energy for rate payers. In Mr. Goetsch’s experience, renewable energy companies are often foreign-owned, there are few permanent jobs associated with projects, and current policy abates a lot of the potential tax revenues. Recall that above I pointed out that Mr. Goetsch prefers renewable energy over nuclear and fossil fuel energy sources, but even he says, “It is all wonderful if it helps slow global warming - and we've made a miniscule impact on that issue - so morally that is a good, but economically we have not thought this through (April 13, 2012).” Clear and distinct local benefits are required to gain the support of these local residents.
And support for new energy developments from the local citizens is vital. Local
governments have to approve renewable energy projects, even those developed on
federal lands. Moreover, politically conservative regions elect the decision makers that
decide whether to support the development of nuclear, fossil fuel or renewable energy
technologies. Support for clean energy alternatives does not come from altruistic
motivations, the support is earned in response to the clear and direct benefit renewable
energy projects have on the local community. The next section explores the various
revenue streams that are generated for local governments from renewable energy
projects.

CIRCULATING MORE MONEY IN THE COUNTY: JOBS AND FOREIGN OWNERSHIP

I noted varying levels of perceived benefits from the local renewable energy
projects in the county, which are almost exclusively geothermal power plants with some
solar and small scale hydroelectric generation. When asked about benefits to the local
area from the geothermal plants, Dairy farmer Bill Christoph declares, “there is no
question that there is (local benefits); jobs, it helps with the tax base. Really, I don’t see
any real down side (April 28, 2012).” Zip Upham also responded in the affirmative
when he said that the developments provided improved employment opportunities and
an improved tax base (April 23, 2012).

A report commissioned by Churchill County [COMMISSION?] indicated that a 20
MW geothermal facility provides only seven full time, permanent positions; however,
those jobs are paid a high average annual salary of more than $80,000 a year, which is
well over the $55,000 median annual income for a household in Churchill County
(Applied Analysis (2012). John Kirch pointed out that the full time, permanent jobs that
are generated are for educated, skilled employees (April 24, 2012). He said he preferred to have a few high paying positions in the community rather than a larger number of jobs paying lower wages. Geothermal employees will be well paid and provide benefits of their own through property taxes and increased spending in the community.

Some residents are a bit more skeptical about the employment benefits the energy projects bring to the county. With the limited amount of full time, permanent jobs that are created for the county as a result of a new geothermal plant, Jim Johnson explains that those jobs might not mean a net benefit for the county:

“Unfortunately, geothermal plants, while there is a large expenditure of money to put them in, they do not generate a huge amount of jobs. I don’t know the cost-benefit breakdown to the local government, whether it generates enough jobs to produce enough taxes because they are always giving so many rebate programs and free taxes that the state gives away to them that sometimes it is almost detrimental to the local governments (April 24, 2012).”

Mr. Johnson is concerned that employment benefits the energy developments produce for the local county do not compensate for the lack of taxes due to Nevada state tax breaks for renewable energy facilities.

One respondent (anon3) who works with county leadership acknowledged that the plants provide a few permanent jobs for people that become part of the local community, but “the hundreds of jobs portrayed that is absolutely not true. A lot of the
construction jobs, those people are from out of state. They come and then they go (April 19, 2012).” New facilities generate jobs for construction crews and state law requires that in order for the renewable energy facilities to take advantage of tax incentives then 50% of the construction crew must be residents of Nevada. But the regulation does not require the crews be hired from county residents only.

The construction phase of the developments were reported by local residents as the most disruptive to the local community with lights for crews working at night and lots of noise and dust. The heavy equipment and parade of trucks also had an impact on local county roads. The county provides services to the energy projects through road maintenance and emergency response, but with the lack of property taxes, members of the county leadership do not think the projects pay enough to the county to make up for the use of those services. Monte Morrison acknowledges the cost to the county, “When the plants are built, there are hundreds of jobs in town, a big flurry that changes the economy, but there is wear and tear that really there is nobody to pay for (May 1, 2012).”

Chris Henning, a local business owner, admits the renewable energy projects are great because they “employ some people. They certainly put construction crews to work”, but he goes on to say, “we have issue with the fact that a lot of tax revenue doesn’t stay in the county. It ends up in different coffers (May 3, 2012).” He is alluding to the fact that the companies that own and operate the geothermal plants are often not Nevada or even U.S.-based companies, so a lot of the profits are spent out of the local region. Ernie Schank, farmer and board member of the irrigation district, expresses similarly contradictory support of the clean energy developments:
“(Geothermal plants) add to the tax base and bring people to the community, if you like growth that is a good thing. They are in the community, use the resource, provide a tax base and there are other revenues that are derived by local government through regulation and those kinds of things. But I guess if it is foreign owned, and by foreign I mean someone from out of state that owns the company, then most of the money is siphoned out. I guess that is the downside. It would be nice if it was local companies and the money really stayed here and was allowed to circulate and generate more (May 2, 2012).”

Several respondents objected to foreign ownership. In his condemnation of government tax abatements, Mr. Goetsch said, “Ormat, an Israeli owned company that has geothermal plants here, have declared hundreds of millions of dollars of profit last year, yet they paid no taxes and contributed almost nothing to the revenues and incomes of the United States of the local communities (April 13, 2012).” The Applied Analysis report (2012) states that Ormat Technologies reported positive growth and profits over the last four years, which occurred during a recession. Their report concludes with this statement, “Given that some large geothermal operators are reporting stable profits, the concept of whether the abatements are necessary to ensure their existence in the state should be considered, especially given the site dependency of the industry.”

Rick Lattin, Management Consultant for the Small Business Development Center at the Churchill Economic Development Authority, compares a geothermal plant’s
impact to the local community with that of a new milk processing plant that just broke ground in Churchill County while I was conducting interviews. The milk plant will hire 50 permanent, full time employees. It will also create more demand for the agricultural goods the community produces, which will push growth in that industry. Moreover, the milk plant will pay full taxes. In comparison, the geothermal plant will have the majority of their taxes abated over the course of the facility’s useful life, and will only create a dozen permanent positions. Using this type of comparison, local residents don’t see clean energy projects as the big boon to the local economy they are hyped to be by renewable energy proponents.

COUNTY REVENUES

I was surprised by the interviewees’ perception of a lack of significant local benefits reaped from the geothermal plants in the county, and so I investigated the state and federal policies regarding local taxes and royalties. Renewable energy projects generate revenues for local governments through different policy mechanisms, in part based on whether they are located on federal or private land. State policies govern taxes; property taxes, mining taxes, and sales and use taxes. Projects that are located on federal land have to lease the land and then pay rents and royalties for production on those leases. In this section, I will explore these two revenue streams of taxes and rents further to see how state policy incentives for renewable energy developments impact benefits for local governments and communities. It is important to note that there are federal tax incentives for renewable energy developments; however, since they do not impact local governments the way state policies do and they were not
mentioned in the interviews, I will focus on the state and public land policies that participants referred to as impacting the local community.

TAX ABATEMENTS

Developments in Churchill County, whether on private or public lands, generate income for the county through taxes. Every project has sales and use taxes it generates through the use and buying of supplies and equipment, from renting bulldozers and cranes to the paper for copy machines and stationery. The majority of these taxes are generated during the first couple years of a project when it is being constructed. The sales and use tax in Churchill County is 7.6%. In 2009, Nevada adopted a law to promote the renewable energy industry in the state. Chapter 701A of the Nevada Revised Statutes explains the energy related tax incentives for the state of Nevada. The sales and use tax for renewable energy projects that meet certain criteria will be reduced to 2.25% for the first three years of the project. In Churchill County that means a reduction of sales and use tax by 70%. The remaining sales and use taxes collected goes to the state rather than the county (Applied Analysis, 2012). The reduction in sales and use tax applies only to the first three years of the project, but most of the sales and use tax is generated during those initial years of construction.

In 2009, Nevada implemented another tax incentive to abate property taxes, which interview participants specifically mentioned. Fifty-five percent of the property taxes are to be abated for the first 20 years of qualifying renewable energy projects. Moreover, the 2009 property tax law allocated 45% of the collected property taxes to the state’s Renewable Energy Fund. In essence, this leaves only 25% of the energy project’s initial property tax to be collected by the county.
The state policies are not only meant to attract renewable energy developments, but they also have criteria attached that ensure that the new developments will benefit Nevadan workers. To qualify for these state tax incentives, a facility built in a rural county needs to: (1) employ 50 or more full time workers during the second quarter of construction with at least half of those workers being residents of Nevada, (2) provide an average hourly wage of 110% of the average statewide hourly wage, and (3) provide construction workers an above average hourly wage and health insurance for them and their dependents. The state expects to recoup or even exceed the loss of tax revenues from the energy projects through the financial benefits that will result from the employment of residents. Moreover, an additional criteria for the renewable energy development to be eligible for the tax incentives is to assure that establishing the facility will require the facility to make a capital investment in the state of at least $3,000,000. A recent report from the Clean Energy Project (2014) confirms:

“The cumulative capital investments for projects sold to in-state and out-of-state customers, including transmission lines to move the clean electrons, total $5.5 billion since 2010. Nevada’s investment of $500 million in tax abatements has attracted $5.5 billion of capital investment in clean energy projects to the state, resulting in a 10 to 1 return on its investment. Additionally, Nevada will receive just over $820 million in employment and property benefits from these projects.”
The state has clearly benefited from the clean energy industry and its forward-thinking policies to encourage the industry’s growth in Nevada, but these policies have an impact on county revenue streams.

Changes in tax policies for geothermal projects have a greater impact in lowering potential revenues on local governments than it does on the state. Proceeds from geothermal projects represented less than 2% of the total proceeds collected from mining taxes for the whole of the state of Nevada in 2011; however, more than 44% of mining taxes collected by Churchill County were generated by geothermal activity (Applied Analysis, 2012). Analyses that look at the county’s investment in the project as equaling the amount of abated taxes and compares that to employment benefits shows that on average, a $2 million tax abatements gets the county one permanently employed citizen with an annual income of $80,000 (Kalt, 2011; Applied Analysis, 2012). The county does not receive the same level of benefits from the tax incentives that the state enjoys.

Overall, the county saw a 22% reduction in revenues from taxable sales from 2009, when the tax incentives were implemented, to 2010 and continues to see a reduction in revenues (Kalt, 2011). The Churchill County Comprehensive Annual Financial Report for fiscal year ended June 30, 2011 (the last such report completed before the interviews were conducted) describes revenues from geothermal projects in contradictory manner (Kalt, 2011). The report acknowledges that it does receive “a significant amount” of funds from geothermal projects, but describes them as “one-time non-sustainable taxable sales.” The county’s 2011 tax revenues increased due an expansion of a geothermal plant that raised its property value as well as the sale of
another geothermal plant. The report states that these funds was enough to offset the loss of property taxes from lower home values, foreclosures, and a slow real estate economy. While it is true that with the state policies on tax abatements there is less money coming directly into the county treasury from these projects, it is also clear that the geothermal projects do benefit to the county.

Any project will bring in additional taxes and revenues to the county. However, since geothermal resources are not universally located, Churchill County leadership believes that geothermal companies will come to Northern Nevada even without incentives since that is where the resources are located. They question why the county should receive less benefits when there are few alternative locations to begin with.

Despite the tax benefits that the county does receive from these renewable energy developments, there is still the sense of loss from the amount of money that could be gained from these projects without the state abatements. That perception of loss is an important factor influencing public support; the interviews showed support for renewable energy, but not for the policies that incentivize the renewable energy industry. County Manager, Brad Goetsch sums up the county’s perspective as this:

“Churchill County is a huge geothermal resource. We have 7 operating geothermal plants right now. We produce over 310 MegaWatts. We have 5 plants in permitting in some aspect or getting ready to build, and that is less than 5% of our potential here, we are told. So, we have the ability to build dozens of hundreds of additional plants just in this 5000 square mile county. But, when the geothermal plants are built, they are getting a huge influx of
money. Well, they did; it is drying up now. They were dependent on a huge federal grant and federal subsidies. Then they would come to this state, and they got an even bigger grant or tax abatement where they would abate 55% of their property taxes for 20 years, which in effect is an entire valued life of a power plant. They would not pay any sales and use tax for the first 3 years, which would cover all of their building time. We have a couple plants that came in recently that proposed to build that were almost free. I mean they were built on government money, federal and state money. Their abatements equaled hundreds of millions of dollars (April 13, 2012).”

Mr. Goetsch understands the need for abatements to encourage industry growth, but thinks “instead of giving someone a 55% tax abatement and letting them make a $400 million profit this year, let’s give them a 25% tax abatement and let them make a $200 million dollar profit a year (April 13, 2012).”

Since I conducted my fieldwork, Nevada has amended the renewable energy tax incentives. The statutes still allow for 55% of property taxes to be abated for the first 20 years of renewable energy projects meeting the criteria described above, but there is no longer the allocation of the 45% of the remaining property taxes to the state’s Renewable Energy Fund. The entirety of the remaining property taxes goes to the local governments. This change in policy shows that state leadership also saw a disparity in the benefits from renewable energy projects to the state and the burden the incentivizing policies placed on local governments. We do not know, however, how these changes may affect local perceptions toward renewable energy development.
Based on my findings, I expect perceptions to lean in a more positive direction than I saw while in the field.

REVENUES FROM FEDERAL LANDS

In addition to perceiving revenue losses from state tax policies, my interviewees also complained about a loss of revenues from developments on public lands. Like much of Nevada, more than 80% of Churchill County land is federally owned or managed. Having such a large portion of untaxable lands is inherently detrimental to a local government’s financial status. County Manager, Brad Goetsch, explains, “Nevada is 85%-87% public lands. That is a problem to start with because there is not a lot of land you can create revenues off of (April 13, 2012).” Farmer Ernie Schank expressed some frustration about being limited by so much federal land when he says, “we end up with public lands that basically don’t provide any tax base. We should be able to at least use it if it is going to be there to the benefit of the state of Nevada (May 2, 2012).”

RENTS AND ROYALTIES

The Energy Policy Act of 2005 indicates that funds from geothermal developments on federal lands shall be allocated with 50% of the funds going to the state the project is located in, 25% of the funds going to the county the lands are located in, and 25% going to the federal government. The Clean Energy Project (2014) declares that bids and royalties from energy projects on public lands generate tens of millions of dollars for the state of Nevada and affected counties, but claims made by interview subjects indicated that federal funding from energy projects had been suspended and was unreliable.
Churchill county residents described the policies governing federal funds from geothermal projects in generalized and abstract terms. They were inconsistent in some facts, but the general idea was that at some point the rents and royalties were taken away from the county, have now been reinstated, but are still unreliable. One participant (anon3) explained it in this manner:

“There used to be a fair way that the county would benefit, and therefore our residents would benefit, from projects going on to public lands: the rents and royalties. It used to be a third goes to the feds, a third goes to the state, and a third goes to the county, and that actually we were really happy with. Then the feds decided they were short of money so they took it all, and we had to work hard to get a little back. We got a little bit back, and then the state took it (April 19, 2012).”

Monte Morrison repeated a similar vague explanation of federal funds. He said, “The federal royalties that the U.S. government got from geothermal - there was an issue with the feds or the state took them and nixed the county out of it. That has gotten fixed on a year to year basis (May 1, 2012).” Zip Upham, who works closely with County leadership in his role at the naval air station explains the changes in fund allocations:

“When they passed the bill that said the geothermal rents and royalties, which were originally divided up for the geothermal production on BLM land, it was
originally supposed to be 50% rents and royalties to the feds, 25 to the state and 25 to the local government. Congress changed that and made it 50% to the state, which is fine to the state of Nevada, but what it does is it takes the rents and royalties which were being significantly used to offset the cost of expenses to Churchill County and moves it up to the state level (April 23, 2012).”

The revenue’s generated from the geothermal developments make up a large portion of the local county’s budget. Dr. Stuart Richardson, an active citizen in Churchill County on land use and water rights issues expounds on the issue of lost revenues. He explains that a delegation to the federal government has once again changed the policy to allocate a portion of rent and royalty revenues to the county from developments on federal lands, but fears that the money can be taken again just as easily. He explained the impact to the county and the unreliable status of the funds in this way:

“Up until recently the income coming to Churchill County was huge, and they just changed a division of the royalties to cut it back to almost nothing which severely impacted the county budget. While we were getting a 25% share of the revenue of these industries, Churchill County was doing extremely well. Regardless of their personal feelings, I think everyone felt it was a boon for the county because it helped the county accomplish a lot of thing like building a new juvenile detention center. ... We have actually gone to our people in Washington and said you have got to help us out. We had 25% which turned out to be in the millions of dollar and all of a sudden it is not there. We have to go
back each year and lobby our individual representatives to do it again, to give us a one year extension (April 30, 2012).”

The federal funds seem to be significant to the county, but the exact facts of the revenue stream were not clear from the interviews. Similar to perceptions of state policies, informants feel that local benefits have been sacrificed or put at risk for the sake of renewable energy development.

I investigated the facts regarding the federal funds to compare them with the perceptions of the study participants. Originally, the allocation of revenues from geothermal power production was governed by the Geothermal Steam Act of 1970. The Energy Policy Act of 2005 (Public Law 109-58) changed the allocation of those funds from the 50/50 division between state and federal treasuries to include the 25% county apportionment. The 2010 Appropriations Act\(^\text{11}\) cancelled the 2010 payments to the counties. The interview subjects’ primary concerns were about this cancellation of payments. The appropriation act also stated that “the 2011 President’s Budget proposed terminating payments to counties in 2011 and thereafter since these payments are inconsistent with the original division of revenues and set an undesirable precedent for future expansion of revenue sharing with local governments (Public Law 111-88).” Nevada’s representatives, along with those from other western states with large amount of federal land, amended the appropriations bill to reinstate the payments to the counties (Public Law 111-212). Each year, an appropriations bill is passed to

\(^{11}\) See Section 423 of the 2010 Department of the Interior, Environment and Related Agencies Appropriations Act, P.L. 111-88.
govern federal agencies, including federal land management agencies, and each year the counties’ portion of geothermal revenues is eliminated. In turn representatives from western states have to reinstate those payments through follow up amendments to the appropriations.

Policies governing renewable energy on public lands are fairly new. Geothermal generation has a history of developments on federal lands and has been grouped together with policies that govern mining on those lands. To develop geothermal projects, a private company needs to bid on a lease, pay rent on that lease, and pay a royalty based on the amount of energy produced. Solar and wind energy projects are not developed in a similar manner. To develop solar or wind energy projects on public land, a company would simply need to get a right of way permit from the land management agency (Solar Energy Industries Association, 2012). This is a new area of policy since the first solar project on federal lands went on line in 2012. Because solar and wind is developed under different policy than geothermal projects, the benefits to the local county from these projects would be different. Senators Heller and Reid, along with senators from Montana and Colorado, co-sponsored the Public Land Renewable Energy Development Act of 2011, which would have acted as a pilot project for legislation governing solar and wind energy projects on public lands, but the bill died in committee. Senator Heller co-sponsored a similar bill in 2013, but it has remained in committee as well. This is an area of policy that is still evolving and should consider the economic impacts to the local counties in the design of the policy.
PAYMENTS IN LIEU OF TAXES

Churchill County’s vast stretches of public land are not subject to property taxes in the same manner as privately owned lands. The federal government makes an annual appropriation to local governments in the form of a payment in lieu of taxes (PILT). PILT money from the federal government is based on acreage of federal lands within county borders. The 2011 Comprehensive Annual Financial Report for Churchill County reports, “In the current year, the total Federal Payment In Lieu of Taxes was $2,060,410 compared to the prior year amount of $2,088,531 (Kalt, 2011).” The county’s financial report goes on to state that the PILT program has received extra funding through the economic stimulus package and will only be funded at this level for the next four years. PILTs are a way for local communities to benefit from the federal lands in their areas, but it does not provide a large or consistent amount of income compared to lands that are open for development. Rents and royalties from energy developments could provide a larger income than PILTs could offer.

