THESIS

EXPLORING PUBLIC LAND'S ORGANIZATIONAL RESILIENCE AND

COMMUNICATION IN THE CONTEXT OF CLIMATE CHANGE

Submitted by

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WE HEREBY RECOMMEND THAT THE THESIS PREPARED UNDER OUR SUPERVISION BY SARAH ELIZABETH SCHWEIZER ENTITLED EXPLORING PUBLIC LAND'S ORGANIZATIONAL RESILIENCE AND COMMUNICATION IN THE CONTEXT OF CLIMATE CHANGE BE ACCEPTED AS FULFILLMENT IN PART REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE.

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ABSTRACT OF THESIS

EXPLORING PUBLIC LAND'S ORGANIZATIONAL RESILIENCE AND

COMMUNICATION IN THE CONTEXT OF CLIMATE CHANGE

Climate change presents significant ecological and social challenges to natural resource agencies, which are responsible for managing changing landscapes while at the same time communicating the impacts of this phenomenon and associated management responses with an increasingly concerned public audience. In most cases, organizations were not structured to undertake dynamic, interdisciplinary issues, such as climate change and consequently suffer in slow response times and ineffective communication. Due to these challenges this research investigates three separate scales of climate change communication within America's public lands. Research will inform important knowledge gaps pertaining to climate change communication and management in federal land management agencies. The three scales and research perspectives will contribute to a larger investigation, providing multiple insights to a very complex and nuanced challenge of communicating and organizing in an era of rapid environmental change such as climate change.

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ACKNOWLEDGEMENTS

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CHAPTER ONE

INTRODUCTION

There is an overwhelming consensus among the scientific community that global

climate change is occurring as the result of anthropogenic emissions of greenhouse gases

into our atmosphere (IPPC, 2007). Climate change presents significant ecological and

social challenges to natural resource agencies, which are responsible for managing

changing landscapes while at the same time communicating the impacts of this

phenomenon and associated management responses with an increasingly concerned

public audience. In most cases, organizations were not structured to undertake dynamic,

interdisciplinary issues, such as climate change and consequently suffer in slow response

times and ineffective communication. A systems approach has not been the norm of past

organizations and institutions. Yafee (1996) found that a systems focus requires cross-

jurisdictional decision-making, which generally violates the current organizational

structure of land management agencies. As environmental pressures become inescapable

realities, organizations of all sectors have acknowledged the need to restructure their

organizational framework to better respond to climate change both internally and

externally.

Due to these challenges this research investigates three separate scales of climate

change communication within America's public lands:

Scale One: Communicating about Climate Change within Natural Resource Agencies

Scale Two: Communicating Climate Change within the National Park Service (NPS)

Scale Three: Communicating Climate Change to the Public

Scale One: Communicating about Climate Change within Natural Resource Agencies

> *RQ 1: What insights can we share with communication practitioners and public land managers?*

> *RQ 2: What communication principles will help these audiences create effective strategies for communicating about climate change?*

> *RQ 3: How can we best communicate the complexity of climate change impacts and nuances of changes at landscape scales?*

Natural resource agencies in the U.S. have a huge responsibility to protect and manage public lands as well as communicate effectively with diverse publics about impacts of climate change on our nation's treasured landscapes. To better understand the challenges natural resource agencies face when combating climate change, Colorado State University researchers, in partnership with the Office of the Governor of the State of Colorado, hosted a workshop on the challenges and opportunities to communicating about climate change on public lands in the western U.S. The conference was entitled: *Communicating About Climate Change:* A Governor's Initiative Toward a Sustainable West and was held on June 2-4, 2008. Key challenges, considerations, and strategies for communicating with the public about complex scientific issues were identified and discussed for present and future exploration.

There are hundreds of well-organized groups and agencies with agendas for dealing with climate change, but it is possible that this polyvocal public sphere has facilitated more polarization than understanding. To overcome this challenge, organizations and agencies should seek out opportunities to collaborate and cooperate. Creating clear, concise, and consistent messages may alleviate some of the confusion and misunderstandings about climate change. The workshop provided a starting point for improved agency collaboration and coordination, building organizational capacity in communicating climate change.