PILTS can also come from private companies. Since local counties have to approve the development of any projects in their jurisdiction, they have leverage to negotiate the best deal with developers. The Board of County Commissioners for Churchill County had approved a geothermal sales and use tax abatement agreement that provided support to the industry after a payment in lieu of tax agreement had been entered into with the county. However, the 2009 Nevada statute (AB 522) that introduced the tax incentives for renewable energy projects, also states:
“The board of county commissioners must not condition the approval of the application (of an energy development) on a requirement that the facility agree to purchase, lease, or otherwise acquire in its own name or on behalf of the county any infrastructure, equipment, facilities or other property in the county that is not directly related to or otherwise necessary for the construction and operation of the facility.”

In response to this law, one county resident (anon3) remarked, “Now the state is telling us that our PILT policy is invalid, against the rules. So I am not sure how much negotiation and discussion we can have now (April 19, 2012).” The county does still have one point of leverage for negotiations and that is the fact that any project in the county needs approval from the Board of County Commissioners, and the geothermal resources are located in Churchill County. A county resident said, “I don’t think it is a bad idea to develop those resources, but at the end of the day, the resources are here. I don’t think we should give away the abatements that we do to induce companies to come because someday they will come either way (anon1, April 19, 2012).”

As a rural Nevadan county, Churchill County compares itself to other rural counties in Nevada, like Elko and Nye counties. Those counties were developed based on their mineral resources, and Churchill residents compare geothermal developments to mining projects. Mr. Goetsch asks, “If a gold mine came into your town and said we are going to mine all the gold out of here in 30 years, but we are not going to pay you any taxes and we are not going to provide any local jobs, do you think people would support it (April 13, 2012)?” The county’s financial reports show that the revenues from
these plants are benefiting the county, but government policies are limiting the extent of those benefits. For local residents, those limitations are perceived as a loss.

CONSERVATIVE POLITICAL IDEOLOGY DOES NOT SUPPORT MARKET INTERFERENCE

Beyond the local impacts that affects my informants’ support for renewable energy, their conservative political ideology is also an influencing factor. They have benefitted on some scale from the local geothermal industry, but they still do not agree with government financial assistance for the industry, especially when Nevada was still struggling to recover from the recent recession and their concern regarding national debt. The high costs associated with renewable energy means that policy support for the industry comes in the form of market incentives. Political conservatism objects to government intervention in free markets, so any perception of incentives or subsidies could be enough for conservatives to categorically oppose renewables.

Fiscal conservatives express skepticism about investing in the clean energy industry because they see the costs as too high compared to other energy sources making. Monte Morrison explains that in his decades of experience in the renewable energy industry, new developments are dependent on the prices of fossil fuels. When prices of fossil fuels rise, renewable energy becomes cost efficient and there is more investment in the industry. Monte Morrison observes, “There is more natural gas now than we have seen in our lifetimes to be certain. That surplus is going to de-incentivize green energy (May 1, 2012).” While County Manager Brad Goetsch doesn’t like being dependent on fossil fuels, he is afraid that transitioning to renewables too quickly might kill the economy. “While we have really cheap clean natural gas that is readily available,
let’s make this change gradually over 50 year period instead of trying to jam it into a 5 or 10 year period (April 13, 2012).” Zip Upham explains, “I think the science behind renewable energy needs to be developed further because currently the costs are higher than you would like. They are not competing, at least not without significant government intervention, on the same footing as fossil fuels (April 23, 2012).” John Kirch says, “The money is not there. Right now, it costs more to produce renewable energy than anyone ever gets out of it (April 24, 2012).” The expense of the technology is equated to the immaturity of the technology. The argument is that if this technology needs help from the government, then it is not ready for wide spread implementation. These quotes express the perspective that renewable energy technologies are too expensive, but it also refers to government policies that are not favorable amongst conservatives. Republican ideology favors a smaller government and a free market. These opinions reflect Brookings Institution’s Charles Ebinger’s (2013) argument that that the renewable energy industry cannot compete in the marketplace with cheaper fossil fuels without tax credits, and that is cause enough for conservatives to support other energy sources instead.

A true cost/benefit analysis of energy projects is not easy to calculate. A conventional coal plant has a cost associated with the construction of the plant, but there is also the additional ongoing costs associated with the fuel including mining, transportation, and mitigating the polluting byproducts. A solar plant has the construction costs, but the fuel is free and it has no emissions. There are methods to try to level the costs of the various technologies so that they can be equitably compared. Over the lifecycle of a plant, a renewable energy plant may be cheaper to build and
operate, and the mitigated impacts on the climate and environment are important to take into account; however, the up-front capital costs of renewable energy can be prohibitive.

Since opposition to renewable energy projects stems from the policies promoting the industry, I explore the informants’ attitudes towards those policies in the next section. They believe that tax incentives and renewable portfolio mandates support an immature industry at the expense of the consumer, displacing the responsibility of private industry to launch worthy technologies into the marketplace.

NO TAX BREAKS FOR AN INDUSTRY THAT CAN’T STAND ON ITS OWN

Doubtfuls and Dismissives believe that mitigation efforts are more expensive than beneficial (Leiserowitz et al., 2013). Government market interventions strengthen that belief. State and federal government can provide renewable energy projects with financial incentives to help develop the industry with tax breaks or loan guarantees, but they directly conflict with conservative political ideals. Gary Imelli expresses his aggravation by saying renewable energy “is supplemented by government subsidies. That always creates an outcry. Geez, the government is subsidizing this and subsidizing that” (May 1, 2012). Tom Inglis also expresses frustration over the government policies, “The government’s attitude is to just throw money at it. Take Solyndra,” they got half a

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12 Solyndra received $528 million from the Department of Energy Loan Guarantee program and then filed bankruptcy. Secretary Chu from the Department of Energy defended the loans to Solyndra explaining that the government’s program was to fund high risk projects with the potential to create high impact energy technologies that are too early for private sector investments but could potentially improve our national prosperity, security, and environmental well-being. In the case of Solyndra, the market changed making their solar panels unprofitable. In the case of Solyndra, the high risk investment did not pay off, but the Department of Energy’s Advanced Research Projects Agency – Energy (ARPA-E) considers the overall program a success reporting that eleven projects that received $39 million in funding went on to garner at
billion dollars. They did not have to work for improvement. They had their money; they
didn’t have to compete, and they paid themselves large paychecks (April 26, 2012).”
Receiving government funding is seen as circumventing the competition of the free
market where the best technology earns the best price.

The strategy behind the government incentives is to encourage a fledgling industry. Since most of the costs associated with a renewable energy plant is the
expensive exploration of the resource base and construction costs, most of the funds
needed are just to get the facility built. Once it is operating, the plant starts to pay back
those costs immediately, so the belief is that renewable energy projects will not need to
be subsidized indefinitely. Rick Lattin, with the Churchill Economic Development
Authority, agrees that “you have to subsidize some of this start up stuff, in fact for here,
it would be great (April 23, 2012).” He is referring to the benefits the county receives
from the geothermal developments, which are dependent on these incentivizing policies
for financial support. Moreover, as the technology is developed and implemented on a
broad scale, then the cost of the technology will continue to decrease, so that future
developments will not need the seed money. Despite his frustration with the subsidies,
Mr. Imelli understands this strategy when he says, “solar panels do seem to be getting
cheaper, so there may be a time when they wouldn’t have to be subsidized anyway
(May 1, 2012). “ Another City of Fallon resident (anon2) acknowledges that this initial
investment by the public is needed to direct the energy sector away from fossil fuels. He
states:

least $200 million of private sector funding, moreover, the program has generated 34 pending patents and
48 technical patents (www.arpa-e.energy.gov).
“These renewable energy sources are going to become more and more prevalent. The industry would never succeed if they didn’t have these built in subsidies and mandates. If you have to have so much solar, then you are going to develop solar; the more you develop, the better it will become. And over time, the more and more efficient it will be (April 20, 2012).”

Informants understand that new industry requires investment, but they are concerned that it is the government investing in renewable energy, rather than not private industry doing the investing. It makes them feel like it is a political agenda being forced on them rather than the natural result of an evolving technology in the free market.

Several subjects mentioned supporting clean energy to the point of paying a few more cents per kilowatt-hour, but their fear of high costs trumps their support for the incentivizing policies. Bill Christoph explains his support:

“At some point, we have to say hey, this whole situation is not going to get any better unless people use some common sense. If it stands on its own, or is close to standing on its own, I am all for it. If you tell me that a wind tower up here can deliver me electricity for 12 to 14 cents, I might consider that. But if you tell me to put a wind tower here and it would go for 40 cents a kilowatt, I am sorry. It is state tax payer money to take it from 50 cents to 12 cents. I am not buying that. At some point we have to be responsible (April 28, 2012).”
Mr. Christoph would accept electricity at 14 cents per kilowatt-hour, which is two cents above the rate he currently pays. That is an indicator of his support for clean technology. However, he also explains that his support is limited by his degree of concern over the need for clean energy; he believes that the nation’s financial status is a greater concern than and climate or energy crisis.

NUCLEAR AND FOSSIL FUEL SUBSIDIES

Recall in the fossil fuels discussion earlier in this chapter, Churchill County residents preferred fossil fuels because it was a proven technology that did not require government support. Their conservative market-focused ideology reinforces their belief that the best technology will be proven by an open, competitive market. Since nuclear and fossil fuels are presently less expensive, they appear to be the best option of energy sources. Churchill residents are often unaware or do not believe that nuclear and fossil fuel energy production is also subsidized by the federal government. Mike Berney thinks that renewable energy needs to be on the same playing field as fossil fuels, which he claims is not subsidized. He knows the geothermal plants get subsidized, especially during their construction phase. But, he says, “I don’t want the government taking my taxes, subsidizing energy and then those guys selling that energy and getting more money for it; they have to be on the same playing field (April 24, 2012).” Berney thinks that the fossil fuel energy producers are an example of a business model that is competitive in the free market based on cheap fuel and a proven technology. Tom Inglis expresses a similar belief when talking about nuclear technology, “Nuclear, if done right, I don’t believe it is subsidized (April 26, 2012).”
These perceptions do not fit the facts. The federal government has had the role of supporting the energy industry since the 1950’s. Management Information Services, Inc., a research firm specializing in energy and environment issues, authored an analysis of federal energy expenditures for energy development from 1950 through 2010. The report demonstrate that “the largest beneficiaries of federal energy incentives have been oil and gas, receiving more than half of all energy incentives provided since 1950 (Management Information Services, Inc., 2011).” Fossil fuels altogether have received about 70% of all federal support for energy development, mostly through the form of tax concessions. All renewable forms of energy, including geothermal but excluding hydroelectric dams, have received only 10% of the federal support for energy. Over the past 60 years, half of all federal research and development expenditures have gone to the nuclear industry, with a quarter of the research and development money going to coal.13

Residents prefer nuclear and fossil fuel energy production over renewables because they believe fossil fuel production relies on proven, low cost technologies. This is an inaccuracy in their beliefs; the truth is contradictory to their own political ideology. The profits and cost effectiveness of those technologies rely on federal tax incentives, research and development funds, and regulation costs in amounts that far surpass renewable energy. This ignorance of fossil fuel’s true costs stands as a key barrier to practical support for renewable energy. A possible solution would be to stop government support of fossil fuels to better represent a competitive market.

13 Informants approve of government support in the form of publicly funded research grants to universities as a form of support. They believe that once a technology is ripe, private industry will buy it and support it to the marketplace for widespread launch or implementation.
Mandates and Fears of Utility Rate Increases

Nevada has a Renewable Portfolio Standard mandating that 25% of the energy sold to consumers must come from renewable sources. My informants were unfamiliar with this policy, but overall viewed it as another form of government interference with the energy market.

The interview participants approach the idea of energy production with a very practical view of supply and demand leading them to assume that with an increase in energy production, there should be a correlating decrease in energy costs to them as consumers. John Kirch said, “Energy production, no matter where it is, is a good thing. There are lots of different ways to produce energy, whether it is fossil fuels, geothermal, solar, windmill in your backyard; all these different sorts of things. By producing more power, it should make power cheaper, but it doesn’t always work that way. Then again, it is demand. Who is demanding this power (April 24, 2012)?”

Mr. Kirch brings up an important question, is there a demand for clean energy that makes investing in new technology worth it? From a perspective of concern about climate change, there is an immediate demand for renewable energy so that old, polluting coal and oil plants can be taken offline as soon as possible. These older power plants are major contributors to greenhouse gasses in the atmosphere as well as nitrogen oxides, sulfur oxides, particulates and other contributors to poor air quality. But, retiring old power plants to stabilize the climate does not resonate the interview subjects since they do not perceive climate change as a problem. Without a belief in the urgency of acting to curb global warming, clean energy is simply not worth the cost.
The CATO Institute\textsuperscript{14} reports that the United States could transition to a completely green energy grid, but the cost would be staggering in consumer prices (Robinson, 2010). Electricity rates will not decrease, even with more green energy plants online, because there will not be a surplus of energy production since old plants will be taken offline. Moreover, the demand for more energy keeps growing with our ever increasing population and increased use of technology, but participants in this study prefer nuclear or fossil fuel as cheaper and reliable options to meet that growing energy demand.

To create a demand specifically for renewable energy, states implemented Renewable Portfolio Standards (RPS) mandating a percentage of the energy supplied in the state be produced from renewable resources. Nevada established their RPS in 1997, and it has been modified in every legislative session since then (Nevada Public Utilities Commission, 2014). The RPS established the percentage of electricity sold by NV Energy, the private utility providing energy to consumers in Northern and Southern Nevada that must come from renewable sources. The current standard states that 25% of the energy sold in Nevada by 2025 must be generated from renewable sources, with specific percentages of that renewable energy coming from solar facilities and energy efficiency measures (Nevada Public Utilities Commission, 2014). The RPS creates a market in Nevada for renewable energy in order to fulfill that quota.

Mandates create an artificial market that goes against conservative ideology, which advocates free markets. Charlie Frey puts it simply, “any time the government

\textsuperscript{14} The Cato Institute is a conservative think tank dedicated to the principles of individual liberty, limited government, and free markets (Cato.org, 2014).
starts screwing around with supply and demand, and they screw everything up (May 2, 2012).” Brad Goetsch explains that a mandated portfolio standard means that the utility is forced to buy green energy to meet the RPS, “so if the plant is expensive, even though the government abated all their costs, the plant sets some 19 cents a kilowatt-hour or something, then our rates go up (April 13, 2012).” Ebinger (2013) agrees that mandates for clean energy will drive up rates. A few of the respondents said they would be willing to pay a few cents more a kilowatt-hour, but worry how high the rates will go up as a result of forcing renewable energy onto the market. One man (anon4) qualified his support by saying, “I support (the RPS), but again, the problem is if the utility provider’s portfolio requires a greater percentage (of green energy), then the cost will be passed on to the users. I am comfortable paying an extra cent or two, but I don’t want to be like California and pay double what I am now (April 27, 2012).” Conservatives fear that by forcing utility providers to purchase the more expensive, clean technology, mandates like the RPS will cause an increase in utility rates.

In addition to the cost of the technology, there is a fear amongst participants of the consequences if Nevada cannot meet the RPS. Dr. Richardson said, “I am against the government telling you that you are going to have to produce this much and then fining them because they can’t. It is an industry that is still in its developmental stages (April 30, 2012).” This fear of not being able to meet the RPS was a common sentiment, but it also shows ignorance of the current state of renewable energy in Nevada. If anything, the opposite problems is true; Nevada’s potential for renewable energy production exceeds its demand for it based on the current portfolio standard (Robinson, 2010). Monte Morrison explains that since natural gas is the cheaper source of energy,
the incentive to invest in renewable energy comes from the RPS. Since demand is based on policy, which can be changed at any legislative session, the industry has an uncertain future and poses a risk for investors. Once the portfolio standard is met, there is no need to invest in the renewable technologies or to take old coal plants offline. Any future energy demand can be met by the cheaper fossil fuel technologies. An alternative would be to continue to artificially inflate demand by increasing the RPS percentage after it has been met. Another option, is to build renewable energy plants in Nevada and sell to other states with even higher RPS quotas. California has one of the most ambitious standards with a goal of 33% renewable energy by 2020. Rick Lattin says that one of the geothermal plants in the county was built to do just that, “we have got so much renewable energy apparently that they are now having to ship it to California because NV Energy (the utility) won’t buy it, because they have met their quotas. They don’t want any more renewable energy (April 23, 2012).” Mr. Lattin also explained the benefits of the RPS, “I live out in Fallon. For us out here, we love (the RPS) because it created our renewable energy industry here. We wouldn’t have all this geothermal development if it wasn’t for that I don’t think (April 23, 2012).” Nevada is on track to easily meet its RPS, but renewable energy companies do not know if they should continue to explore energy resources in Nevada if the policy standard is already met.

POLICY EDUCATION

Over the course of the interviews, I found many subjects to be misinformed on policies and technology. For instance, some respondents thought that the Nevada RPS is federally driven mandate with the state owing the federal government punitive fees if the standard is not met. But the RPS is a state policy. Many participants were
completely unaware of Nevada policies and programs that would help offset the cost of energy improvements to their ranches and homes. Those who favored nuclear energy and fossil fuel energy production did not believe that the government subsidized those industries. Such inaccuracies reinforce their unsupportive attitudes towards renewable energy development. One seemingly obvious response is to simply initiate more education efforts to clarify matters of energy policy. As Sovacool (2009) explains, it is not just renewable energy technologies that are new but also the policies associated with them. As such, there is a need to educate people on policies and systems that bring the technology to the consumer as a means to take away the fear associated with a changing system. The knowledge-deficit model suggests that by providing more information to those who are unaware of important scientific and policy matters, we can overcome obstacles standing in the way of important changes.

Yet, the knowledge deficit model is not very effective. Cultural cognition theory tells us that people who are already convinced of an idea, will only become adamant about that principle, even when supplied with logical arguments and data supporting a contradictory truth (Kahan, 2011). If political conservatives are convinced that any government interference in energy policy constitutes government overreach, then more education may not be very effective for changing perceptions of how policy and energy markets actually work, or attitudes about renewable energy and climate change.

Yet there clearly is an actual knowledge deficit about energy policy that needs to be addressed. The question is, how? Since renewable energy is supported in principle, there is an opening for more practical support. Nevada farmers and ranchers have shown support for smaller energy efficiency projects that save them money, like
improved insulation and lighting in their buildings (Smith Jr. et al., 2014a). However, they were more skeptical and less educated about more costly opportunities to be energy efficient, like installing photovoltaic panels or solar water heaters on their buildings, let alone utility-scale renewable energy developments. The approach to policy literacy needs to be sensitive to their attitudes towards government overreach as well as their preconceptions of renewable energy and climate change. Fracking technology is what allows for an expansive amount of natural gas, but it is expensive and the government has played a role in supporting the technology and infrastructure that delivers such an abundance of this energy resource. Practical comparisons of how energy technologies rely on the government could be informative, but new information should be couched in a case study focused on people and communities my informants can relate to. Simply providing more information about energy subsidies falls into the knowledge-deficit model trap. The information must be presented in a narrative involving people they can sympathize with. For instance, Joshua Zaffos writes articles for High Country News illustrating multiple facets of fracking development as it pertains to the local communities in the West (Zaffos, 2005; Zaffos, 2013). These are communities with similar resources, populations, attitudes, and struggles are rural Nevada. I further discuss communication strategies in the conclusion chapter.

The rural, conservative Nevadans that I spoke to support the concept of renewable energy in principle, but not in practice. They do not mind siting energy projects in their county, but the need for policies to financially assist the industry indicates to them that the technology is not developed enough to be worth wide scale implementation. Since these conservatives do not recognize the urgent need to change
our energy production system to stabilize the climate, reasons beyond global warming are needed to justify the push for renewable energy. They need to see direct and substantial economic benefits coming back to the community if they are to support permitting, siting, and operating renewable energy plants. Beyond local benefits, the overarching political ideology that influences their beliefs also needs to be addressed. Renewable energy needs to be re-framed so that it is not perceived as a government welfare program. Energy is not a commodity that operates in a free market, and that fact needs to become more transparent. The concerns of conservative Americans need to be addressed to develop a critical mass of political support to implement much needed, large scale changes in our national energy system.
CHAPTER SEVEN: COMMUNICATION: SOURCES AND MESSAGES

This chapter describes how messages about renewable energy and climate change are communicated among Churchill County residents, the primary information sources that residents use, and how the communication patterns affect attitudes toward renewable energy and climate change. I asked questions to identify trusted sources for this audience group. I sought to understand not just sources from which my study group of Doubtfuls and Dismissives acquire their climate information, but also what sources they referred to when they had questions about other topics that might inform their behavior on topics such as strategies to enhance crop efficiency, buying new technologies for their ranches, supporting for political candidates, and their community involvement.

As I explained in chapter six, I had expected to find support for renewable energy among Churchill County residents. However, the conclusions I drew from my research suggests a more complicated picture. Residents did not express support for renewable energy as strongly as prior research suggested. Informants support renewable energy because it provided a clean, domestic source of energy; but, they do not support policy incentives that they perceive as using public money to subsidized large energy projects that take away from county revenues. Their objections to the policies are strong enough that they prefer nuclear and fossil fuel technologies over the clean energy because they perceive these technologies as proven and not requiring the extensive government support the renewable energy industry requires. There are local renewable energy projects in Churchill County that residents widely support and see as
beneficial, but those projects are dependent on the types of policies the residents oppose. Given this, I wondered what types of messages were circulating within the county that might help to explain these complex attitudes towards renewable energy development and climate change. Following recent research on rural communities, I suspected that one explanation might be that Churchill County residents have strong social ties that also act to insulate them from outside messages about renewable energy and climate change (Smith Jr. et al., 2012; Davidson et al., 2003).

Climate change is a mediated phenomenon and the sources of climate change messages becomes just as important to how people perceive climate change as the actual content of the message. Most individuals get their information about climate change through media representations and social interaction with others. Increasingly, scientists attribute extreme weather events to climate change, which journalists then communicate to the public. In this chapter, I describe local influences that help shape my informants’ perspectives on renewable energy and water conservation practices. I describe the study group’s perspective on climate experts and why they discount their findings. I explain which sources of information the participants define as most relevant and accurate to their lives. I end the chapter with a discussion of possible suggestions for future climate solution communication campaigns.

My research shows that the residents I spoke to consider themselves to be well informed and highly skeptical of science, rely mostly on a narrow range of information sources while still defending their own objectivity, use narrowly confined Internet searches, and hold preconceived biases that shape how they filter information and which sources they use for their information. They are exposed to information about
renewables and climate change from family and friends, community leaders, scientists, and political leaders. Some of the messages align with their preferences and others do not. The information is filtered by the sources and then further filtered by the individual who receives and processes that information. We should not assume that disagreements about climate change simply reflect a deficit of information. The relationship between information and attitudes is much more complex.

LOCAL MESSENGERS AND THEIR MESSAGES

In this section I discuss the local messages regarding climate change solutions such as renewable energy and water conserving adaption measures. Since I expected to find high levels of support for renewable energy, I also expected to find local messengers whose ideas supersede the ideas of national commentators arrayed against the renewable energy industry. Nisbet and Kotcher (2009) explain that key individuals in communities and social groups often serve as vital go-betweens and information brokers who pass along messages about climate change and energy conservation that resonate with their otherwise inattentive peers, coworkers, and friends. In my interviews, I asked questions to identify which messengers my informants paid most attention to on topics such as drought adaptation and renewable energy, looking for those individuals who acted as informal experts for this audience group in Churchill County. I identified two local actors whose messages regarding climate change solutions were prevalent among the interview responses.

One local messenger is County Manager Brad Goetsch. His position as County Manager means that he was a very prominent figure who often spoke at public meetings both in the Churchill and in other rural counties. The fact that I was
repeatedly referred to Mr. Goetsch as a local expert on many topics indicates that he is a respected community leader. When asked about climate mitigation through renewable energy developments, Mr. Goetsch emphasized the fact that renewable energy developments in the county come with large tax abatements that keep a significant amount of money from entering the county treasury. As a county employee, he is sensitive to how the county benefits or is affected by development projects. Many other residents that I spoke to repeated Mr. Goetsch’s messages criticizing policy incentives for renewable energy. I cannot say whether Mr. Goetsch was their sole source for their anti-tax abatement stance, but his position gave him a pulpit to voice his position to many residents. With regard to climate change adaptation, Mr. Goetsch displayed a poster he had made to illustrate how water that enters the county is used multiple times as it goes through the local hydrological cycle. He explains how flooded agricultural fields grow crops and restore shallow aquifers that feed the domestic wells for homes in the county, then those aquifers and runoff from the fields go on to feed deeper aquifers and downstream wildlife habitat. He stresses that water conservation practices that would decrease the amount of water brought into the county would be detrimental to the county at large. Mr. Goetsch’s message justifies the large amounts of agricultural water because it is reused. Most of the other residents I interviewed repeated this same message. He explained that he had the poster made because he needed the visual aid to convey his ideas in public talks regarding water use and water rights. He speaks often with agricultural water users, municipal water suppliers, geothermal industry representatives, and state water managers.
Monte Morrison is a well-known community member amongst the study participants. Most respondents spoke of Mr. Morrison as a friend. He is also respected based on his position as vice president of one of the local geothermal plants and a frequent speak at public events, local civic group gatherings, and local schools. When describing the types of messages he often conveys in his talks, Mr. Morrison explained that, “People don’t understand that Churchill County is 100% green energy. That is something I have done a lot of education on, and I have probably just nicked the surface in our time with students and local community events (May 1, 2012).” He emphasizes that geothermal is one of the cheaper renewable energy technologies, even though it is also dependent on government support. He describes it as a base load technology that provides energy at a steady capacity; whereas solar and wind are intermittent energy sources. He also likes to highlight the fact that due to the local geothermal industry, Churchill County is able to export clean energy to the state’s grid. He says that he receives a lot of information from his trade organizations: the Geothermal Resource Council, the Geothermal Energy Association, and the Nevada Geothermal Council. Despite the professional relevancy and the different trade journals, he says that he doesn’t discuss climate much because it is not important to his field of renewable energy, “Other than how it affects the performance of the plant - we talk about how the meteorological cycles affect the performance of our plant daily – we only talk about climate change and how it affects us and what we are doing for it 2-3% of the time. It is not a hot topic for us (May 1, 2012).” Mr. Morrison’s comment illustrates just how discussions of renewable energy can be conceptually distinguished from the issue of climate change. While Mr. Morrison is a local messenger who promotes renewable energy, he also fits squarely into the Doubtful audience segment when it comes to his
global warming beliefs. Mr. Morrison is an example of how local messengers within the conservative, skeptical community can also be proponents for renewable energy.

While informants are certainly influenced by other sources in the discussions, these particular messengers are local community leaders with both professional and social ties that fit with the Doubtfuls’ and Dismissives’ ideal of a trusted source. As local rancher John Kirch explained, “I have more faith in my local politics; somebody that I know something about rather than a talking head from Las Vegas (April 24, 2012).” Because the information is directly related to local developments and farm issues, it is relevant enough to engage the interest of the participants. Local knowledge tends to be more salient and apt to be repeated through informal, social networks, than messages emanating from outside the community.

These local messages about renewable energy development and water conservation, which are climate mitigation and adaptation strategies, do not counter the preferred beliefs of this audience group, which include ideas such as: a) tax abatements are harmful; b) keep using the water to the benefit of all; c) local resources should benefit the local community; and d) renewable energy is generally expensive and unreliable. It is noteworthy that these messages exist outside of the realm of climate change. Residents discuss renewable energy in terms of economic development not carbon mitigation. Their main water conservation issue is how to legally sustain water availability for use, not how to conserve as a way to adapt to climate change.

Local’s trust messages from community sources rather than messages from public figures outside of the community, regardless of their position. If a topic comes up at town meetings then it is worth paying attention to, it is relevant simply because it is
occurring within the community. Local meetings do not typically expose participants to views that challenge their own, but rather circulate views that reinforce established beliefs. Still, public meetings do offer opportunities to discuss certain topics that may be unpopular with a conservative crowd, but relevant to a rural county, like renewable energy development. Mike Berney, a local realtor, says that his information mostly comes from people he is in personal contact with rather than media outlets since he doesn’t like the news. He interacts with a broad section of the community because he is a member of several boards and community organizations. He believes that this keeps him open to new information, however, it mostly reinforces attitudes he holds in common with most other residents. Similarly, Dr. Stuart Richardson remarked that he gets a lot of his information through his role as Chairman of the County Planning Commission. In the context of community boards, these individuals use fellow county residents as filters and sources for information. Only information that is relevant to the local community needs to be researched, and none of my informants suggested anything about doubting the integrity or comprehensiveness of the information presented at public meetings since the individuals presenting it were well motivated to support their case.

According to Nisbet and Kotcher (2009), people overwhelmingly prefer face-to-face communications over digital sources of information. This suggests that local agents are likely to be much more persuasive with arguments on just about any subject, because of the opportunities for personal and face-to-face dialogue that can occur within a community setting. John Kirch said, “I have gone to universities and to department heads and introduced myself and said come talk to me about this, and they
have. University of Nevada Reno in particular, when it comes to agriculture (April 24, 2012).” Mr. Kirch respects academic researchers who are experts in their fields, but he does not conduct his own investigations by reading academic research and policy briefs. He prefers a direct line of communication where he feels more comfortable filtering out any information he decides does not apply to his situation and determining for himself if he likes the author of the information. But, relying only on personal communications is limiting because of time and geographic constraints. The limitations of personal communication opportunities may explain why the scientific community has not been able to establish themselves as a trusted source for conservative audiences; they are too far removed from the personal lives of the audience group. Still, there is a need to build bridges and open a dialogues with this community to establish a baseline of trust and communication between researchers and rural conservatives (Smith Jr. et al., 2014a; Liu et al., 2014; Safi et al., 2012).

In the next section I will describe the Doubtfuls’ and Dismissives’ perspective on the scientific community and why they do not believe anthropogenic climate change is occurring despite the growing number of scientists that argue that it is occurring and that we are already feeling its impacts (Cook et al., 2013).

SCIENTISTS AS EXPERT MESSENGERS?

When scientists make conflicting claims regarding global climate change, Doubtfuls and Dismissives interpret the conflicts as discrediting the scientific community. “Scientist" is a credentialed social category based on years of specialized training. “Expert” is a socially constructed title that occupies a different category than scientist. Expertise may be attributed to a trusted family member, friend, neighbor, or
colleague based on one’s perceptions of their experiences or history of good advice. During the interviews, I asked study participants if they believed scientists generally agreed about the reality of anthropogenic climate change and which experts informed their own perspectives on global warming. This section explores the relationship between Doubtfuls and Dismissives and the scientific community.

My informants shows that Doubtfuls and Dismissives do trust scientists. They just think they are not in agreement, so they trust their friends, family, and colleagues to decide which scientists they trust. There is no evidence of a decline in trust in scientists, and climate skeptics believe scientists are on their side (Voosen, 2014). They believe in science, but the message that scientists are espousing is not the message the audience is receiving. They do not think they know more than scientists, just that they can decide for themselves which messages to believe from the variety of sources that convey information to them.

Trust

Science is contested knowledge. While a majority of people may trust scientific research when it is used for public health policy, such as determining safe contaminant levels of a contaminant for drinking water, there is almost no scientific issue that does not have some detractors. When people perceive the scientific community as a disputed source of information, they may question whether or not to trust scientific arguments and the scientists who make them. Churchill County resident, Jim Johnson, expressed frustration when he explained how the public is forced to simply trust what a scientist says:
“From a lay person’s perspective, it tends to make one believe that you can make the data support whatever you want it to support. So if you read one report you start to think maybe there is something to (global warming), but then you read another report and it is like okay, maybe these guys were tainting their information somehow or twisting it. If you don’t understand the scientific data, it is pretty hard to interpret. You are more or less subject to interpretation by scientists (April 24, 2012).”

On an issue such as climate change, when technical experts present information on both sides of the issue, the lay public may become confused about what to believe. In a condition of confusion, the lay public often turn to other belief systems and trusted sources to decide what they accept as true and what actions they should take (Frakena, 1983).

Doubtfuls and Dismissives say they trust science. However, indicators of trust do not support these statements. Stern and Coleman (2014) explain that trust is an inherent part of any problem because there wouldn’t be problem if the trust was already there. Information and suggestions would be unquestionably accepted and implemented. There must be “distrust of a different sort (Voosen, 2014).” Distrust of products like reports and research findings does indicate a lack of trust. The may be trust in science as a concept, but in actuality, they are not trusting the products and messages espoused, which shows they perceive science to be mediated and they do not trust that mediation, or they actually do not trust scientists after all. Perhaps a lack of procedural trust in the peer review process of journal publications as opposed to the
open democracy of the Internet where all individual views are represented. A dominant view should be clearly represented in a sampling of an open Internet.

Whyte and Crease (2010) explain that while experts may have the credentials and training to be deemed an accurate source of information that the public should defer to, the actual credibility of an expert is more dependent on social variables than credentials. Jakob Arnoldi (2007) agrees that the public’s reception of expertise is, at least in part, socially constructed. In this way, knowing the facts does not make you an expert, the public must recognize and trust you as an expert and be willing to defer to you. Smith, Anderson, and Moore (2012) explain that trust in an information source requires some form of personal connection, whether informal through social networks or formal through professional networks. However, most of the general public does not actually know a scientist, let alone a climate scientist, who can fully explain the complex issue of climate change. Whyte and Crease (2010) demonstrate that in cases where trust (or distrust) in experts has become an explicit element of the scientific or technical issue, “there is no hope for a technical argument to succeed.” Rather than trusting unknown scientists, individuals often rely on their community leaders, peers, or family members for information on important issues.

Nisbet and Scheufele (2009) observe that climate skeptics tend to put more faith in their peers than in scientific experts. The Six Americas Project (Maibach et al., 2009) reports that Doubtfuls and Dismissives tend to be suspicious of most sources for information. They prefer to think of themselves as self-educated experts. They trust scientists, but not as much as they trust information from people they know personally. Still, scientists are among their top preferred sources for accurate information, so they
must somehow reconcile their acknowledgement of scientific credentials with their discounting of scientific conclusions and recommendations.

To alleviate their cognitive dissonance climate skeptics and deniers look for experts that promote their beliefs. As Kahan explains, “who is viewed as an expert depends on who is espousing the opinion that meshes with your worldview. There is always some ‘expert’ that will (Kahan, 2013b).” Thus, credentials are not as important in determining which expert an individual will defer to as much as which argument they are supporting. Despite his years of working with university researchers as a means to explore alternative crops that conserve water and would be suitable to grow in Lahontan Valley, Churchill County resident Charlie Frey still believes that nature is beyond human understanding. He said, “(Scientists) don’t know what they are doing. I will guarantee that. You are not going to figure out Mother Nature. We have been trying to do that. I am a fourth generation farmer, my son is a fifth generation farmer, and you get what you get (May 2, 2012).”

Ultimately, when it comes to choosing which facts to believe, especially regarding a subject beyond their own expertise, individuals must decide who they trust. People in strong social networks often look to family and neighbors for information more than they look to experts (Smith Jr. et al., 2012), and the social norms represented by those people may be cultural barriers to new ideas and change. Deviation from the group’s norms risks social control and stigma. Since climate change has become a polarizing issue where one’s identity within a group can depend on their stance on the issue, it makes sense that peer pressure would dictate their beliefs (Doherty and Clayton, 2011). This is not to say that a Dismissive would no longer be friends with you if
you believe anthropogenic climate change is happening, but they may give your opinion less credence for other topics as well. Kahan et al. (2009) explains that it is perfectly rational for a person’s beliefs to be governed by their social norms. It allows an individual to avoid dissonance and secure their standing within their community, which has a higher impact on their personal well-being than scientists do.

The scientific community is largely separated from the lay public. Without some form of social tie or common association, large audience segments of the American public do not unconditionally trust the messages coming from the scientific community. Especially when that community is portrayed as being divided within itself.

Split

Doubtfuls and Dismissives use the perceived ongoing scientific debate they hear about regarding the causes and consequences of climate change as a justification to disregard scientific claims in favor of their peers’ perceptions. Most Doubtfuls and Dismissives described in the Six Americas Project believe that there is great scientific disagreement about the causes and consequences of climate change (Maibach, Myers, and Leiserowitz, 2014; Leiserowitz, et al., 2013). As expected, most of my respondents also do not perceive a scientific consensus on anthropogenic climate change. Forty-two percent believe that the issue is still being researched and debated, while thirty-one percent do not know what to believe at all. Their view is that if scientists are not clearly in unified agreement, then alarmists must be making global warming out to be more of a threat than is warranted. If scientists are all in agreement, then it is harder to ignore the weight of their viewpoint. Only about a quarter of the participants in my study believe the scientists are unified in their ideas about anthropogenic climate change
(Figure 13), but amongst that quarter there is still uncertainty about whether scientists agree about the impacts of a changed climate.

This perceived lack of scientific consensus sustains confusion and doubt among my informants. John Kirch states, “The scientific community is pretty much ripped on (climate change). You can get 200 guys on either side of that question that will give you a straight, honest answer that they believe is true. You can get scientists from universities and the governments and all sorts of positions that will say either side. I have heard both (April 24, 2012).” Zip Upham explained the impact of having scientists supporting both sides of the climate issue, “The scientific community is being looked at from the outside as being split, kind of at war with itself, which makes non-scientists confused over the issue. I don’t know that there is actually a consensus (April 23, 2012).”
Beyond creating confusion, Dismissives respond to the reported debate amongst scientists by believing that most scientists do not accept that climate change is even real. Ron Juliff stated, “I don’t think they are split fifty-fifty. If you follow Fox News, like I do, you think there is more (scientists) that say there hasn’t been true climate change yet (April 19, 2012).” Mr. Juliff admits his own political biases and knows that Fox News is aimed at politically conservative audiences, but there have been scientists that have publicly stated that they do not support the theory of anthropogenic climate change (Lahsen, 2013; Allegre et al., 2012).

Lahsen’s (2013) study of contrarian scientists shows similarities between Dismissives in my study group and contrarian scientists. Both groups are older individuals, meaning near or past retirement age, that have had negative experiences with the rise of environmentalism in the 1960s. Contrarian scientists are older scientists that were originally trained in highly focused disciplines that conducted basic research observing experiments under highly controlled, single variable conditions. Lemos and Morehouse (2005) explain that environmental problems are complex because at the root of their causal chain are intricate interactions between biological, physical, and social systems which means they cannot be reduced to single variable conditions for lab experimentation. Lahsen (2013) explains that since the 1960s there has been a shift in scientific research values and funding that favors interdisciplinary, applied research conducted using models. This shift has led to relative demotions and fewer opportunities for funding and prestige for these older, highly disciplined scientists in favor of the younger generation of scientists who use numerical models. These changes in the field of science that have been detrimental to their careers facilitates their criticism of knowledge produced by models. Contrarian scientists are not just skeptical
of climate change, but of other environmental concerns as well, including planetary resource limits and pollution.

Farmers have had issues with scientists that sound the alarm on environmental issues. The rise of environmentalism has sometimes pitted farmers and ranchers against environmental groups over land and water conflicts, as well as conflicting attitudes towards various farming practices regarding the use of chemicals. Informants that favor fossil fuels as an energy technology are less concerned with the pollution that is associated with the mining and burning of coal and oil than those informants that favor nuclear or renewable energy. They just do not believe that the issue of pollution is as bad as environmentalists portray it.