Scale Two: Communicating Climate Change within the National Park Service (NPS)

> *RQ 1: What enhances the NPS's potential to build organizational resiliency as the agency responds to climate change?*
>
> *RQ 2: What challenges the NPS's potential to build organizational resiliency in response to climate change?*

After determining several challenges to climate change communication within natural resource agencies, scale two will concentrate on understanding the complexity of these issues by conducting an organizational assessment of one land management agency, the NPS. This study examines the motivations and barriers to organizational changes that are taking place at the NPS because of global climate change effects.

This assessment will determine their ability to react, cope, and change to an environmental stimulus, specifically climate change. It will also identify weaknesses and strengths in managing for climate change as well as determining areas and strategies for natural resource agencies to improve upon and to consider during decision-making. This research evaluates NPS' overall resiliency and adaptive capacity to managing and

communicating climate change both as an internal organization and also externally to visitors. The study as a whole will help to test the theoretical understanding of organizational change and resilience, and help to better recognize how climate change pressures are causing transformation within social systems. The results from this study will help inform NPS' strategic response plan for climate change that is currently being developed.

Scale Three: Communicating Climate Change to the Public

> *RQ 1: How do National Parks in the Western United States currently*
>
> *communicate about climate change?*
>
> *RQ 2: Are National Parks utilizing a place-based approach?*

While climate change science is more understood than ever before we still lack sufficient research to effectively communicate and influence behavior on climate change issues. Moser and Dilling (2004) found that there is a widening gap between the individual's awareness of what climate change action is needed and what actions are being taken. Without an understanding of what to do, individuals are left feeling overwhelmed and frightened. Further research on climate change communication will allow public land management agencies to determine communication barriers and effective strategies to reach the public.

Due to this need, scale three is primarily focused on identifying how messages and landscapes of America's National Parks may influence the visitor's perception and understanding of climate change. I propose that Parks and other landscapes offer an opportunity for place-based discourse about climate change through a visceral, material, and emotional experience. I will use place-based discourse as my conceptual framework,

for making sense of public communication about climate change connected to specific and unique landscapes. This framework will be used to analyze artifacts collected at three popular national parks in the Western United States – Rocky Mountain National Park, Yellowstone National Park, and Glacier National Park. This study determines how National Parks are communicating about climate change and if they are using the full potential of this unique place-based approach and communication opportunity.

Research Perspective

The foundation for this research is influenced from an interpretive world view that is not seen in black and white but rather in shades of gray. This interpretive paradigm allows me to combine multiple realities to explore several qualitative approaches to study the research questions concerning climate change communication. While in quantitative research there may be one answer to a question, qualitative research discovers different results depending on the interpretation the researcher uses to study the question (Willis et al., 2007). In the spirit of Glesne's (2006) perspective, "There are many ways to connect the dots…" (p. 19). Overall, this research perspective encourages new creative ideas and methods to explore the same questions we have studied in the past. These principles will allow me a systematic framework from which I can approach the different research scales and data sets.

Methodological Approach

Scale One: Communicating about Climate Change within Natural Resource Agencies

> *RQ 1: What insights can we share with communication practitioners and public land managers?*

RQ 2: What communication principles will help these audiences create effective

strategies for communicating about climate change?

RQ 3: How can we best communicate the complexity of climate change impacts

and nuances of changes at landscape scales?

The workshop convened 41 scientists and public land managers to address how climate change can be discussed by natural resource agencies with their respective visitors and stakeholder groups during the three-day workshop. Several data sources were collected during the workshop including brainstorming exercises, field notes, lectures, personal journals, and surveys. Through facilitated group break-out sessions, participants created communication strategies, including specific messages and delivery mechanisms, which could be used with different audiences to capture attention and ultimately inspire action on the climate change issue.

The combination of facilitation, observation, and participation will allow me to gain an in-depth understanding of the intricacies of climate change communication within the context of public lands. Content analysis of data will be used to explore emergent codes applicable to communication challenges and strategies. Analysis will reveal prevailing themes and messages that demonstrated the viewpoints of workshop participants.

Scale Two: Communicating Climate Change within the National Park Service

RQ 1: What enhances the NPS's potential to build organizational resiliency as the

agency responds to climate change?

RQ 2: What challenges the NPS's potential to build organizational resiliency in

response to climate change?