Older climate skeptics have lived through past scientific predictions that did not end in a state of emergency. One of my female respondents, Mrs. Frey, related a memory for her college days that she still draws on to support her dismissal of climate change: “When I went to the University of Nevada Reno in the 1970s, the big scare was global cooling where we were going to have a big ice age. This glacier was going to come down through Canada and get us all (May 2, 2012).” She remains skeptical of alarms raised by the scientific community. Rick Lattin relates a similar story about scientific uncertainty:

“I was on the college campus in the 60s. I was there during the zero population growth days, and those old things where they said this earth can’t support more people. We can’t grow the food. They were all totally and completely, absolutely, 100%, totally dead wrong. Dead wrong because they didn’t take into
account technology. Paul, Harvey, he was the most popular commentator of the 60s and 70s. Paul Harvey did an expose’ once on the steel plow. When the steel plow was invented, the environmental movement said this is the end of the world. We are going to contaminate the ground. Pulling that steel plow through the ground to prepare the soil for planting is the end of the world. Well, the steel plow wasn’t the end of the world. It didn’t hurt the ground. So, do we know if genetically modified organisms is the steel plow of this generation? So much political hay to be made in the argument that the science part of it just gets lost. It is really hard to find good hard data about this sort of stuff that people agree on (April 23, 2012).”

To these conservatives, climate change is just the newest environmental alarm. Zip Upham told me how the first Earth Day was about the severe threat we were to ecology and the climate. Things were so drastic then that they expected some sort of crisis within 5 years, but that did not happen. Mr. Upham said, “The ones that I thought were really kind of fascinating was newspaper stories about the coming ice age because they had seen a series of weather trends that looked like the earth was cooling off. There was some alarmism then, but it was for cooling not warming (April 23, 2012).” Older conservatives tend to trust other older conservatives who are less likely to be swayed by alarmism. Charlie Frey told me, “As you get older, you get more realistic. You’ll be there someday (May 2, 2012).” Based on my study participants’ responses, age seems to be another reason for older, conservatives to dismiss the recent climate change warning messages being expressed by the scientific community.
Most of my informants believe that the scientific debate over climate change is not over, although they still believe that the climate is changing. Brad Goetsch said, “I think that there is a preponderance of scientists who have said yes, there is something going on climate wise. I think there is a big dichotomy on who thinks that man has influenced the current trend, but I think there is a pretty good consensus that there is a trend and a change underway right now (April 13, 2012).” Ernie Schank also believes that the climate is changing, it is just the cause that is debated. He says, “I know they (scientists) are split (on the cause of climate change) because I go to water conferences occasionally, and they will have speakers that swear it is manmade and others that think it is some kind of a cycle (May 2, 2012).” The lack of perceived unity within the scientific community allows climate skeptics to adamantly defend views that run counter to the messages generated by the scientific community regarding the causes and consequences of climate change.

**Why are Scientists Distrusted?**

The recently released Third National Climate Assessment (Melillo, Richmond, and Yohe, 2014) and the Intergovernmental Panel on Climate Change’s Fifth Assessment Report (Stocker et al., 2013) warn about the current impact of climate change. But Doubtfuls and Dismissives will likely disregard these definitive reports. Participants explain their perception of competing scientific claims through a variety of conflicting interests and biases held by the scientists. Most of the arguments that climate skeptics and deniers use against climate scientists are the same arguments climate change advocates use against climate skeptics.
Political ideology influences one’s general trust in science as a legitimate source of information, especially when that information contradicts their political beliefs. Conservatives will typically defend free market principles and distrust science that highlights the negative impacts of business, while expressing trust in science engaged in work to develop innovative industrial technology and products (McCright, Dentsman, Charters, and Dietz, 2013). As I noted in the previous chapter on energy technologies, participants in my study express strong values for commerce and private enterprise. In their survey of Nevada farmers and ranchers, Smith Jr. et al. (2014a) explain that science that resulted in benefits to their industry like crop genetics that mitigate drought and pests and create higher was supported, even if science that warned of increased droughts and heat waves was dismissed. Kahan et al. (2011) explains that those who admire commerce and industry activities tend to dismiss evidence of environmental risk because the widespread acceptance of such evidence would lead to restrictions on those activities they value. Conversely, liberals tend to defer to scientists and believe that industry poses risks that should be limited (Binder, 2010; Kahan et al., 2011). Dr. Stuart Richardson expressed this perception when he explained “I was the past chairman of the Churchill County Republican Central Committee. I have to make that disclosure. I believe that most of them (Republicans) feel that the Democrats are trying to use science to accomplish political objectives (April 30, 2012).” For him, science is a political tool used by Democrats for ideological purposes, not for the common good.

McCright and Dunlap describe climate change as a political issue in and of itself (McCright and Dunlap, 2011a; McCright and Dunlap, 2011b). This well-known connection between political ideology and concern for anthropogenic climate change
has led to common blame-placing on politics to explain any conflicting knowledge or beliefs. Conservatives tend to blame political influences for biased climate researchers. County Manager, Brad Goetsch, believes scientists and universities sway with politics because they are funded and influenced by those interests. Ed Rybold agreed when he said that he assumes climate information is coming from researchers who, “all have agendas too (April 26, 2012).” He concludes that “…it is hard to believe any of it (April 26, 2012).” Similarly, when talking about the integrity of the reports from the Intergovernmental Panel on Climate Change, Zip Upham says they “didn’t sound completely scientific when they (the reports) became a political football (April 23, 2012).” Gary Imelli also sees climate change as an issue that has been overwhelmed and engulfed in politics so that scientific evidence can no longer convince people.

“We have just roused people on both sides to be argumentative, but not found any grounds to prove anything one way or another. It just keeps creating these splits between political parties. It is definitely a political idea. I think there needs to be more coming together, politically, before they can convince people (May 1, 2012).”

The strength of political beliefs over scientific facts showcases the theory of motivated reasoning; factual evidence cannot counter preferred beliefs already held by an individual.

Most of the participants acknowledged their partisanship, along with their exasperation with the partisan gridlock over climate change and other issues. They are particularly frustrated that they do not know who to believe or what action to take.
Frustration flow from the dissonance they experience as they hear competing claims from scientists, political leaders, and friends whom they trust. Mr. Goetsch explained his strategy in the face of this confusion and frustration:

“We are watching the scientists and we participate in the process. Churchill County is involved with the Central Nevada Regional Water Authority, Southern Nevada Water Authority, Nevada Water Resources Association, and a number of other entities that have constant meetings and conventions with speakers, and we attend global conferences. We are trying to sift the science from the politics and really have an understanding of what is happening and an influence on the decisions that they are making to respond to that (April 13, 2012)”

Mr. Goetsch’s comment reflects his feeling that politics have overwhelmed and consumed science, as well as his need to take control of how decisions based on science are made. He feels that scientists are political actors more than he is as the County Manager.

My informants also cited money as a major factor manipulating the legitimacy of scientific research. Many of the study participants claimed that while researchers may not be bought off directly, their choice of research and how it is reported is swayed by funding sources. Debbie Frey described her perception that university science can easily perpetuate a misinformed belief because they get grants to study any problem if they can connect it to whatever current fad is being funded. If climate change is what is being funded, then everyone will study climate change. But she also points out that just because everyone is studying it, that doesn’t mean the climate is actually changing.
Brad Goetsch echoed this belief when he said, “Scientists and colleges flock to whatever the popular thing is because they want money and they want grants (April 13, 2012).” Tom Inglis believes that scientists who purposefully say that anthropogenic climate change does not exist will lose their funding, and that fear keeps more scientists from speaking out about their true beliefs on the subject. Mr. Inglis elaborates:

“I have read quite a few scientific journals and the thing you run into is that everybody knows that the guys who speak out against global warming, they are the first ones that lose their grants because they are not part of the fad. They are not part of the group. I believe that the ones that speak out the most are after the money. The ones that don’t speak out against it are afraid of losing their grants, losing their money. Every once in a while you will get some brave soul that will actually give you a maybe (April 26, 2012).”

Assuming that messengers have been bought by monied interests is an all too common way to dismiss their message. Dismissive and Doubtfuls make similar assumption of bias about the disregard they perceive toward contrarian scientists and those concerned about climate change.

Indeed, Mr. Inglis claims that environmental issues, including climate change, are little more than a money-making marketing scheme. He argued, “If you don’t think people are making money on this, you are crazy. This is generating billions of dollars, this green culture (April 26, 2012).” The implication is that climate change does not
really require a high level of concern since it is just a marketing gimmick. Mr. Kirch also believes that the environmental movement may exaggerate the truth in return for money. He explained, “Climate change, global warming – it is all the same. It is all based on one model out of many models. They pick one that is suited to where they wanted to go with it. They being the environmental community with a big ax to grind and money to be milled of course (April 24, 2012).” Mr. Inglis and Mr. Kirch connect the issue of climate change with their attitudes towards the “green culture” and “the environmental community.” It is hard for climate scientists to use just climate facts to counter decades of conflict between conservatives and those advocating regulations on behalf of the environment; everyone is accused of greedily trying to make money.

Conservatives still regard scientists as experts in their fields, but to quiet the cognitive dissonance that is created by conservative beliefs, they disregard climate scientists’ claims. One way my informants dismiss climate scientists is saying they are influenced by politics and money, the same way industry leaders and politicians are dismissed as biased. Another way they dismiss scientists is by insisting that research and theories do not translate to real world conditions.

SCIENCE IS NOT THE REAL WORLD

One of the ways that Churchill County ranchers discount scientific conclusions that support anthropogenic climate change is to claim that experimental research results do not reflect the “real world” that they know. Churchill County residents have some experience with the university system through their own education and through the University of Nevada Reno cooperative extension office that supports agricultural endeavors. They respect the scientists, but they also think they are have little to no
practical experience in comparison to themselves and their fellow farmers and ranchers whose expertise is derived from practical experience. Rick Lattin, a successful, college educated businessman and farmer described scientists in this way, “I think scientists are typical scientists. They have to develop a hypothesis and then test it. That is what scientists do. Sometimes they do it in ivory towers where they really aren’t on the ground knowing what people see on a daily basis (April 23, 2012).” Ron Juliff claimed that the experts that are providing advice and guidance in the Obama administration have never “really worked anywhere, ever. They are all academics (April 19, 2012).” He dismisses their conclusions by disregarding their experience since he presumes that it does not match up with what he would consider as relevant, applied knowledge. My informants delegitimize academia with their assumptions that it is an isolated community that does not offer the type of useful knowledge that is generated from hands-on experience.

Whyte and Crease (2010) have shown that when people perceive that scientists exclude the knowledge and input of lay people, then the lay public ignore scientific claims. Cash et al. (2003) explain this reaction as rejecting the legitimacy of the information. They observe that “legitimacy reflects the perception that the production of information and technology has been respectful of stakeholders’ divergent values and beliefs, unbiased in its conduct, and fair in its treatment of opposing views and interests.” If science is not communicated in a manner that is sensitive to the beliefs of the Doubtful and Dismissive audience segments, then those audience groups will consider that knowledge to be fraudulent.
Some argue that the scientific community promotes their own isolation by communicating primarily with their peers through research journals and professional conferences, and rarely with the public. Borchelt (2013) explained in his research that scientists don’t often communicate with the public because it is not part of their job. In surveys he has conducted with scientists, Borchelt (2013) found they do not have a positive view of the public as an audience group. They described chilling receptions from a public that is annoyed with the time the scientific process requires. In surveys, scientists described the public as irrational, emotional, stubborn, and prone to fear and self-interest (Borchelt, 2013). Borchelt (2013) conveys a scientific community that does not see the public as a source of information to engage with, thus relegating public audience segments to the role of receivers of knowledge only.

Parker and Crona (2012) explain that when scientists share data with managers and policymakers, it is often not useful to the temporal and spatial scales relevant to those groups. The type of information demanded by policy makers often does not match with types of information demanded by academic disciplines and grant funding foundations. Universities conduct basic research asking questions with broad impacts looking at trends over long periods of time; whereas, decision-makers want answers to specific questions directly relevant to the systems they manage. This inherent mismatch between objectives can often lead to frustration from all sides in scientific discussions making it challenging to apply scientific research to public concerns.

Doubtful and Dismissives also see academic researchers as political liberals. Some of the Churchill County residents have familial bases for their perceptions. When talking about his four children, Ernie Schank described them as all being fairly
conservative, similar to himself, except for his one son who had earned his doctorate degree from the Georgia Institute of Technology, “That one is probably not as (conservative). He got his Ph.D. from Georgia Tech, and well, you live in that environment, those kinds of people have a whole different attitude than people who live in rural areas, and it has influenced his attitude (May 2, 2012).” Debbie Frey suggests that liberal attitudes that she assumes flourish in college settings mislead the younger, educated generations. “Kids are being taught (global warming) in schools, and they don’t have any life experience. They are probably going to believe it is true (May 2, 2012).” She described a lot of her neighbors and friends as “older” and cited their “wisdom” that comes with age as helping them to see through all the conflicting media to the truth, which to them is that the climate is not changing and any fluctuations are certainly not caused by humans.

EMOTION AND SCIENTIFIC BIAS

Several participants also perceived a strong emotional bias among scientists. A few of my study participants believe that scientists are unnecessarily sounding an alarm because they are driven by their own fears and ideology rather than empirical evidence. Zip Upham explains that “an awful lot of perceptions that scientists bring to the table are not necessarily extremely logical, factually based, responses. They may be much more emotionally based arguments (April 23, 2012).” He suggests that a panicking scientist is quoted and repeated because “he is supposed to be the expert,” so others start to panic too, but “what you end up with is a fairly emotional argument that you are putting out there that people respond to. But the arguments are not necessarily quoting the data (April 23, 2012).” The end result is an undermining of the perceived expertise
of the scientific community. As Brad Goetsch puts it, there is “fear that the current science in this area is being greatly influenced by politics and emotion (April 13, 2012).”

The perceptions described above indicate that scientist do not make ideal messengers for Doubtful and Dismissive audience groups. It is necessary to find alternative messengers that can discuss climate change solutions with conservative audience groups that will not be rejected or dismissed. In the next section, I identify which sources of information my informants defer to for guidance when making decisions. My aim is to find overlap between messengers that my study participants will listen to and messages that motivate them to support and implement climate change solutions like water conservation and renewable energy development.

SOURCES

Previous research demonstrates that Doubtfuls and Dismissives and rural residents trust family and friends as expert sources above others. I wondered if this pattern holds among Churchill County residents and, if so, how it affects their attitudes toward climate change. I asked participants about where they get their general information that informed their choices and perspectives. I also noted in my interview notes which sources they referred to during their interview and informal conversations when they explained and supported their attitudes and perceptions. I wanted to understand the sources of information they already trust and consider whether these sources could be avenues for messages focusing on climate change solutions for this audience group. I describe below how my informants see themselves as self-educated decision makers. They believe it is the individual’s responsibility to stay informed. Aside
from Internet searches, they depend on their social and professional networks as information sources rather than scientific messages in the media.

SELF AS INFORMATION SOURCE

Doubtfuls and Dismissives tend to be fairly untrusting as a group. The Six Americas Project (Maibach et al., 2009) survey results show that they are most likely to trust their friends and family for information. But even that level of trust is low compared to the degree to which other audience groups defer to friends and family, scientists, news outlets, nonprofit organizations, and religious leaders for information. In general, this is a group that considers themselves as self-informed decision makers that do not need to rely on others for important decisions.

Doubtfuls and Dismissives in Churchill County define themselves as their primary knowledge mediator. They do not need data interpreted for them by scientists or news groups. Chris Henning has a bachelor’s degree in logistics from the University of Nevada Reno and has been a business owner in Churchill County for many years. He explains that his education “is as good an education as you can get” and that he continues to self-educate by constantly reading a variety of sources (May 3, 2012). Tom Inglis believes there is enough information and data available for anyone to do their own math and come to their own conclusions. Like his neighbors, he doesn’t need information interpreted for him.

Ed Rybold doesn’t want information interpreted for him because he doesn’t trust anyone to truthfully convey what he needs to know. Mr. Rybold says, “I don’t know what the protocols are and what the data suggests and how it has been analyzed and interpreted. I am a little jaded with the fact that people will manipulate data to
serve their own purposes. I would rather have some kind of no kidding, actual proof (April 26, 2012).” While Mr. Rybold admits that he doesn’t trust the science to be interpreted, he acknowledges that he wouldn’t know what to do with the data if it were given to him to interpret himself. Still, the tendency is to disregard information that has been prepackaged in a foregone conclusion, especially when that conclusion conflicts with preferred beliefs.

It is the paradoxical challenge with this audience group that they do not trust others to synthesize, interpret, and present information to them, but they do not have the skills or motivation to interpret the complex scientific modeling and conclusions themselves. This way of thinking is why a standard “this-is how-you-should-think-about-climate-change” literacy campaign may be a waste of resources if the goal is to shift the hearts and minds of conservative skeptics. They are too suspicious to trust interpretations of others, and they need to feel that they are actively reaching their own conclusions.

Like many of my informants, Mischa Stojicevic, a county engineer, says when he wants to learn about something, he does his own research, usually over the Internet. I did not uncover a pattern of particular sets of websites that residents consistently use. Most explained that they tend to do global searches using Google, Yahoo or Bing. “You always go to the Net and Google it and see what research is done. That probably would be my starting point,” explains John Kirch (April 24, 2012). Jim Johnson says that he gets more information from his Internet searches as from any other place. Tom Inglis refers to “scientific journals” in his interview, but he finds those journal articles through Internet search engines. Lance Gomes, a young dairyman that is learning the family
business says that most of his information comes from the Internet and word of mouth. In fact, sixty percent of my respondents mentioned simple Internet searches using the search engine that accompanies their email service as the main way they gather information.

While residents may actively search for information as a way to educate themselves, there are numerous complications to finding accessible, rigorous, and reasonably interpretable scientific information on the Web. One problem is access. Scientific articles are typically published in journals that require a subscription before the full text can be read. Another issue is that metadata from websites helps sort and rank the relevancy of links determining how they are listed on the search results page. Pariser coined the term “filter bubble” to describe the way search engines surround people with results that support their views (Pariser, 2012). Pariser used an example where two people googled the term “BP”; one received links to investment news and company profiles and the other received links to the Deepwater Horizon oil spill (MIT Technology Review, 2013). Presumably, the discrepancy in links returned to the users was a result of a computer algorithm incorporating previous searches and websites visited. Even the simplest Internet search is already filtering the information passed on to these individuals. Without the right phrases and knowledge, whole swaths of relevant information may never show up in the search. For instance, several participants, including Mr. Gomes, mentioned researching solar panels or solar water heaters for their homes, but never installed them because they did not perceive an adequate return on the cost investment, but none of them looked into the rebate programs available through the utility because that information never showed up in their searches.
Additionally, the amount of information accessible through the Internet can be overwhelming. And, as commercial interests increasingly dominate the search queries, finding “objective information” becomes increasingly difficult.

Clay Shirky (2008) explains that previous to the ubiquitous use of the Internet, people had to go through professionals to acquire information. Trained editors, publishers, producers and journalists all chose carefully which information was worth making available to the public, so they chose material of a certain quality. With social media and the Internet landscape of today, anyone can cheaply reproduce and disseminate information without care to the standard of quality or accuracy. It is more difficult to discern good sources of information from misleading sources. As individuals find sources that fit with their preferences, they can easily copy and paste and perpetuate that idea within their own social networks. The same idea quickly becomes published in dozens or even hundreds of places, which creates an amplifying effect for the original message (Shirky, 2008). Even though repetition does not make an idea correct, we tend to use it as a short cut to determine accuracy of a message. If you hear many people say the same thing, you may believe it is true.

Individuals choose and process information based on ideology, partisanship, and preferences (Nisbet and Kotcher, 2009). The theory of Motivated Reasoning tells us that we tend to look for information that confirms our preconceived preferences for an issue and disregard information that challenges those preconceptions (Kahan, 2013a; Kahan, 2013b). Literacy campaigns are often based on the knowledge-deficit model which aims to inform the public of climate facts with the idea that if they just knew the facts they would change their attitudes and beliefs. But these approaches fail because they
mistakenly treat their audience like passive receptors for their messages. Audience
groups actively filter messages based on their preconceptions. This means that they may
interpret messages very differently than the sources intend. Individuals may edit
information that discounts or ignore their preconceived notions and pay most attention
to information that confirms what they are predisposed to believe and what their most
trusted sources suggest that they should believe. (Lebo and Cassino, 2007; Taber and
Lodge, 2006).

Self-selecting information quickly leads to further polarization of the public
regarding climate change (Taber and Lodge, 2006). Kahan et al. (2011) found that
“respondents predisposed by their values to dismiss climate change evidence became
more dismissive, and those predisposed by their values to credit such evidence became
more concerned.” By this process, individuals become more and more adamant in their
beliefs as they continue to filter information to align with their preconceptions. Even
individuals with high levels of scientific literacy still self-selected information based on
preferred beliefs (Kahan et al., 2011). Kahan has shown that such intelligence make
people even more talented at rearranging facts to fit their views (Voosen, 2014). Their
logical thinking of the arguments allow them to use those arguments to rationalize their
beliefs, which are drawn from social norms, not evidence. Dismissive and Doubtful
beliefs are not simply the result of ignorance of the facts.

Climate literacy campaigns aimed at the Doubtful and Dismissives that use a
knowledge-deficit approach can inadvertently backfire by creating a more adamant
belief that human actions cannot affect climate. For instance, Charlie Frey, a college-
educated resident with a successful farming business, has been engaging in research
with universities to determine if the Lahontan Valley can support crops other than the
grasses and grains that are typically grown there. He has started a vineyard on his
property and his son is expanding the operation to include a winery and a distillery for
the grains they grow as well. His research on diversifying his crops has led him to a joint
project with the University of Nevada Reno. He also has talked with researchers at
University California Davis and University of Washington. Despite his own research and
his interactions with scientists, he still disagrees with the idea of human caused global
warming. Mr. Frey refers to his own weather charts and attributes any irregular
weather to natural variability that does not add up to the climate changing over the long
term. And, as he says, the more information he acquires, the more certain he is in his
beliefs.

It is not uncommon for individuals to filter and edit information unreflectingly.
We are inundated with information on daily basis and it is difficult, if not impossible, to
consistently reflect much on one’s preconceived biases. This unreflecting tendency
feeds another tendency to consider oneself unbiased and fair-minded (Taber and Lodge,
2006). When asked, they will defend their objectivity. In response to Kahan’s cultural
cognition theory, many people rejected it arguing that it could not apply to them; few
people can admit that they let their cultural values trump facts (Voosen, 2014). Gary
Imelli, a well-respected educator in Churchill County, explains that he and his wife like to
watch both sides of an issue. Acknowledging that different networks cover the news
from different angles, he said, “We watch the network and CNN occasionally. We watch
Fox News occasionally and try to make up our minds ourselves on what is going on, so I
am not one sided and listen to only one point of view (May 1, 2012).” Despite his open
mind and all the information he has received, he is not concerned with global warming. He believes it is a political issue, not a scientific truth. He says there may be some changes in the weather, but he is not sure about the cause and feels no need to worry about it. His beliefs fit his preferred preconception that anthropogenic climate change is not an established fact or a cause for concern.

The Six Americas Project reports that Doubtfuls and Dismissives consider themselves to be “informed” to “very well-informed” on causes and consequences of climate change, as well as personal actions that can be taken in the face of climate change (Maibach et al., 2009). In general, the more concerned of the Six Americas audiences better understand the scientific explanations about how the climate system works and the causes, consequences, and solutions of climate change than do Doubtfuls and Dismissives. However, for some areas of knowledge, the Doubtfuls and Dismissives have as good an understanding, and sometimes better, than those concerned audience groups (Leiserowitz and Smith, 2010). Despite the knowledge gaps, participants in my study feel, if not well informed, at least well enough informed. Half the participants specifically said they did not want more information on climate change. Ron Juliff believes the jury is still out on whether the climate is changing or what could be causing that change, but he said, “To the extent that I believe that, I feel comfortable; not concerned. It will sort itself out (April 19, 2012).” When asked if he wanted to learn anymore about climate science, Mike Berney said, “No, not really. That is for people like you (April 24, 2012).” Like many of the Doubtfuls and Dismissives in my study, Mr. Juliff and Berney believe that is an individual’s responsibility to educate themselves. They feel well enough informed on the issue considering that it is not deemed relevant to their
daily lives. Berney went on to say, “If I keep my head in the sand then I guess I deserve what I get (April 24, 2012).” Unfortunately climate change doesn’t just impact individuals. It is a complex collective problem that requires collective solutions. Believing that it not happening, there are no human causes and, therefore no human solutions, that climate change is merely a political issue, and that the science is too divided to make any reasonable predictions creates major obstacles to much needed adaption and mitigation efforts.

POLITICAL IDEOLOGY

McCright and Dunlap (2011b) have established that political ideology is a key factor in attitudes and beliefs regarding climate change, and the Six Americas Projects confirms that Doubtfuls and Dismissives tend to align with conservative Republicans (Maibach et al., 2009). Smith Jr. et al. (2014a) also found “the strongest factors influencing one’s acceptance and knowledge of climate change were partisan affiliation and political ideology.” McCright and Dunlap (2000) have shown that prominent conservative think tanks strategically implement communication campaigns to counter arguments supporting anthropogenic global climate change. The counter arguments create doubt in the science that has been conducted and in the fact that scientists are prominently in agreement that humans have changed the global climate. The counter arguments also suggest that global warming is beneficial or at the very least, any action to stabilize the climate would do more harm than the impacts of a changed climate will cause. Fox News is the common network that my respondents say they watch for news and commentary. Many respondents also listen to politically conservative talk radio shows on the satellite radios in their trucks and tractors, including those hosted by Rush
Limbaugh and Sean Hannity. Fox News, right-wing talk radio, the Wall Street Journal, and opinion editorials are media that use political commentators that do not bear the burden of having to be reviewed for accuracy. Conservative commentators use their positions to echo and amplify messages of climate change skepticism and denial (Elsasser and Dunlap, 2013). This collective conservative counter movement to anthropogenic climate change has created a polarized American public (McCright and Dunlap, 2011b). Recent research suggests that the polarized politics of climate change in the US is a prime cause for suppressing the critical mass needed to implement policies and technologies that could stabilize the climate (Goldberg, 2013).

Climate change messages threaten Doubtfuls’ and Dismissives’ political ideals (Goodman, 2011). Naomi Klein lists a few of the perceived threats that conservatives feel from climate change policies: economic decline and loss of globalized free trade; industrial limits through polluter-pays laws and government regulations; and increased government debt from subsidizing renewable energy (Goodman, 2011). All of these fears conflict with their faith in free markets and limited government. Doubtfuls’ and Dismissives’ fears of increased regulation and higher energy costs anchor their belief that there are more drawbacks than benefits to proposed climate change solutions (Leiserowitz, et al., 2013). Hoffman (2011) explains that the root of the climate debate is not about science but about cultural values, ideology, and worldviews. He says, “For skeptics, climate change is inextricably tied to a belief that climate science and policy are a covert way for liberal environmentalists and the government to diminish citizens’ personal freedom (Hoffman, 2011).” Climate discussions must acknowledge and dispel those deeper fears. Conservatives need to view climate mitigation and adaptation
strategies as benefits rather than as threats. I discuss more about how this can be done in the conclusion.

Despite the well-established connection between climate and political ideology and my respondents’ reliance on conservative media outlets, most of my participants also expressed doubt and disapproval of polarizing political partisanship. Charlie Frey stated, ‘I am always listening to the news. I hardly ever listen to anything else, but I don’t know which one I believe. I don’t believe any of our politicians, Republican or Democrat. I am a Republican, but I just think they are way off (May 2, 2012).’ But while national political rhetoric regarding climate issues has no doubt shaped the thinking of Churchill County residents, local issues seem to trump them as a primary information source. Rick Lattin says, “I know you can listen to talk radio saying there is no climate change, there is no climate change, but hey guys, wake up. There is climate change going on (April 23, 2012).” Mr. Lattin is still a Doubtful and qualifies his statement by saying, “what the human role is, how important that is, whether it is going to destroy the world are all separate questions from climate change (April 23, 2012).” His conservative leanings are evident, but he is still open-minded enough to disagree with the extreme Dismissives he listens to everyday on the radio. Mr. Lattin said, “nine-thirty in the morning every tractor and truck in the valley is tuned to Rush Limbaugh. Rush Limbaugh is saying scientists are a joke, there is no such thing as global warming, and that is what you hear (April 23, 2012).” Despite every tractor and truck in the valley listening to Limbaugh’s dismissive comments, seventy-four percent of my participants believe the climate is indeed changing, even if they are still struggling with what to believe regarding the cause and consequences of that change.
MICHAEL CRICHTON’S STATE OF FEAR

Several of my study informants cited Michael Crichton’s fictional novel, *State of Fear* (Crichton, 2004) as an important source of information about climate change. Since the novel came up several times throughout the interviews and many people referred to like it was a scientific reference, I wanted to take a closer look at both the arguments in the novel and how my informants responded to it. *State of Fear* offers a fictional account of a young lawyer who discovers a plot by environmental extremists to trigger catastrophic events that will then be blamed on global warming. The extremist’s goal is to garner more money and political support for environmentalism. While flying all over the world to try to intercede and prevent these catastrophes, the characters engage in discussions that ultimately vilify alarmism over global warming and casts mainstream environmentalism as a manipulative brand of politics that relies on people living in a “state of fear.”

Despite the larger than life action that is the backdrop to the story, Crichton presents virtually all of the conservative counter-movement’s arguments against anthropogenic global warming, while support for global warming is portrayed as folly. Characters incessantly argue that many scientists doubt global warming “theory.” The book alludes to a list of scientists from existing prestigious organizations, including the National Academy of Sciences, MIT, Cambridge, and Princeton, that reject the idea of global warming and suggests that most of what is considered evidence of climate change is dependent on predictions generated from computer models, not actual empirical evidence. The novel portrays global warming as a media campaign organized by environmental organizations to generate more revenue for them. One character
even argues that increases in carbon in the atmosphere would actually be good for crop
growth. Most of these arguments do not have accompanying footnotes. Although the
book is full of fictional events and adventurous action sequences, it is still referenced
like a scientific journal article by my informants.

CREDIBILITY

Although it is a fictional novel, Crichton’s education and commercial success
appears to give his fictionalize accounts an air of truth among his readers. As a Harvard
trained medical doctor and a lecturer at Cambridge, he is an educated man who knows
how to do research. He has had great success as an author with best-selling novels,
blockbuster movies, and creation of the popular television show, *ER*. In *State of Fear*,
Crichton suggests that his account is meant to reflect real science. At the beginning of
the book, before the dedication page, is a preface that states that the people and events
in the book are fictional. But Crichton also points out that he has used footnotes
throughout the book to indicate where real data is referenced. He uses graphs
throughout the book and offers a 23 page Bibliography. In the author’s note after the
story, he says he has spent the last three years reading environmental texts and had the
opportunity to look at a lot of data and consider many points of view.

Yet, Crichton’s work is fictional. He is not a climate scientist who interprets raw
data. In his book, one character summarized a list of scientific journal articles to prove
his point that Antarctic ice sheets were not melting, but the points taken from the
references were out of context and counter to the authors’ theses. In my review of the
research that Crichton draws upon, virtually all of the researchers’ implicitly or explicitly
endorsed the idea of anthropogenic climate change. They indicate that their research elaborates on existing data about climate systems on the polar continent.

Beyond Crichton’s own credibility, other organizations have held this fictional novel up to the status of a peer reviewed journal article. The American Association of Petroleum Geologists praised Michael Crichton as “Journalist of the Year (Long, 2006).” President Bush invited the author to the White House to discuss State of Fear (Long, 2006), and the United States Senate cited the book as a serious contribution to the climate change debate (Allen, 2005). The Heartland Institute’s review of the book called it an “accurate and tenacious presentation of the science of global warming theory (Bast, 2005).” In anticipation of the controversy that the book was sure to generate, The Heartland Institute offered a feature on its website in 2005 dedicated to following the debate over the science in *State of Fear* with links.

**IMPACT TO CONSERVATIVE AUDIENCE**

As a popular novelist, Crichton makes the convoluted issue of global warming accessible to a large lay audience. The book resonated particularly well with the conservative audiences since it espoused the views that global warming was a media sensation more than a scientific fact. The Heartland Institute, a conservative think tank, highlights the impact of this bestselling novel:

“With a first edition print run of 1.7 million copies, *State of Fear* will reach more readers in a few months than all the nonfiction books ever written... It is difficult, therefore, to over-estimate the impact the book could have on the national and international debate over global warming. If *State of Fear*
continues to sell as other Crichton books have, its impact on the environmental debate will grow over time (Bast, 2005).”

Indeed 8 years after it was published, the book is still referenced by participants in my research study. Former County Manager, Brad Goetsch suggested that I read State of Fear to look at “actual data (April 13, 2012).” He echoed Crichton’s argument that records of warming all come from cities that can attribute the increased temperatures to the heat island effect as opposed to global warming. Gary Imelli, a respected educator in Churchill County, also refers to Michael Crichton as a “researcher” who provides alternative explanations for weather anomalies rather than attributing them to climate change (May 1, 2012). Tom Inglis admitted that he started to do some research after reading State of Fear, and concluded that he agrees with Crichton that the government and media picked up global warming as a crises because it became more fashionable than anything else.

State of Fear links the issue of climate change to the larger issue of resource scarcity and the environmental movement, which has led to the creation of new regulations since the 1970’s. Climate skeptics and deniers view climate change as just the most recent environmental issue that is raising alarm and pushing for more regulations, and they view all environmental problems with similar skepticism. They do not recognize the problem of resource scarcity and the limits ecological systems have for buffering damaging impacts. Environmental regulations, whether for clean air, clean water, or climate stabilization are all, therefore, overreactions and unnecessary restraints to commerce. This message that climate change is an alarm raised by
hysterical activists resonates with Doubtfuls and Dismissives, especially my own study group of conservative skeptics who have had their own challenges with and criticisms of environmental regulations. Conservatives dislike the idea of government regulations and believe that technology and innovation allow us to overcome the issue of scarcity.

As Crichton concludes *State of Fear* he offers his readers a few notes and statements on his own behalf, including a section on the dangers of politicizing science. He likens climate change research to the much reviled and controversial eugenics research. He claims that scientists framed their research agendas in the 1940s to align with eugenics programs, because so much funding was available for it. Scientists who spoke out against eugenics were effectively silenced through lack of promotion, grants, and publications. All of my informants echoed Crichton’s ideas.

The book does illustrate the point that arguing facts may not often change a person’s beliefs. Crichton’s story presents lawyers and scientists arguing facts with celebrity activists who will not budge in their environmental beliefs even when their beliefs have them blindly deliver themselves to a death at the hands of cannibals. As Kahan et al. (2011) has shown, even for highly-educated people, more facts may just make that person more adamant in their beliefs rather than prompt them to consider alternative or opposing views.

**FRIENDS AND FAMILY**

The massive amount of information we confront everyday requires us to use shortcuts to process it all (Cooper, 2011). But, we are not only inundated with information, more and more of us appear to be increasingly distrustful of news and advertising, preferring to believe instead information from family, friends, and
coworkers (Nisbet and Kotcher 2009). My observations suggest that Churchill County participants also prefer information from personal relationships, be they family, friends, or coworkers. Jim Johnson described how he got his information:

“We are pretty active in the community. I would say I probably get at least half or more (of my information) from friends and acquaintances that I know. I am just real lucky that I just have a large number of friends. One works in a geothermal plant. They are just in such different variety of areas, and we get together probably 20-25 of us in our group that meet on a regular basis once or twice a week, and we are always talking about stuff. I think you get a lot of information that way (April 24, 2012).”

My informants are satisfied with the amount and accuracy of knowledge that is transferred through their social networks.

For Doubtfuls and Dismissives, friends and family come with their own credentials, although they differ from the credentials scientists hold. Friends and family enjoy what Stern and Coleman (2014) refer to as affinitive trust. Affinitive trust comes from social connectedness, perceptions of shared identities, or assumptions of similarity of salient values. Within a social network, credentials may mean that the person shares a similar spiritual faith or has a job or hobby that keeps them informed of particular topics. Dr. Stuart Richardson explains that he does not do a lot of research or thinking about climate change, but he has a friend who does and that friend “is constantly going
on the Discovery Channel and listening to programs about the last ice age and what happened before and what happened after and where we are in the cycle, and it is his contention that it is basically a cyclical thing (April 30, 2012).” He explicitly states his friend’s qualification to report on climate topics is his affinity for educational programming, but there is a deeper perquisite of trust that has been established between the friends. Monte Morrison explains that he trusts his friends because they study the atmosphere and oceanography for the military, but he admits, “It is difficult for me to believe that we as people are necessarily influencing it to the extent that some are believing (May 1, 2012)” He was ultimately convinced more by his friend who is a fellow Christian believer. Mr. Morrison said that his Christian friend, “guaranteed, no doubt in the world, it is warming (May 1, 2012).” These separate sources of information, with their own brand of qualifications, corroborate each other’s belief that the climate is warming.

FILTERS

Shirky (2008) explains that small groups allow for more interaction, which creates and sustains agreement amongst members of the group, but does not allow for new ideas to develop. Peer groups filter and mediate information for us (Binder, 2010; Shirky, 2008). My informants believe that if something truly important were to be discovered, they would hear about it, while irrelevant information would naturally be filtered out. They believe this filtering process keeps them up to date on local news, even if they don’t read the local paper, and it is why they don’t know the names of pop culture icons. However, using social sources for information means that the filtering process may keep out messages that are significant but do not fit with preferences held
by that social network. Trusting shortcut assumptions like consensus-equals correctness means that when an individual hears the same message, such as climate change is a political conspiracy, from separate people, they believe the message has been corroborated. Closed groups with limited sources for new information tend towards consensus as a means of creating a social norm. Participants might think that their social group is a good filter that would still allow new ideas to challenge them, but in fact that is unlikely (Smith Jr. et al., 2012; Taber and Lodge, 2006).

The Doubtfuls and Dismissives that I interviewed appear to be aware that their social network acts as a filter. Ron Juliff admits, “I don’t really associate with those who don’t really share a lot of my beliefs (April 19, 2012).” When asked about energy information, John Kirch acknowledges with a smile that, “guys that know those figures don’t hang out at the same joints I hang out at (April 24, 2012).” They trust their social network to act as a filter, not to filter out important information, but to filter out irrelevant information that they wouldn’t be interested in or don’t need to know in order to earn a wage or raise a family. Fallon realtor, Mike Berney says that he does not watch a lot of news because it is all about people complaining about a variety of topics. Berney says, “I mean I talk to friends and I read the paper, the sports page. My wife might print an article, but other than that I am not too interested (April 24, 2012).” When asked what he talks to his friends about, Berney answered, “We talk about camping and what the weather is going to be like, but we don’t talk about climate changes overall.”

They do not believe that their filter is so tight that it would keep out new ideas, if they were ideas worth knowing. They believe they are fair-minded. Gary Imelli
explains that he gets information from diverse views thanks to his grown children, “I
have a daughter who is very conservative and watches Fox News. Fox is fair and equal
you know,” he says with a wink and a smile (May 1, 2012). “She is very conservative, and
we tend to be as well. But, my son is totally on the other side. He lives in San Francisco.
He is from Fallon and used to be very conservative but then he is awful liberal now. He
keeps sending me reports from the New York Times (May 1, 2012).” He relayed this
information to me to explain how he makes up his own mind based on information from
opposing views. His social filter is open enough that messages with liberal views get to
him, but only through his immediate family. Even those messages are not equally
received since the New York Times is not an open source periodical, and Mr. Imelli is not
willing to pay to open the links his son sends him.

PROFESSIONAL/TRADE SOURCES

In a closed social network that maintains social norms, professional ties can act
as bridges to other networks, which offer new information (Smith Jr. et al., 2012). For
instance, one of my informants (anon2) referenced professional trade magazines for his
climate change information rather than friends. He believes anthropogenic climate
change is occurring said he knows it to be a documented fact because he read it in a
number of his professional trade publications.

Half of my informants specifically mentioned various trade magazines\(^{15}\) as well
as professional training and seminars and conferences as important sources of trusted

\(^{15}\) Specific trade magazines that were mentioned included the Dairy Farmers or America Cooperative’s
Leader Magazine, Herd Magazine, Progressive Farmers, the American Planning Association’s Planning
Magazine. More trade publications were referenced, but not specifically named.
information. Anon4 explained that he learns a lot for the weekly professional training programs provided by his job. There are some websites specific to the industry that he refers to when he has questions. County employees attend seminars, association meetings with other rural government groups. They also attend conferences that feature speakers and presentations of data they have contracted.