In order to conduct an organizational assessment I developed a data collection instrument which can be found in Appendix A. This instrument is to guide electronic surveys and interviews for NPS employees. The NPS sample consists of a nonprobability sample which was purposefully selected by NPS' Climate Change Coordinator to represent the different levels of employees within the agency: National, Regional, and Park. This is intended to provide a good representation of the agency as a whole as opposed to a top-down hierarchical viewpoint. The study was designed to consist of purely qualitative methods. These eight open-ended questions were created to encourage in-depth organizational perspectives. Questions addressed topics such as the main challenges in dealing with climate change, long-term issues, barriers to responding to challenges, organizational structures that limit communication, the NPS's effectiveness to cope with climate change, and the joys and opportunities in working in response to climate change. A qualitative methodology is the most useful and appropriate approach to gather in-depth and detailed insight on NPS. However, I do note that it would be beneficial to include a quantitative component in the future to explore findings that are generalizable to other organizations.

Employees were instructed to complete the survey and send the results back electronically. Once receiving the e-mail, I copy and paste the data from the e-mail into a document representing their employment in the National, Regional, or Park level. The e-mail is then immediately deleted, in addition to the name of the employee from the data set to ensure confidentiality. In some instances, the survey is administered as a semi-structured telephone interview. In these cases, interviews are recorded and transcribed before analyzed.

Before choosing an analysis method for the data, I explored a few mapping exercises to view the data through a different lens. This included both taxonomy (see Figure 1) and domains (see Figure 2) which led me to my current methodology. I conclude that it will be best to conduct a modified grounded theory coding process for the qualitative data analysis (Straus & Corbin, 1990). This includes a line by line data analysis including processes of open coding, axial coding, and a process of constant comparison. For the purposes of this research I will perform an initial coding analysis to discover key themes amongst the data set. Codes will then be developed iteratively as I employee a comparison process.
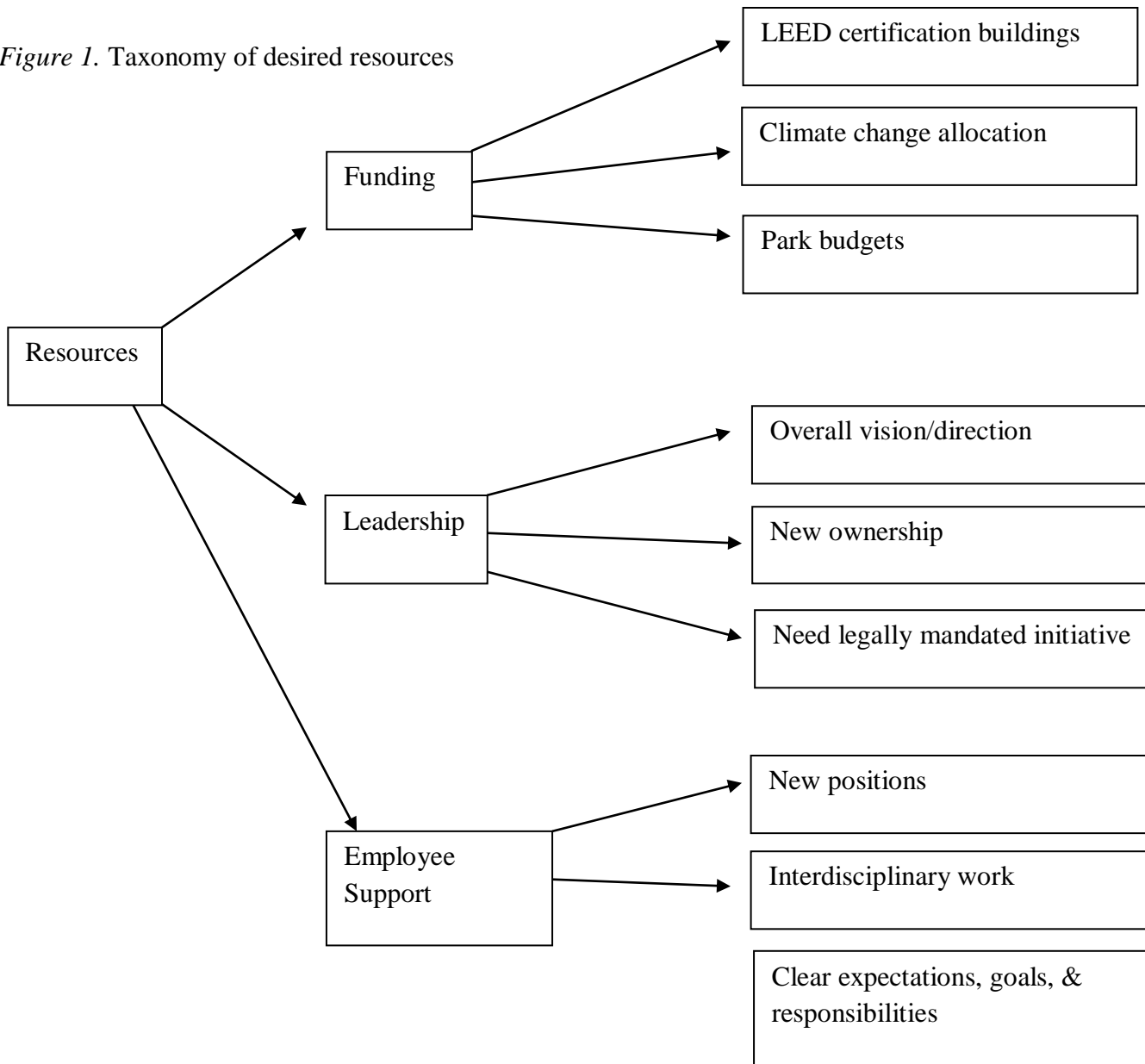
Figure 1. Taxonomy of desired resources

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                                            ┌──────────────────────────────┐
                                            │ LEED certification buildings │
                                            └──────────────────────────────┘

                          ┌─────────┐       ┌──────────────────────────────┐
                          │ Funding │────────│ Climate change allocation    │
                          └─────────┘       └──────────────────────────────┘

                                            ┌──────────────────────────────┐
                                            │ Park budgets                 │
                                            └──────────────────────────────┘

 ┌───────────┐
 │ Resources │
 └───────────┘                              ┌──────────────────────────────┐
                                            │ Overall vision/direction     │
                                            └──────────────────────────────┘

                          ┌────────────┐    ┌──────────────────────────────┐
                          │ Leadership │─────│ New ownership                │
                          └────────────┘    └──────────────────────────────┘

                                            ┌──────────────────────────────┐
                                            │  Need legally mandated        │
                                            │  initiative                   │
                                            └──────────────────────────────┘

                                            ┌──────────────────────────────┐
                                            │ New positions                │
                                            └──────────────────────────────┘

                          ┌────────────┐    ┌──────────────────────────────┐
                          │ Employee   │─────│ Interdisciplinary work       │
                          │ Support    │    └──────────────────────────────┘
                          └────────────┘
                                            ┌──────────────────────────────┐
                                            │ Clear expectations, goals, &  │
                                            │ responsibilities              │
                                            └──────────────────────────────┘
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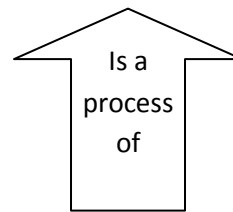
Figure 2. Domain of organizational challenges and opportunities

Organizational Motivation

Is a
kind of
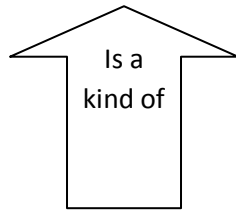
- Challenge
- Protect future generations
- Problem solving
- Effective leadership
- Interagency coordination
- Defining success

New climate change leadership

Is a
process
of

- Climate change committees
- Pacific North West region
- New Director of climate change position
- Climate change steering committee
- Interdisciplinary work

Organizational Re-structure

Is a
reason
for
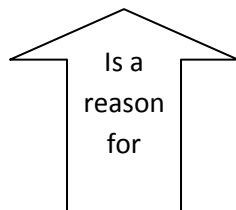
- Feudal system structure
- Lack of interdisciplinary work
- No overall vision
- Disorganization
- Decentralization
- Plans need to address climate change
- Priorities change often