My informants’ professions shape the way they view broader issues. It is also how they measure impacts and relevance to their lives. Charlie Frey has a degree in accounting and spent years in that profession before returning to the family farm. Mr. Frey sees the problem as the federal government not having “a CPA attitude (May 2, 2012).” In response to my questions asking him for his stance on climate adaptation and mitigation, energy efficiency, and state policies, he invariably answered with a question, “Is it a good investment, does it pay itself back, does it have a good return on investment (May 2, 2012)?” His profession guides his thinking. Likewise, contractor Tom Inglis understood climate and energy topics through the lens of energy use in buildings. He said the Department of Energy “are the ones that are taking the strictest point” in the face of climate change through building codes (April 26, 2012). He did not understand much about renewable energy or energy policy beyond the immediate use of energy in a building. On the other hand, if a person doesn’t connect the topics of energy and climate to their profession, then it is not a salient topic to their lives. Ron Juliff is the emergency management coordinator for Churchill County. When asked about gathering more information about climate and energy topics, Mr. Juliff said, “My job doesn’t require me to do it, so I don’t jump to it. I suspect if I had a real scientific curiosity, I would be an engineer or I would be a scientist, but I am not (April 19, 2012).”
Not only does their profession provide information to the Doubtful and Dismissive individuals that they may not get from their friends and family, the profession may also advocate for a way of thinking that makes climate information relevant to them.

Professional networks and trade publications can be vehicles for presenting climate change solutions to a skeptical, conservative audience group by depicting climate adaptation and mitigation efforts and professional endeavors. Professional colleagues are a peer group, but they may not share the same political and demographic characteristics of Doubtful and Dismissives. As such, they act as bridges to an otherwise closed communication network.

The data collected during interviews shows that my informants prefer to think of themselves as self-educated, informed individuals that are capable of coming to their own conclusions. They disregard messages from the scientific community in favor of what they hear from their social and professional networks. Scientists are not a part of their personal or professional lives, so any information they offer is easily dismissed or considered irrelevant. Climate science research does not apply to their lives, so it is all theoretical to them, not practical knowledge worth acting on. In the next chapter, the conclusion, I will discuss communication strategies to engage conservative, skeptical audience groups.
CHAPTER EIGHT: CONCLUSION

Anthropogenic climate change continues to meet resistance from key segments of the American public. My goal in this dissertation is to engage and understand those who are skeptical or dismissive of climate change and determine ways that strategies to mitigate and adapt to climate change may be developed among this population in spite of their dismissive attitudes. My qualitative ethnographic data of the politically conservative Churchill County, Nevada ranching and farming community offers unique on-the-ground insights into the context in which dismissive attitudes persist toward climate change, renewable energy development, and water conservation.

My introductory chapters explain why communication campaigns that intend to dispense climate change facts with the expectation to garner policy support for climate solutions are ineffective for Doubtfuls and Dismissives. As research suggests, personal beliefs drive individuals’ preconceived preferences, which influence how they receive and process information. Climate messages predicated on a knowledge deficit framework, which mainly offer just facts about climate change to convince skeptics to act may instead further polarize dismissive attitudes about climate change. This dissertation is not about how to more effectively convince Dismissives that climate change is happening. Rather I am ultimately interested in how to engage climate skeptics to support and implement policies, technology, and practices that have multiple benefits that include climate stabilization and adaptation.

I chose Churchill County, Nevada as the site for my case study. The county demographics indicated that it would be representative of the Doubtful and Dismissive
audience group, and previous survey work (Safi, 2011) confirmed that climate skeptics and deniers made up a large portion of the surveyed farmers and ranchers in the area. Most believed that the climate is changing, but dismissed the idea of it being a cause for concern or the result of human behavior. I interviewed residents to assess their attitudes and confirmed that most did fit into the Doubtful and Dismissive category described by the Six America’s Project (Maibach et al., 2009). After establishing climate beliefs, I discussed climate adaptation and mitigation options, specifically around issues of water security and renewable energy development. I also investigated how my informants received information and how they incorporated it into their beliefs and applied it to their decision making.

Regarding my first research question, I confirmed that the large majority of my informants were climate skeptics or Doubtfuls (23 out of a sample of 25). They do believe the climate is changing, but they do not believe it is a reason for concern or caused by human activity.

My second research question inquired about plans for adapting to a changing climate since the agricultural community is so thoroughly dependent on surface water. Even with the belief that the climate is changing, my informants have no fear that it will impact their water supply. Rather their water fears center on the potential for losing water rights to other users along the Truckee River, and the impact water conservation may have on their ground water supply. They believe that they will survive future droughts the same way they have survived past droughts and heat waves; with the same infrastructure, water rights, and water use practices they have employed for the past century.
As residents of an agricultural county, my informants all depend on a shared resource over which competition for more access is growing. They do see a threat to their water supply, but it is the threat to lose water rights to upstream development or to litigation for wildlife needs. Consequently, for them, conservation under present water regulations could mean losing their rights to any water that they did not use, meaning they would free up water for their competitors. In such a system, conservation makes little sense to them.

I argue that incentives for water conservation can only occur through policy changes that acknowledge the myriad of disincentives to conserve water. One option is to incentivize conservation through water banking options. Giving farmers a way to save a portion of the water they conserve for future use without risking their rights to the water may be seen as an incentive for them to invest the time, money, and effort required to implement water conservation technologies and practices. Banking the conserved water would provide a buffer to their water supply for future droughts. Incentivizing water conservation in this way would likely be more effective in motivating conservative farmers. Messages describing climate change threats to water supplies, litigation from competing water users, or mandatory water conservation regulations would likely engender politically defensive behavior to support policies that are counter-productive to conservations and climate adaptation.

My third research question asked about the nature of support for the development of renewable energy amongst my sample population of Doubtfuls and Dismissives in Churchill County, Nevada. In terms of renewable energy, Churchill County has vast geothermal resources. The county presently produces more geothermal energy
than it can consume, so it exports the excess out of the area. Given the prominence of geothermal energy and prior research indicating that they held positive attitudes toward renewables, I expected to also find high levels of support for renewable energy. But, while county residents are proud of their locally-produced geothermal power, I found that they prefer nuclear or fossil fuel energy development over renewable energy.

Churchill County residents hold pragmatic, politically-conservative, free-market individualist beliefs. Based on these beliefs, they seek personal and local benefits from economic development. They are concerned about what they perceive as the high expense of the emerging renewable energy industry and the government subsidies they require, creating doubt that there are direct benefits renewable projects can bring them.

Because there are renewable energy projects sited in the county, the local residents are very aware of the state tax incentives meant to promote the renewable energy industry in Nevada. They are also aware that that state’s tax abatements limit the revenues that the local county receives from new renewable energy developments. Local residents see the abated taxes as a loss of funds rather than focusing on the taxes that are generated. My informants see the tax abatements as government support for a premature industry that is too expensive to compete fairly in the marketplace. In contrast, they believe that nuclear energy and fossil fuels are established, non-subsidized technologies that can provide cheaper energy in a free market economy.

To garner local support, the tax abatement mechanism will need to be adjusted to allow more money to flow into county coffers. As locally focused, economically
pragmatic people, Churchill County residents support the energy technology that benefits them most directly. My informants feel a special sense of local ownership over the geothermal resources that exist in Churchill County and that they should benefit from the development of those resources. Yet, they also do not believe that geothermal development requires incentives since it is a very location specific resource. They welcome the exploitation of local resources, which includes solar and wind energy. But only if they are certain that the county will see local benefits in the form of money to support programs and infrastructure.

My case study of Churchill County residents offers an opportunity to develop a deep, local understanding of a specific rural Nevada ranching and farming community thinks about and acts toward climate change, water conservation, and renewable energy development. My final research question inquired about the information sources and messages respondents use to anchor their perceptions about these issues. I found that most participants do not want more information about climate change because they already feel well enough informed and do not think it is a priority for how they invest their time. They prefer to be self-educated about important issues and look to peer groups and professional organizations for information. I use this data to explore potential communication strategies that might engage them in climate change solutions. And while my communication suggestions flow from a specific population, they can be adapted in more generalized ways across locales and regions for broader impact (Bickman and Rog, 1998). I discuss the implications my results have for future science communication strategies below.
COMMUNICATION SUGGESTIONS

Other counties in western states with conservative populations are likely to be dominated by Doubtful and Dismissive attitudes and beliefs, but rich with renewable energy potential. Doubtfuls and Dismissives are a group that are not likely to easily change their beliefs regarding climate change causes and consequences. That does not mean that this is a group that should be overlooked in climate communication campaigns. Leiserowitz explained to the Boston Globe that they may only be 15% of the American population, “but they are a really loud 15 percent. They are overly represented in Congress, and as result they appear to be much larger than they actually are (Struck, 2014).” This audience group requires communication strategies about climate issues that are sensitive to their beliefs, values, and perceptions.

Communication science calls for an in depth understanding of target audience groups to tailor effective communication strategies. My qualitative research leverages Safi’s (2011) previous survey research to provide a more nuanced understanding of how rural conservatives incorporate information from different sources into their attitudes, which in turn determine their degree of support for or opposition to various climate change solutions. Looking at the sources of information that participants from my study do and do not trust, I suggest the following strategies for science communication with the Doubtful and Dismissive audiences. My suggestions are not about manipulating the perceptions but are meant as ways to present solutions to climate related matters such as water conservation and renewable energy develop that are free from political ideology and partisanship to find common points of interest and support among citizens (Voosen, 2014). The communication strategies are less about how to manipulate the
wording about solutions, but about using real world examples of science-based climate solutions being used and supported by the types of people that conservative Doubtfuls and Dismissives trust (Voosen, 2014).

**ROLE OF SCIENTISTS**

There is a wide gap between my informants’ beliefs about climate and climate scientists’ claims about the causes and consequences of global warming. When the science is communicated, it may be discounted or disregarded altogether for a variety of reasons. Gauchat (2012) shows that conservatives have increasingly lost faith in science over the course of the last four decades. Mooney (2010) suggests that perhaps what is needed is not a more scientifically informed public, but one that trusts scientists and is more engaged by them throughout the research process. Smith Jr. et al. (2014a) agree that “a baseline level of trust is needed for constructively engaging the public to create socially relevant forms of research.”

There is an old idea that with knowledge comes responsibility. Scientists are a small subset of a much larger community. They develop specialized skills to produce empirically-based knowledge on a wide range of physical and social matters. Scientific research offers information that can inform applications in both technology and social policy. With such wide-ranging influence on societal development, it seems reasonable to expect scientists have to communicate and engage with the larger population. This may include bringing results of scientific research to the attention of stakeholders, decision makers, and managers, as a part of the scientific process (Scott, et al., 2007). Below, I contribute three recommendations to the larger work to help push forward attempts to communicate science matters, especially to the communities most skeptical.
of scientific findings as a primary base on which to ground decisions. My suggestions depart from the institutional tradition of reporting research only within their own disciplines, but supports the works of those involved in participatory science, co-produced knowledge systems, and boundary organizations (Armitage et al., 2011; Carolan, 2006; Cash, 2001; Guston, 2001; Parker and Crona, 2012; Carr and Wilkinson, 2005; Smith Jr. et al, 2014b; Guatam et al., 2013).

COME OUT OF ISOLATION

My informants view scientists and scientific research as too far removed from the matters important to theirs’ and others’ daily lives. They dismiss scientific knowledge in favor of what is being produced or communicated by more familiar sources of information, like their friends and colleagues. To keep from being eclipsed by non-experts, scientists need to come out of their isolated research centers and better engage the public, even at the most local levels. Historically, scientists have used communication methods that transmit their knowledge one way. This method demotes citizens to being only passive receptors of information. One result is a negative impression of scientists from within the audience groups (Nisbet and Scheufele, 2009; Pidgeon and Fischhoff, 2011). According to Cooper (2011), the public wants to be involved in the formation of what is considered to be true or factual, which is why two-way dialogues and public engagement are being recommended to science communicators.

However, as Hoffman (2011) points out, “Few academic scholars possess the skills or inclination (or resources) to play the role of educator to the general public.” In a survey conducted by Borchelt (2013), scientists reported that they believe the public to
be irrational, uninterested, and not a source of information to engage with. Scientists reinforce the perspective that the lay public should only be receptors for scientific information. This way of thinking needs to change. Information exchange is needed both to gain more knowledge and to better convey information to the public to enable informed decisions. Borchelt (2013) does not believe that the media has failed in its job to be an information source, but he does criticize the fact that the media is even needed to act as a third party communicator for the scientific community.

Another obstacle to scientists performing effective outreach and science communication is the fear of being portrayed as activists and having their input dismissed as ideologically biased. When science is presented as part of an advocacy message, it may not be viewed as credible by all sides and may compromise the use of that information in policy and management decisions. Scott, et al. (2007) describe how the public’s trust in science depends on the neutrality of the information scientists deliver. Hoffman (2011) counters that “science is never socially or politically inert, and scientists have a duty to both recognize its impact on society and communicate that impact to those who must live with the consequences.” Bernard (2006) adds that “the power of research is in its irrefutability, not its neutrality.” Researchers need to lose some of the fear that they have of stating their position on what they consider to be facts and include the public in some of the discussion that is usually reserved for scientific conferences. Scott et al. (2007) explains that policy discussions can still occur using value-neutral language: if x is your goal, then y will give you this result. In this way, research findings can be a part of policy discussions without advocating a position. The value-neutral language leaves identifying the objectives to decision makers, but still
supplies relevant knowledge. In a survey of conservation biologists, many respondents indicated that advocacy should be a part of scientific literature, but qualified their statements by saying that authors should explicitly state when they are writing from an advocacy viewpoint as opposed to a scientific one or should keep policy suggestions as different sections from research findings (Scott et al., 2007).

Cook et al. (2013) reviewed close to 12,000 climate abstracts from 1991 – 2011 and found that 66.4% of the authors expressed no position on anthropogenic climate change. In a similar study, Anderegg et al. (2010) attribute this absence of a position statement to the fact that scientists assume the debate over anthropogenic climate change has largely been settled and a position does not need to be restated in peer-reviewed articles. Scientists may have settled the debate amongst themselves, but it is well known that the debate is still quite active among lay publics (Maibach, 2009; Cook et al., 2013; Anderegg et al., 2010; Saad, 2014). I would argue that in a time when information can be accessed by anyone using keyword searches, it should be assumed that any publication has the potential to be read by the public. Without a clear position statement, those studies may then be used to argue positions counter to what the authoring scientists believe to be true, similar to how the novelist Michael Crichton used research findings in his book *State of Fear* (2004). If the debate amongst scientists regarding anthropogenic climate change really is over, then it is not advocacy to simply state the facts.

There are few professional incentives for scientists to go beyond communicating with their peers, so most do not (Borchelt, 2013). It is not part of their job description, so the time and energy put towards reaching out to specific audience groups goes
professional under-recognized and under-supported. Tenure and promotions are dependent on scholarly publications. But, as research institutions shift toward more community engagement, they may increase the ways they credit researchers who work closely with boundary organizations. Boundary organizations are organizations that apply science through the collaboration of researchers and stakeholders. Working with boundary organizations to co-produce knowledge may require changes in the culture and practices of scientific research (Guston, 2001), but research institutions are constantly assessing their public impacts and making changes to broaden those efforts through entrepreneurial technology development, policy contributions, and expert outreach efforts to community groups. Publicly funded research also has an inherent obligation to make sure the public supporting that research can access and use the knowledge produced. Arizona State University (ASU) has undergone a massive reorganization to increase interdisciplinary practices and stakeholder collaborations. While they have struggled with these new goals, ASU President Michael Crow (2007) argues that traditional university models cannot meet the knowledge demands of the 21st Century and more interdisciplinary interactions are needed to produce practical knowledge. This is not a critique of basic science in favor of applied science, but more simply a call for a balance of both approaches to knowledge production.

PROMOTE WORK WITH BOUNDARY ORGANIZATION

When scientists advocate a particular policy or solution to a public problem, they open themselves to attacks by people who disagree with them. These attacks can diminish scientists’ credibility. Speaking as a researcher, Roberts (2013) counters this notion of scientific neutrality by saying, “The problem is that the further we move away
from foundational, physical-science posits and towards more contested political or moral posits, the more meaningful our stories become to our audience. That is the stuff they care about!” Stating moral and political positions firmly places a scientist in the role of advocate, while also making their messages relevant to broader audiences. One way to overcome the challenge of maintaining scientific objectivity while applying the knowledge in meaningful ways is to work with boundary organizations. Boundary organizations can help maintain the gap between scientific knowledge and political bias, while bridging the divide between research and relevancy to citizens’ daily lives.

Lemos and Morehouse (2005) explain that science is usually operationalized through boundary organizations; those organizations that facilitate collaboration and information flow between researchers and stakeholders. Stakeholders can include (but are not limited to) local government decision-makers, resource managers, and interested members of the public based on their profession or work with civic organizations. Boundary organizations are designed to bring together science and policy. They share three criteria: (1) they have representatives from both stakeholders and decision makers, as well as from the sciences and researchers, (2) they are accountable to stakeholders on both sides of the science-policy boundary, and (3) use opportunities and incentives for creating and using boundary tools such as; models, fora, experimentation stations, and maps (Parker and Crona, 2012; Cash, 2001). Boundary organizations play a distinctive role that would be difficult or impossible for organizations in either community (science or policy) to play (Guston, 2001). Facilitators within the boundary organizations enable a constant negotiation of the needs and aims of the organization based on stakeholder discussions and collaborations. The most
familiar boundary organization is the agricultural cooperative extension program. The historical cooperative extension service is now operated as the National Institute of Food and Agriculture (National Institute of Food and Agriculture, 2014). Under this program, federal funds are distributed to states for land-grant universities to establish agricultural outreach, research, and education programs. University resources are extended to cooperatively solve public needs through non-formal, non-credit programs. Figure 14 illustrates how boundary organization operate at the boundaries of science and society.

**Figure 14. Boundary Organizations operate at the boundary of science.**

While scientists need to better communicate across boundaries, they also have an interest in maintaining independence from decision makers to maintain scientific
credibility (Cash, 2001). Scientists distance themselves from the public and key decision makers because they fear their work will be politicized. But Guston (2001) argues that blurring the boundaries between science and politics can lead to more productive policy making and extend the impact of natural science and social science research. Boundary organizations can play key roles to help manage the blurring of these boundaries to maintain science credibility. While most researchers are not comfortable with the role of advocacy, they can work with boundary organizations to explain the impacts policies can have if implemented. This places researchers in a distinctly different role than one of advocating for a policy to be enacted. Climate change scientists can investigate and discuss impacts and benefits of policies that may help stabilize climate, but also address other issues like drought preparedness, energy savings, and security provided by a diversified energy grid. Cash et al. (2003) explain that boundary organizations can play key roles in communicating, translating, and mediating information between experts and decision makers.

Boundary organizations may include trade groups that represent the businesses with whom universities and research centers have entered into public-private partnerships. Researchers in partnership with a company to develop and assess solar panels from a new material do not have to endorse the products of that particular company, but can report their findings to the American Council on Renewable Energy and speak at their conferences. There may still be a perception of bias towards researchers who speak to trade organizations, but I argue there is potential for trade organizations to become the boundary organization that applies research knowledge to developments, community outreach, and policy suggestions. Jim Johnson was running
for Churchill County Commissioner when I interviewed him, and he said, “I believe that people in the private industry that are trying to develop solar should be the ones providing that information and trying to educate people as to why they believe that they should invest in their projects (April 24, 2012).” Such statements reflect the trust conservatives have in private industry and how they measure value in economic terms.