Organizational Barrier

Is a
kind of
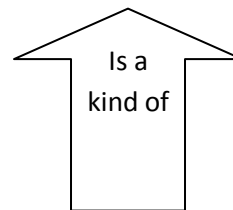
- Lack of communication
- Lack of funding
- Lack of climate change vision
- Short term goals over long term goals
- No sense of urgency
- Planning processes take too slow
- Employee turnover

Scale Three: Communicating Climate Change to the Public

>*RQ 1: How do National Parks in the Western United States currently*
>
>*communicate about climate change?*
>
>*RQ 2: Are National Parks utilizing a place-based approach?*

This proposed research combines rhetorical and observational studies in America's National Parks. The project explores how Rocky Mountain National Park, Yellowstone National Park, and Glacier National Park are communicating about global climate change through a generative rhetorical analysis of a combination of artifacts. Generative rhetorical analysis allows the flexibility to generate units of analysis based on relevant theory (Foss, 1996). This analytical process focuses my lens and illuminates significant features of the artifacts, which allows me to determine how National Parks in the Western United States currently communicate about climate change and if they are utilizing a place-based approach.

The study is an analysis of the artifacts that were collected or seen at these parks during extended visits between May 2008 and August 2008. I experience and interpret many of the messages a typical visitor would be exposed to while touring these parks: ranger-led programs, photographs, films, tours, brochures, books, and exhibits. Each examination of the artifacts allow me to discover further information, relationships, and patterns linking the whole set of artifacts (Foss, 1996). Engaging in a closely conducted analysis will identify key terms and themes allowing me to explore the context and meaning of the communication tool. Conceptual frameworks such as place-based discourse, connection to place, and place-based education will help create units of analysis in which I use to analyze the artifacts.

Through open coding I identified and analyzed common climate change themes across various forms of messages (i.e., brochures, ranger talks, interpretive boards). I began with an open-reading and open-coding of all of the collected textual materials, then the research team compare open codes, discuss, and negotiate to reach main coding categories. The research team agreed that these codes capture the main messages about climate change presented in literature received at the Parks.

My goal is to analyze each park as a complete artifact; I read the Park's communication as well as the Park's landscape to determine whether a place-based discourse is being used and whether it was an effective strategy for visitors to make sense of climate change. In determining whether a place-based framework is used I analyze the park's messages for evidence of appeals to one's connection to the place and messages designed with an understanding of place-based education. Through this process I will identify examples of place-based discourse. The open codes combined with the three principles of a place-based discourse, informed by theory, provide a framework to interpret messages about climate change.

Broader Significance

According to the Intergovernmental Panel on Climate Change, carbon emissions are recommended to be reduced at least 25 to 40 percent from 1990 levels in order to mitigate adverse social-ecological effects. (Gupta et al., 2007). This response will require effective communication efforts focused on connecting climate change impacts to human behaviors. As the United Nations Educational, Scientific and Cultural Organization (2009) points out however, it is not only necessary that people understand the issue but

that they "respond to the nature, causes and consequences of climate change" (p.3). This research is intended to explore these issues in-depth.

Overall, we believe the conceptualization and operationalization of this research has the potential to contribute to a deeper, multifaceted understanding of organizational change and communication in the face of climate change. This research contributes to finding innovative solutions to very complex problems that we are all facing globally. The principles of this research can be shaped to meet the needs of any place or cultural context around the world.

Research will inform important knowledge gaps pertaining to climate change communication and management in federal land management agencies. The three scales and research perspectives will contribute to a larger investigation, providing multiple insights to a very complex and nuanced challenge of communicating and organizing in an era of rapid environmental change such as climate change. A master's thesis and manuscripts which will be submitted to journals for publication will be part of the product of this research. Additionally, research will inform NPS' strategic response plan on climate change.

<div align="center">Road Map</div>

This thesis explores three separate scales of climate change communication within America's public lands. Each scale is discussed in the following journal or academic book submissions:

Scale One: Communicating about Climate Change within Natural Resource Agencies

Journal Submission:

Schweizer, S.E., Thompson, J.L., Teel, T., & Bruyere, B.L. (2009).

Strategies for communicating climate change impacts on public

lands. *Science Communication, 31*, 266-274.

Scale Two: Communicating Climate Change within the National Park Service

Journal Submission:

The article will be submitted March of 2010 to Human Ecology Review.