Boundary organizations can give transparency to how these public-private research partnerships develop technology innovations and make them ready for the open market. Cash (2001) describes how County Agricultural Extension Offices can fulfill the role of a boundary organization by facilitating communication and research opportunities between farmers and university researchers. Churchill County has an Extension Office, but it does not incorporate research on water banking. Since programs experimenting with water banking stress the need for local participation in the planning process (Cronin and Fowler, 2012), the Extension Office could play a strong role to facilitate research-based dialogue and action among resource management stakeholders. Interview participants highlighted the significance in surface/groundwater interactions in their statements about water conservation. These resources are governed as separate resources, but modelling the interaction between irrigation and domestic water supplies is another opportunity for the Extension Office to facilitate a co-produced research approach to water management. Additionally, local managers and government agents commented on how their membership with resource management organizations kept them informed of science, even if that science was at times contradictory. In short, the co-production of knowledge facilitated by these associations can clarify the science.
Parker and Crona (2012) highlight the tensions and challenges that can exist when research centers work with boundary organizations. Grant funding agencies and academic departments focused on a specific discipline prefer basic research conducted to answer bigger questions that focus on long term issues; whereas, resource managers and policy-makers work on very specific problems with shorter timelines. Because the rewards system that directs the career track of academic researchers is tied to their disciplines and grants, there is little incentive to produce the type of knowledge that is useful to decision makers on the other side of the science-policy boundary. When Parker and Crona (2012) asked a researcher who worked with a boundary organization why he didn’t publish a practical article on water conservation for the organization’s stakeholders, he replied, “I’d have to publish it in the Wal-Mart Journal. I’m not going to publish it anywhere NSF cares about. So you’re driven by that, not just by the NSF but by faculty and collegial pressure not to do it from that end.” Moreover, many researchers do not want to do science as consultants. They want to ask the bigger questions. It is important to acknowledge this inherent tension and have organization structures and rewards systems in place to mitigate it. Mutually beneficial issues or activities should be identified to alleviate these tensions in knowledge production and application.

CO-PRODUCED KNOWLEDGE

Given that lay publics tend to be skeptical about scientific claims that they perceive ignores lay input (Whyte and Crease, 2010), we need to engage in co-produced knowledge and highlight that process when communicating results. Boundary organizations can help facilitate co-produced knowledge by engaging non-scientists in
partnerships with research centers. Co-producing knowledge fosters relationships that encourage open communication among the parties involved, informs researchers of stakeholder needs, and encourages legislators, resource managers, and other decision makers to use the knowledge that comes from this process. According to Stern and Coleman (2014), such participatory science research can promote the type of affinitive trust that friends and family enjoy. There is a better chance that all parties will perceive co-produced knowledge as salient, legitimate, and credible. Cash et al. (2003) explain that information is salient when stakeholders perceive it to be relevant to their, legitimate when they perceive it as unbiased and respectful of their divergent value and beliefs, and credible when it appears accurate in terms of technical evidence and arguments.

In addition to adding credence to the knowledge that flows from collaborative research partnerships, the act of conducting research also becomes the method of communicating information to the non-scientists’ professional and social network. Smith Jr. et al. (2014b) describe how participatory research develops a culture of data sharing with further capacity to bridge cultural divides through inclusion of local participants in the planning and implementation of research, as well as in the determination of how to keep research useful to highly local needs. This is important since audience groups tend to self-select and filter out information easily when it conflicts with preconceived preferences. For climate skeptics, you cannot just build a website and expect them to go to it, read recommendations, and act on them. They self-select information from a rather narrow range of sources, which typically do not include scientific websites. But directly engaging community members in the science can
circumvent those filters, encourage dialogue, learning, and trust (Lemos and Morehouse, 2005; Armitage et al. 2011).

Scientists need a co-produced knowledge process to best identify locally-specific conditions and adapt generalized science to those conditions, and vice versa (Carolan, 2006). Carolan (2006) describes how scientists create abstract generalized knowledge while lay persons or practitioners create local, practical knowledge. Scientists may be able to talk about water conservation technologies, but farmers will be able to talk about conservation in the context of water rights, local drainage and infiltration rates, and other factors that scientists may not consider. Scientists create generalized knowledge that is packaged and shared in an abstract form. But that knowledge must be adapted each time it is applied based on local particularities (Carolan 2006). Co-producing locally-specific knowledge makes it relevant to those that the research will affect the most, but the ability to do participatory research requires a deep understanding of the geographic, social, and historic foundations of a region, as well as local priorities (Smith Jr. et al, 2014b).

Research designed and conducted to provide information useful to regulators and resource managers in specific locales requires local input to identify critical questions, variables, and follow-up steps. Research project assessments would also include stakeholders. Lemos and Morehouse (2005) explain that such an iterative process increases the “fit” between knowledge produced and the usefulness of that knowledge. Engagement provides more data, information, and feedback, which, in turn, improves the quality of the research. Lemos and Morehouse (2005) further explain that stakeholder involvement increases the likelihood that research-based policies will be
seen as legitimate, which, in turn, can attract broader constituent support and dampen skepticism and opposition. Transparent research procedures foster stakeholder confidence and can build what Stern and Coleman (2014) refer to as “procedural trust.” Under these conditions, all participants can question the assumptions and capabilities of models or tools produced to ensure they are salient and credible, which in turn means they are more likely to quickly adopt policy suggestions that emerge. Guatam et al. (2013) provides an example of how a history of participatory science within a community can improve that community’s resilience and adaptive capacity due to existing collaborations and networks and a strong willingness and common desire to incorporate climate change into their plans.

Co-producing knowledge requires sustained relationships that become the platform where researchers and stakeholders can address a range of issues that arise. The process of co-producing knowledge requires all involved to acknowledge that their own spectrum of knowledge is incomplete (Carolan, 2006), creating the motivation to engage in a learning process that is more complex and time consuming. Limited communication skills create obstacles early in the process as each party learns to communicate beyond their own lexicon and biases (Carolan, 2006; Lemos and Morehouse, 2005). Building relationships between stakeholders and producing useful knowledge takes time. Cash (2001) describes how farmers and university researchers spend years designing a water model as participants offered comments, suggestions, and criticisms. However, the resulting model was a useful and credible tool for all participants.
Co-production requires time to exchange information and adapt to participants’ needs. Time investment can be an obstacle to conducting research throughout the co-production process since all parties tend to be busy and the time to build the relationships, let alone for meetings and retreats to exchange information, can be unmanageable. The interdisciplinary nature of co-produced knowledge requires a long maturation period to generate mutually beneficial deliverables (Lemos and Morehouse, 2005).

As Parker and Crona (2012) described previously in this chapter, there may also be institutional obstacles to the co-production of knowledge. Lemos and Morehouse (2005) expound on the challenges describing how “job security and the future careers of these individuals can be negatively affected by a research effort that does not easily fit within academically recognized disciplines.” Co-produced knowledge requires money, staff support, long periods of time between outputs, and communication and outreach beyond the accepted standards of publication within disciplines. With all of these professional obstacles, co-produced research requires considerable commitment from researchers with an acceptance that rewards might be delayed, incomplete, or unhelpful towards advancement. Research institutions should look to how co-produced knowledge can increase the quality and relevancy of the work they generate and match rewards systems to that end.

Co-produced knowledge is challenging, but particularly relevant to conducting resource management research in rural communities, especially with what it can add to an adaptive management policy. Agricultural resources like soil and water, habitat, or extractive resources like logging and mining all influence rural communities and
scientists can benefit from the practitioners’ knowledge from those communities. It is in rural areas that concentrations of Doubtfuls and Dismissives dominate the realm of policymaking. Personal relationships between practitioners (farmers, miners, loggers, hunters) and researchers create an environment where scientists could discuss issues like climate change and resource scarcity without being automatically filtered and dismissed. Even if discussing climate change does lead some to dismiss scientists’ arguments, researchers can still help to implement practices and behaviors that can have a latent effect on climate change mitigation. As an example, I refer again back to Mr. Frey, the farmer who had conducted joint research with university experts regarding weather and his ability to diversify his crops. While he still does not believe that global warming is happening or that there is a predominant belief among scientists that it is happening, he did develop a vineyard that relies on 75% less water than his previous crops. His farm is more adapted physically and economically to bear the impacts of increased droughts brought on by climate change, though he did not pursue this transformation to affect the climate.

**SOLUTIONS-BASED EDUCATION**

Experts must be careful to not presume that climate change skeptics do have knowledge of climate issues. Valuable resources can be wasted by literacy campaigns that force more information onto Doubtfuls and Dismissive without first understanding how the group filters or reinterprets the information. If publics feel they are simply being marketed, it will reinforce polarization and gridlock (Nisbet and Schuefele, 2009). Education solely based on scientific facts can cause further polarization since the same arguments used to support the fact that anthropogenic climate change is occurring are
the same arguments that are used to counter it. For example, when warm oceans create extreme hurricanes, it is attributed to global warming through complex models; but skeptics countered the claim by saying it is no more than an extreme weather event rather than a trend that indicates climate change. Conversely when there is a heavy snowfall, climate skeptics view it as evidence that global warming is not happening, while but climate scientists point out that in some areas climate change will produce precisely such storms.

Doubtfuls and Dismissives require information that they determine to be relevant to them. Nisbet and Scheufele (2009) explain that messages need to connect to something the audience already values or something that impacts them more directly. Theda Skocpol, suggests the need to address the various values of citizens through sustained, local efforts to build grassroots instead of negotiations taken at the top level by large conservation non-profits and federal decision makers (Goldberg, 2013). I suggest that educational messages must connect with a group’s values and explain how policies are meant to be solutions to problems they define as relevant. Communication strategies should focus on solutions that are not about changing people’s values or political ideology, but meet them where they are with solutions to the problems they face and the values they hold (Voosen, 2014).

RELEVANCY

Participants in my study were not particularly interested in learning more about climate science, they just wanted to know how it would impact them and the things in their lives they do care about, such as finances and family. Respondents spoke about being busy with life, concerned about kids, and not interested in learning more about
climate, energy, or water beyond cost and availability. Nisbet and Scheufele (2009) tell us that a frame is only effective if it is relevant or applicable to the audience’s preexisting interpretations. For my informants, climate messages about sea level rise, endangered species, refugees, or future disasters are not immediately relevant. Rather than changing the perspective of conservative skeptics so that they see the world differently, messages about climate need to show how solutions are immediately relevant. Jain and Maheswaran (2000) explain the importance of a motivated audience in how they process information; communicators must provide an incentive for the audience to receive their message by making it consistent with their values and beliefs. Consistent with my respondents, Smith Jr. et al. (2014a) also found in their surveys that conservatives were only likely to take actions towards energy issues that saved money as a byproduct. Climate solution messages need to address this concern of costs. How will renewable energy development affect power bills? How will renewable energy effect transportation costs?

In addition to cost, family was another relevant issue and popular topic of conversation amongst the study participants. While individuals may find facts about ecology and climate interesting, family conversations are not the place where they’re often discussed. They do not deem future disasters that may affect their family as relevant, but the immediate impacts to family or the financial future of the kids are a concern. Dismissives do not believe the climate is changing, and Doubtfuls do not know if it is happening fast enough or at a large enough scale to affect their children or grandchildren. Climate change is still too vague and too distant a concern for them to consider it a relevant threat. As Smith Jr. et al. (2014a) conclude, “Policy makers and
agencies would gain little traction using sustainability terminology regarding ‘future generations’ in outreach.” However, conservatives do want to be able to provide some financial security for their children. This might be done by affording some form of vocational training or college preparation for a skilled career in areas that can affect climate mitigation and adaptation. Messages framing climate change solutions for this audience group should focus on the family financial security solutions can provide.

Career paths that are available from climate adaptation and mitigation solutions are an important. Degree and certificate programs at the local community college that can put people on track to rewarding careers in the emerging renewable energy industry would be a positive benefit to the local community. It would also show that local hiring is planned for future developments rather than the expectation that all new jobs will go to specialists from out of the area. Additionally, demonstrating how renewable energy can benefit these family owned farms by diversifying income sources and reducing energy costs also shows the relevancy of renewable energy policies and technology for farmers and ranchers. Messages should focus on policies and practices that can generate biogas from farm waste, install solar panels on less productive acreage, or generate wind energy on grazing lands.

EDUCATE ON POLICIES

Many of my informants were unaware of state policies regarding renewable energy or the goal and benefits the state is trying to achieve by implementing these policies. For example, respondents knew very little about Nevada’s fifteen year Renewable Portfolio Standard, much less what it requires and its affects. Participants were also unaware of the utility’s various programs for demand-side energy efficiency
and reductions. Simply explaining and clarifying current policies, without advocating new policies, is a non-political way to establish a foundation for future discussions and assuage fears regarding renewable energy impacts to the health of the state economy. Boundary organizations have traditionally produced tools like maps and models for use by stakeholders and physical scientists, but since boundary organizations are dynamic entities, it makes sense that their role expands to include social and political sciences and education in their scope of work. Boundary organizations can facilitate the information flow between policy makers and the public. Policies have end objectives that policymakers hope will come to fruition when they design and implement those policies. Political and social scientists can explain to the public the possible impacts of the policies while the public stakeholders can provide scientists with reactions to the policies before they are implemented. The public needs to be provided with a vision of the benefits that the policies will bring them. Co-produced policies are more quickly and easily adopted by a public, meaning they are more likely to stay in compliance of the policy and provide it with sustained support (Lemos and Morehouse, 2005).

Messages describing specific local benefits and impacts resonate with this audience over national political rhetoric or ideology. Churchill County has a geothermal resource, which is well known amongst the residents. They know that any development of local resources means potential benefits for them, but what are the long term impact and benefits of the state policies for this county? A limiting factor for energy development in the county is the lack of transmission lines to get the energy onto the grid. The Clean Energy Project (2014) published a white paper that states that the $500 million in tax abatements from the state has attracted $5.5 billion of capital investment
in clean energy projects, including transmission lines. The benefits of this type of capital investment needs to be clearly explained to constituents. If capital investments within the county were counted as local benefits, Churchill County residents may be more forgiving of the large abatements the state has guaranteed clean energy developers.

**Peers**

Because each audience group requires specific communication strategies, most studies do not provide specific suggestions for those communication strategies. Suggestions that are provided are so vague or overly general as to be useless. Peer groups are the best messengers. Peers enjoy affinitive trust among them, similar to the kind of trust vested in friends and families, because of perceptions of shared experiences and assumptions of relevant values (Stern and Coleman, 2014).

One peer strategy to gain farmers’ and ranchers’ support is to connect with groups that they already view as legitimate (Smith Jr. et al., 2014a). Showing Doubtfuls and Dismissives how their peers engage in practices that are “climate helpful” could change their perspective and motivations. Knowing that conservative skeptics tend to look to their peers for guidance rather than look for an expert authority figure, communicators can use peer behavior to replace partisan messages. In fact, this strategy could work for all audience groups. The Six Americas Project shows that every other audience segment also chose friends and family as trusted sources of information, second only to scientists, but above all other sources listed as options in the survey (Maibach et al., 2009). The strategy of showcasing conservative peers does not mean finding a Republican that is now championing solutions for anthropogenic climate
change. It means highlighting the other benefits a climate solution may have for the target audience through case studies demonstrating those solutions in action.

Communicating case studies of dairies that have invested in long-term drought adaptation practices and technology to save money and make the business more sustainable could demonstrate that such a change is not extraordinary, but rather a normal reaction to a changing climate. Adaptation is then a smart business strategy. Nisbet and Kotcher (2009) advocate using examples of ordinary people employing energy conservation or renewable energy production to meet their needs as long as they are people the audience can relate to, in this case: farmers, conservatives, business owners. Climate stabilization may be mentioned, as just one of many benefits that peers receive. Kahan (2013b) explains, it is simply normal to defer to people who you perceive as knowing more and often those are peers. It is not normal to be informed by and defer to faceless graphs and general data.

PROFESSION/TRADE

Professional peers are a particularly underutilized group of trusted messengers that could illustrate how climate change solutions are relevant to this group of Doubtfuls and Dismissives. Half of my participants explicitly referred to communications with colleagues, professional development seminars, conferences, and trade magazines as sources for information that they trust. Some of these trade sources already address water and energy issues, but very few speak to climate specifically. In trade magazines, credentials and trust have already been established for the Doubtfuls and Dismissives that subscribe to them. With proper framing, professional journals can immediately place climate solutions in context with the livelihoods of rural conservatives and to
better describe their relevancy to skeptical audiences. Water, energy, and weather conditions are already vital issues to many of the professions in rural areas. If trusted trade publications propose climate solutions without using climate change as the sole or primary rationale, then chances diminish that farmers and ranchers will automatically filter and dismiss them.

There are some obvious connections between agriculture and water and energy issues. Building design combined with electrical engineering can provide for more efficient options for water and energy use and farm operations. Professional magazines can highlight the opportunities to implement renewable energy, passive solar design, and water conservation technologies. Showing other dairies as they become efficient and more prepared for future droughts is a way of communicating climate change solutions without trying to first convince skeptics that anthropogenic climate change is happening.

Applied solutions for climate change are inherently interdisciplinary. Calls for farmers who want to participate in pilot projects for emerging technologies can also be advertised in trade magazines. Several of the dairy farmers I interviewed mentioned that they had been approached to work with private companies who were developing bio-digesters of various types, but they were skeptical that the projects would not work in their region or on a diary of their size. Showing examples of how technologies were developed in partnership with working farms in trade magazines may help establish that participatory research and encourage investment in new technologies.

Every dairy in Churchill County is a member of the Dairy Farmers of America (DFA) cooperative and its magazine, the DFA Leader. The Leader has provided a few
examples of farmers diversifying dairy operations to include energy production through renewable energy technologies, but they are just a few based on keyword searches through past issues. The DFA had developed a separate webpage that provides resources for, and examples of, energy efficiency and renewable energy production on farms (www.dfaenergy.com). The webpage is an excellent example of the type of content that can be included in more agricultural trade magazines.

A year after my interviews, drought struck throughout the country and has continued creating severe conditions. An article in DFA Leader a few months after the interviews features a couple dairy men and how they are going to extremes trying to weather the drought, including selling livestock and switching their feed to sunflowers and sugar and corn stalks, less than optimal forage (Petrovic, 2012). The article discusses how bad the drought is and some emergency programs in place for farmers, but it does not talk about climate trends or the possibility of droughts occurring more frequently requiring farmers to implement adaptation strategies. This is a missed opportunity to highlight what proactive dairies can do as droughts become more frequent or intensify. It is also a missed opportunity for the dairy industry and scientists to engage in a relevant discussion for the benefit of dairy farmers across the nation.

Local resource managers and government decision makers also consult professional resources to guide their views. These trade magazines like, Planning, the magazine for the American Planning Association, are another venue for researchers to be more proactive in engaging policy makers and stakeholders. Kahan has been testing his cultural cognition theory by advising a coalition of Florida counties addressing the issue of sea level rise (Voosen, 2014). As coastal counties, flood mitigation is already
within the scope of the counties’ management duties. Kahan advised the coalition to avoid inflammatory language that could embroil the normal operation of the counties in partisan conflicts. In the end, the coalition of counties unanimously passed, in public meetings, more than 100 climate adaptation measures. This is a great case study of how science can inform decision makers, and can be showcased in municipal planning and management trade journals. The city and county employees that I interviewed all referenced magazines from various professional organizations they belonged to. While some of the energy journals did address climate change specifically, it is more important that they address climate change solutions in a frame that highlights multiple benefits for local governments beyond climate stabilization.

**FOCUS ON EMPOWERING AND SOLUTIONS, NOT CLIMATE**

Communication strategies need to be tailored to regional and cultural audience groups to be effective. Nisbet and Scheufele (2009) acknowledge that it take a lot of resources to frame discussions for different audiences in different locales. The cost of customized campaigns and solutions is why there are so few of them. But, without resources directed to engage people with divergent viewpoints, “the most likely individuals to turn out [in elections, public comment processes, and other policy forums] are those already opinion intense, well informed, and emotionally committed to the issue” (Nisbet and Kotcher, 2009). In short, we will see more of the same of individuals and groups there, not with open minds to work towards solutions, but those ready to battle. Leiserowitz reminds us that we need to engage Doubtfuls and Dismissives because they are loud and vocal, and account for half or more of the comments we hear about in conversations about climate change and climate change policies (Struck, 2014).
They may be a minority of the American population, but they are concentrated in rural regions and as such, they elect policymakers and influence development in resource-rich areas.