Scale Three: Communicating Climate Change to the Public

Academic Book Submission:

Schweizer, S.E. & Thompson, J.L. (2010, in press). Place-based learning

and discourse: Communicating climate change in America's

National Parks. In Carvalho & Peterson (Eds.), *Governance*

Communication and the Political Aspects of Climate Change.

CHAPTER TWO

COMMUNICATIONG ABOUT CLIMATE CHANGE WITHIN NATURAL

RESOURCE AGENCIES

Introduction

There is an overwhelming consensus among the scientific community that global

climate change is occurring as the result of anthropogenic emissions of greenhouse gases

into our atmosphere. While the Earth experiences climatic changes through time,

compelling empirical and simulated data depict these changes are occurring more rapidly

than at any other period in recent human history (Christensen et al., 2007). Climate

change presents significant ecological and social challenges to natural resource agencies,

which are responsible for managing changing landscapes while at the same time

communicating the impacts of this phenomenon and associated management responses

with an increasingly concerned public audience. Arguably, many of these agencies were

not designed or organizationally structured to address such interdisciplinary issues that

transcend agency boundaries, nor have they been fully equipped to communicate the

nuances of such complex topics with the public. Effectively dealing with the challenge of

climate change will require thoughtful and coordinated responses across multiple

agencies, communities and landscapes. Further, agency coordination of communication

efforts will be critical to ensuring the public receives clear, consistent messages about

climate change. Given the uncertainty that often surrounds this issue, consistency will be key to building greater consensus among the public and gaining support for future climate change initiatives.

To contribute to improved agency coordination and capacity building in climate change communication, the Warner College of Natural Resources at Colorado State University, in partnership with the Office of the Governor of the State of Colorado, hosted a three-day workshop in June 2008 on the challenges and opportunities to communicating climate change on public lands in the western United States. The workshop convened 41 scientists and public land managers to address how climate change can be discussed by natural resource agencies with their respective visitors and stakeholder groups. The approach used during the workshop consisted of the following four components: First, following presentations by lead scientists with expertise in climate change impacts, participants worked to distill climate change research into a series of explicit, uncomplicated "message themes" for use in agency communication efforts. Second, a team of social scientists offered their recommendations for overcoming challenges to effective communication with the public about complex scientific topics, specifically climate change. Included in this was an overview of prior research regarding public understanding of climate change to-date. A third component of the workshop focused on exploring what participating agencies are currently doing in the area of climate change communication. Finally, through facilitated group break-out sessions, participants were asked to build upon what they had learned throughout the workshop to design communication strategies, including specific messages and delivery mechanisms, which could be used with different audiences to capture attention and

ultimately inspire action on the climate change issue. Here we offer a summary of ideas generated from the various components of this workshop, including a set of 10 key principles for effective climate change communication in a land management context.

Challenges to Effectively Communicating about

Climate Change on our Public Lands

Nearly 30% of the United States is designated as federally owned and managed public lands. With this privilege comes a monumental responsibility and opportunity to communicate the impacts of climate change to the public. It could be argued that land management agencies have the potential to effectively disseminate information and educate audiences in more depth than popular media. Agencies annually captivate the attention of millions of visitors; enthralled with majestic landscapes and historical-cultural treasures. Parks and protected areas seem to be an ideal venue to inform, influence perceptions and empower behavioral action concerning climate change.

Many factors have challenged the effective communication of climate change science to the public. There is an enormous time lag in the change in climate and changes in our social system coupled with the assumption that the impacts of climate change most directly affect people and animals far away (Moser & Dilling, 2004). For this reason, individuals rarely see climate change as a local issue or related to places they value (Bostrom & Lashoff, 2007). There is also a widening gap between the public's awareness of what action is needed and what actions are being taken. Without an understanding of what to do, individuals are left feeling overwhelmed and frightened (Moser & Dilling, 2004).

The leading challenge in communicating about climate change with the public is that we do not have many local examples or stories that argue global climate change is happening now and impacting our current life and landscape. It is difficult to attach any one event to climate change; it's the trends and patterns over a longer period of time, which also requires that the public stay engaged over a longer period of time. Americans seem to accept climate change as a real phenomenon, but the challenge that appears the most pervasive is that most do not seem to have a great deal of concern about it (NSF, 2006; Pew Global Attitudes Project, 2006). Polls report that people feel "there's nothing they can do about it – or that someone should do something about it, but that someone isn't them" (Galst, 2008, p. 68). Instead the perception of global warming is that it is a risk far off in the future that will primarily impact people, animals, and places in distant locations (Leiserowitz, 2007). Overcoming this challenge requires that climate change communicators connect human choices and behaviors to the cause of climate change events by educating their audience on the complexity of system dynamics.