Rural conservatives distrust many sources of information. They prefer face-to-face communication about topics that are directly relevant to their community, family, and finances. To best engage them on climate change solutions, we must leave climate change to the side of the dialogues and center on the other financial, family, and community benefits the solutions can provide. Conservative political campaigns focus on creating doubt about the science of anthropogenic climate change, but we can circumvent the quagmire of this debate. We need to have a conversation, not about if climate change is real, but what we can do about it (Leiserowitz 2013; Bowman, 2014).

Cooper (2011) explains that climate change deniers have been better “educators” because they: (1) empower their audiences by appealing to them as individuals who learn, decide, and act for themselves, and (2) deliver their messages through many forms of trusted media. I believe that scientists can and should take a more interactive role that also empowers conservatives to participate in the production of applied science. Communicators can use the local and professional sources of information already being used by the conservative audience members to educate people on the impacts and benefits that policies and practices are meant to achieve beyond addressing climate change: greater efficiency and personal savings, capital investments that provide energy security, diversified economies that stabilize community finances. Another benefit is climate stabilization, which can be listed with all of the benefits, but it cannot stand alone as the only motivation for people to act.
Graphs and tables are not effective communication tools for the population I studied.
And we need even more case studies that exemplify rural conservatives modeling
climate adaptation or mitigation behavior.

NEXT STEPS

Climate adaptation and mitigation strategies, as well as the communication
campaigns needed to implement them, are location specific. As such, they require
further specific audience knowledge beyond the level of what a coarse survey can
provide. Additional qualitative field research is needed to understand consistencies and
differences amongst communities and resource issues.

My suggestions for communication strategies need to be tested, which mean
more partnerships with boundary organizations and community leadership as well as
outreach to various trade journals. I would also like to pursue a series of follow-up
interviews to enhance my study validity (deMarrais and Lapan, 2004; Hancock and
Algozzine, 2006; Bickman and Rog, 1998) and to examine new questions. For instance,
how has the 2013 change in state policy that returns a large portion of property taxes to
the county affect support for that tax incentive for renewable energy developments?
Have options for a water banking program been pursued? Is this something that the
local cooperative extension program would be willing and able to facilitate? Would case
studies of other farming operations and small communities motivate individuals to
explore implementing local climate solutions?

Specific to climate adaptation, further work is needed to understand how a
water bank works in the context of providing more flexibility in water supplies as well as
providing surplus water during drought years. California water models have projected
that the state can adapt to drier climates because of the statewide water conveyance and storage infrastructure in place, but most of the models show that urban water supplies will have to be supplemented by agricultural water rights. I want to explore how evolving water policies and water conservation efforts impact and benefit rural communities. I expect to expand my research in Northern Nevada into similar communities throughout the West, including agricultural communities dependent on snowpack in the Sierra Nevada and Cascade mountain ranges and communities that have been engaged in water banking programs. Potential case studies include the Washington State pilot water banking program in Walla Walla and the Kern Water Bank Authority that has been operating for two decades and come under controversy in the last couple years when they were sued by the Center for Biological Diversity.

Another avenue for continuing research is exploring how clean energy technology can affect agricultural operations at different scales, and how those benefits and impacts can be communicated across the farming industry. Butte County Rice Growers Association built the first solar powered rice drying facility in 2004, and built a second array five years later. Which policies and financing mechanisms allowed that to be a beneficial investment? How have individual farmers benefited from the solar power at the drying facility? Has it changed their support for state policies that promote renewable energy development? What was the impetus behind the initial investment? Has the association suggested it to others or been featured in trade magazines?

We need to develop and implement climate change mitigation and adaptation strategies at all levels of society and among all groups. Developing solutions that climate change Doubtfuls and Dismissives will incorporate into their activities may be a
challenge, but I do not think it is one that cannot be overcome. Using boundary organizations, co-produced knowledge that incorporates science and the social construction of climate change can be used to create and implement policies and practices, even amongst those that do not agree that climate change is a problem that requires action.
APPENDIX A. INTERVIEW GUIDE

Rural Conservatives View of Climate Change Solutions

Thank you for participating in our research. Your trust is important, so please remember that your responses will remain confidential. This research is to better understand the perceptions and beliefs that rural Nevadans have about potential solutions to climate change and energy solutions. I am also trying to learn how ideas about energy issues are learned and shared with others.

- Some of the questions may seem repetitive, but they ask slightly different things, so please keep answering the questions fully.
- It is not a test, it is an interview, so I am more interested in what you think and believe.
  - If you don’t know how to answer a question, I can elaborate a bit and just let me know what your initial thoughts are.

Introduce yourself/get to know:
- Job
- How long have you lived here?

Climate Change Beliefs
First, I would like to ask some simple questions about your belief on climate change:
- Are you familiar with the term climate change? What do you think about it?
- Is there a difference between climate change, global warming, and the greenhouse effect?
- Do you believe the earth’s climate is changing?
  - Have you seen variations in the climate?
  - In what ways is it changing?
  - What do you believe is causing it?
- Are you worried about climate change?
  - To what extent?
- Do you think climate change will affect you locally?
  - When?
  - How?
  - Any plans to prepare for those changes?
- Are these efforts done on personal scale, regional of district scale, state scale?
- What are those plans?
- Are they for specific industries (agriculture, building efficiency, resource management)?
- Any changes in water supply or soil productivity expected?
- What do you think most scientists believe with regards to climate change?
  - Are scientists in agreement with each other about the state of the climate?
Can you estimate the occurrence of agreement with a rough percentage? (i.e. they are in 100% agreement or they are split 50%/50%, or 25% of the scientist are being paid to lie)

In your estimation how do you think others in the area feel about climate change?

**Climate Policies**
Are you familiar with any proposed solutions or policies that are meant to be a response to climate change?
- What policies do you know about that are meant to be solutions to climate change?
- What do you understand to be the benefits or supportive arguments are associated with those solutions?
- Are there any costs or negative arguments are associated with them?
- Are there strategies that you especially support or disagree with pursuing? Why?
- Would there be a difference in a national policy or a state or local policy?
- How much of a priority should climate change be for the national government? Local government?
- Should local governments take action to adapt to or mitigate climate change?

**Energy Policy**
- Renewable energy technologies are being discussed as important for Nevada.
  - Are you familiar with the term renewable energy? What does it mean to you?
    - Describe examples?
    - Do you support any or all of the renewable energy examples that you listed?
    - Support or oppose some more than others? Why?
    - How do you feel about renewable energy in comparison to, say, nuclear energy production? Why?
    - Do you feel that you understand all renewable energy project to the same degree, or some better than others?
- Because solar is being used as a typical example of renewable energy and has a special standard in NV, I would like to ask you some more specifically about solar energy development.
  - Are you supportive of solar? More or less than other technologies?
  - How is solar being developed in Nevada? When you think of it, what does it look like? Are you familiar with a solar development?
  - Who is benefiting from the solar development? Anyone bearing the cost without the benefit?
  - Are you familiar with the different types of solar technology (trough, power tower, PV)?
  - Do you have any thoughts about solar on rooftops versus solar development on public lands?
- Nevada was one of the first states to adopt a Renewable Portfolio Standard or RPS. Are you familiar with this policy? What do you think about it?
  - If they don’t know, describe it for them and get initial reaction.
  - Nevada established a renewable portfolio standard (RPS) as part of its 1997 restructuring legislation. Under the standard, NV Energy renewable energy resources to supply a minimum percentage of the total electricity it sells. The portfolio requirement has been subsequently revised, to 25% by 2025. The 2009 amendments also raised the solar carve-out, requiring utilities to meet 6% of their portfolio requirement through solar energy beginning in calendar
year 2016. The solar carve-out remains at 5% through the end of calendar year 2015. **AB 3** of 2005 allowed efficiency measures to be used to satisfy a portion of the requirement. To qualify as portfolio energy credits, efficiency measures must be: (1) implemented after January 1, 2005; (2) sited or implemented at a retail customer's location; and (3) partially or fully subsidized by the electric utility. The measure must also reduce the customer's energy demand (as opposed to shifting demand to off-peak hours). The contribution from energy efficiency measures to meet the portfolio standard is capped at one-quarter of the total standard in any particular year. **AB1 of 2007** expanded the definition of efficiency resources to include district heating systems powered by geothermal hot water.

- Do you see any benefits of this policy?
- Are there any problems or difficulties associated with developing renewable energy in NV?
- Do you think we should have a national RPS?

It has been stated that renewable energy sources are usually located far from the population centers that use the energy, so integrated transmission lines are needed.

- What conversations have you had or heard about transmission lines?
- What do you think about integrated interstate transmission lines?
- A national policy for a nationwide integrated grid?

Locally,

- What renewable energy is produced locally?
  - What can be produced locally? Know of plans to develop it?
  - How do you think others in this area feel about renewable energy? Are people generally supportive, opposed? Why?
- Where does your energy come from?
- What types of fuel is used to create your energy?
- Have you been to any county meetings, BLM scoping meetings, or utility hearings regarding any of these projects or proposed projects?
- How close is the plant? Have you visited it?
  - What negative traits are associated with the local renewable energy projects?
  - What positive traits are associated with the local energy projects?
  - Are those traits specific to the renewable resource?

On a more personal level of energy use,

- Have you taken steps to reduce your energy consumption?
  - How? Why?

**Communication (Messages/Messengers)**

The interviews are to not only learn what your opinion of various energy and climate solutions, but also how you learned about and develop those ideas.

- Do you consider yourself to be well informed of current events?
  - Why? Where/how do you get your information?
  - What topics are usually discussed?
    - Local? National? International?
    - Econ, politics, energy, climate?
- How often do you discuss climate change with family/friends?
  - Do most people agree with your views
  - When you do talk about cc, do you give more info, receive more
  - Do these people think you are a good source of info?
• How informed do you feel about your knowledge level of the science of climate change?
• How informed do you feel about the policies and technology associated with solutions to climate change and energy issues?
  o Do you want more information? About what?
  o Where do you look for it? Or where do you receive it?
  o Who specifically (person, show, blog) do you get climate, energy, economic information from?
• Whose responsibility is it to provide this knowledge? Who should they provide it to?

Faith
There is a connection that is often talked about between different faith based organizations and their political influence. There has also been a growing number of inter-faith groups that have become advocates with regards to climate change. As such, I would like to ask you a few questions of about your faith if that is okay?
• Are you a member of a faith based organization, church?
  o How often do you attend?
  o Which religion?
• Does climate change get discussed in your faith meetings?
• Has energy, economics, or national security been discussed at these gatherings?
• Do political issues or representatives come up?
• Are environmental issues addressed at all at these meetings?

Demographics:
Thank you so much for the conversation. I would like to end by asking you some demographic questions. I remind you again, all of your responses will be confidential.
• Age
• Gender
• Education level
• Household Income level
  (ball park figure to the nearest $10,000 mark)
• Can I ask for the nearest cross streets of your residence?

Political Ideology:
• Registered to vote?
• With which political party?
• In what way would you describe your political orientation? (liberal, moderate, conservative)
• When considering a political representative, what factors do you weigh the most when making your decision?
• What considerations do you weigh the most when considering proposed energy policies?
  o Do you often contact your representative or write editorial letters when you support or oppose a policy?
  o Have you attended any scoping meetings or utility hearings with regards to energy production in the region?
Do you consider yourself an activist or actively political?

Is there anyone else you think I should speak with about this issue? Thank you again for your time and participation. Contact information will be provided if you have any questions about the study. Any questions for me about the study or the topics involved?
APPENDIX B. EMERGENT THEMES AND SUB CATEGORIES FROM TEXT ANALYSIS

Adaptation Through Water Conservation
- Threats to Water Supply
- Canal
- Urban
- Lack of Climate Concern
- Weather
- No Control
- Weather Vs. Climate
- Snowpack
- Conservation
- Methods
- Recharge
- Litigation
- Fish and Wildlife
- History
- Policy
- Dixie Valley

Renewable Energy Support
- Preferred Technology
- Nuclear
- Clean
- Yucca
- France
- Fossil Fuels
- Renewables
- Government Roles
- Policies/Regulations
- Research and Development
- Funding
- Public Lands/Siting
- Transmission Lines/Export
- Utility Rates
- Technology Specific
- Limitations
- Support

Communication Strategies
- Sources
- Friends and Family
- Professional
- Self
- Local
- State of Fear
- Relevancy/Values
- Scientist/Experts
- Distrust
- Split
- Age
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Western Regional Climate Center. (2014). Nevada Climate Tracker. Available at: [www.wrcc.dri.edu/monitor/nev-monitor/index.html](http://www.wrcc.dri.edu/monitor/nev-monitor/index.html)


CURRICULUM VITAE
Patricia (Mynster) Dutcher

1895 N Green Valley Pkwy, #524
Henderson, NV 89074
(530) 680-4493
tmynster@hotmail.com

EDUCATION:

PhD in Environmental Science
University of Nevada, Las Vegas
Expected graduation: May 2015
Dissertation: Burdens and Benefits of Climate Change Solutions: a case study of climate skeptics and deniers in Rural Nevada.

M.S. in Environmental Science, policy and management track
University of Nevada, Las Vegas
Conferred: July 2005

B.S. in Earth Systems Science & Policy
California State University, Monterey Bay
Conferred: Dec 2001

AWARDS:
2013 – First Place, Greenspun College of Urban Affairs Graduate Research Symposium
2011 - James Deacon Award for Environmental Studies, UNLV
2008 - UNLV Environmental Studies Department Outstanding Alumnus Award
  For Leadership and Dedication to the Environmental Community
2005 - University of Nevada Las Vegas Graduate Teaching Assistant Excellence in Teaching Award
2003 - Bureau of Land Management National Excellence in Interpretation Award

REFEREED PUBLICATIONS:

Mynster, P., (Author); Andy Jorgensen (Topic Editor). “NCSE-NASA Curriculum Module - Colorado River water supply”. In: CAMEL: Climate Adaptation, Mitigation, E-Learning at:
http://www.camelclimatechange.org/resources/view/170549/

RESEARCH EXPERIENCE:

Graduate Research Assistant, EPSCoR Grant # EPS0814372
University of Nevada, Las Vegas   Las Vegas, NV   Aug 2011– May 2014
- Conducted qualitative case study researching conservative stakeholders’ views regarding water policies, communication strategies, and renewable energy development.
- Developed climate change curriculum modules.
- Assisted in preparation and distribution of grant products including preparing manuscripts, organizing conferences, and presenting research.

Research Assistant, Department of History
University of Nevada, Las Vegas   Las Vegas, NV   Jan 2005 – Aug 2005
- Researched natural resources administration history at Yosemite National Park.

Research Assistant
California State University, Monterey Bay   Seaside, CA   Apr 1999 – Oct 1999
- Conducted bird surveys in density and feeding behavior.

TEACHING EXPERIENCE:

Instructor, School of Sustainability and the Environment
Chatham University   Pittsburgh, PA   Fall 2012
- Developed and taught SUS 501: Fundamentals of Sustainability, a graduate level course for an interdisciplinary program.

Instructor, Department of Environmental Studies
University of Nevada, Las Vegas   Las Vegas, NV   Aug 2002 – Aug 2012
- Instructed ENV 101: Introduction to Environmental Science; 205: Development and Environment.
- Developed and implemented ENV 206: Introduction to Climate Change, a course template that was then used by subsequent instructors in the department.
- Developed and taught ENV 794: Intro to Climate Change, an online graduate level course for high school teachers.
- Acted as advisor to the Sierra Student Coalition and Women’s Rugby Club on campus.
TEACHING EXPERIENCE (CONTINUED):

Content Developer, Climate Adaptation and Mitigation E-Learning (CAMEL) (NSF funded climate education project)
University of Nevada Las Vegas Las Vegas, NV Jan 2010 – May 2011

- Developed, tested, and evaluated climate change curriculum made available through the CAMEL web portal for undergraduate courses.

Part time facilitator, Public Lands Institute
University of Nevada Las Vegas Las Vegas, NV Jan 2010 – Sept 2010

- Led programs on federal lands for grades 4 – 12. Activities included geocaching, hiking, and kayaking.
- Led environmental science activities for grades 4th and 5th on a boat on Lake Mead National Recreation Area through the Forever Earth program. Water samples were collected and analyzed to answer a research question.
- Facilitated outdoor activities on federal lands for Hispanic families through the Families in Nature program.

Supplemental Materials Consultant

- Developed supplemental materials for environmental science textbooks including videos, lecture launchers, and review questions.
- Checked questions and other supplementary materials for accuracy.
- Generated quiz banks.

Teaching Assistant, University of California Environmental Science Academy
Lassen Volcanic National Park Shasta, CA JULY 2001

- Provided instructional support in the field and the lab.
- Facilitated learning and teambuilding activities among students.
- Coordinated transportation and lodging logistics as well as logistics and support for lab supplies and equipment.
TEACHING EXPERIENCE (CONTINUED):

**Program Specialist, The GLOBE Program**


- Conducted professional development workshops for program trainers and teachers so that they can participate in GLOBE research with their own schools.
- Served as liaison between educators and principal investigators.
- Provided outreach support for The GLOBE Program.
- Answered teacher queries regarding program, instruments, and protocols.

**Teacher, Recruitment In Science Education (RISE)**

CSU, Monterey Bay  Seaside, CA  Jan 2000 – July 2000

- Led educational and recreational activities relating to watersheds for at-risk youth.
- Facilitated instructional and recreational activities relating to diverse marine environments as part of SEA Lab Monterey Bay, a residential science camp.

PROFESSIONAL EXPERIENCE:

**Program Coordinator, Spring Mountains National Recreation Area**


- Collected and analyzed guest use data in order to make recommendations on visitor programs and interpretation displays.
- Researched natural and settlement history of the Spring Mountains National Recreation Area.
- Evaluated visitor experiences at existing interpretive displays in order to guide expansion and renovation of exhibit.
- Coordinated on interagency outreach and education projects (podcasts, mobile exhibits, cultural inclusion).

**Conservation Organizer**

The Sierra Club  Las Vegas, NV  Apr 2006 – Aug 2007

- Recruited, trained and supervised volunteers.
- Managed canvassing and phone bank events.
- Created coalitions for local conservation efforts and awareness events.
- Supervised campus organizer; a position I created for UNLV.
- Worked with local and state governments to achieve conservation goals: increasing community recycling and eliminating new coal plants in the state.
PROFESSIONAL EXPERIENCE (CONTINUED):

Ranger, Red Rock Canyon National Conservation Area
ECO Associate Las Vegas, NV Jan 2002 – Aug 2003

- Developed and led K-12 educational programs on and off site, including the award-winning Mojave Max program that used the emergence of the desert tortoise in the spring as a springboard to discuss specialized adaptations.
- Led professional development workshops for K-12 teachers for GLOBE protocols and field trip experiences at the Conservation Area.
- Established partnerships with agencies locally and out of state.
- Monitored trails and cultural sites.
- Served as a guest contact at the visitor center to answer questions and provide interpretive experiences with the exhibits at the center.

MEMBERSHIPS

2009 to Present - Association for Environmental Studies and Sciences (AESS)
2012 - Solar NV, So. NV Chapter of American Solar Energy Society, Board of Directors

CERTIFICATIONS

2013 – Responsible Conduct of Research
2013 - Environmental Dispute Negotiation Training from Concur Inc.
2008 - Educational and Interpretive Programming Evaluation
2006 - The Climate Project Presenter (now the Climate Reality Project)
2005 - Graduate Student Professional Development Program in College Teaching
2002 - GLOBE Trainer

PRESENTATIONS:

PRESENTATIONS (CONTINUED):


Mynster, P. “Conservative Perspectives on Climate Change Solutions.” Santa Clara, CA. Association for Environmental Studies and Sciences annual meeting, 2012.


Hassenzahl, D., Bloom, A. and Mynster, P. “CAMEL Climate Education Workshop.” Portland, OR. Association for Environmental Studies and Sciences 2010