To overcome these barriers, organizations and agencies should seek out opportunities to collaborate by creating clear, concise, and consistent messages about climate change. Discussions throughout the workshop revolved around identifying fundamental principles for effective communication about climate change science and impacts to the public. In addition, workshop participants discussed how to overcome the typical *doom and gloom* messages about climate change. Participants also learned about prior research regarding public understanding of and communication about climate change. Six specific insights emerged during the workshop and guided the participants' development of key messages about climate change: (1) While, an abundance of

scientific research has outlined the concerns about climate change for years, the science about climate change has cast it is serious issue, the *balanced coverage* ethic of the media in the United States led to a period of uncertainty among policy-makers and the public (Boykoff, 2005; Boykoff & Boykoff, 2004; Corbett & Durfee, 2004; Gelbspan, 2005; Tolan & Berzon, 2005). (2) *Doom and gloom* messages can be effective for raising awareness about an issue, but can, discourage people from taking action (Slovic, 1993; Thompson & Schweizer, 2008). (3) Desired behaviors to mitigate climate change must be linked to a person's values, beliefs and attitudes regarding the behavior (Moser & Dilling, 2004; Moyers, 2005; Teel, 2008; Von Storch & Krauss, 2005). (4) Messages about climate change should appeal to both cognitive and affective dimensions (McKibben, 2007; Fitzgerald, 2007; Teel, 2008). (5) Using a place-based approach to discuss climate change impacts on specific regions, communities and locations has promise in making messages more effective (Fitzgerald, 2007; Grossman, 2005; Thomashow, 2002; Thompson & Schweizer, 2008). (6) There is no one-size-fits-all message. The *general public* does not exist, so effective outreach to diverse audiences will require multiple communication strategies and messages (Moser & Dilling, 2004; Thompson & Schweizer, 2008).

The agency representatives, climate change experts and workshop participants spent the first day filtering through several presentations and current research literature to identify the core messages they want to communicate about climate change. In an effort to focus their communication efforts and design coherent, cross-agency communication strategies, the participants agreed on nine key messages about climate change and its impacts:

1. Human choices impact climate change.

2. The impacts of climate change are occurring more quickly than initially predicted.

3. The future will look different, and we must adapt to it.

4. Climate change impacts will vary by location. Some areas will become hotter, some colder, some drier and some wetter.

5. Climate change is like gravity – affects everyone.

6. Climate change affects you and the places important you.

7. Addressing climate change will require a combination of actions at multiple scales, from international, national, state and local policy to individual behaviors.

8. Climate change will have significant social and economic impacts. This is not only a matter of saving the planet, but also saving ourselves.

9. You can help make a difference in addressing climate change.

The workshop participants agreed that these messages have the potential to effectively capture attention and inspire action among a variety of audiences. Throughout the rest of the workshop, participants worked in small groups to develop communication strategies. They began by selecting a target audience, refining the key messages to resonate with that audience and brainstorming how to best disseminate the message.

Example Strategies for Communicating about

Climate Change Impacts on our Public Lands

For public land managers, climate change is an issue of dynamic scientific and socio-political complexity, and consequently, plans for communicating about it need to be carefully developed, based on sound science and aligned with best practices of communication. Throughout the workshop participants developed several message strategies; Table 1 and Table 2 outline message design efforts during group break-out sessions.

Table 1. Climate change communication message for park visitors

Target Audience:	Visitors to a National Park
Key Messages:	"Our everyday actions outside the park affect the natural resources inside this park you enjoy." "Collectively, we can make a difference to minimize the impact of climate change." "Practice new behaviors during your visit! At this park you can (insert relevant behaviors here)."
Message Delivery Considerations:	Brochures distributed at entrance booths Interpretive presentations by rangers at visitor centers and during park programs/activities

Table 2. Climate change communication message for educators and students

Target Audience:	Educators & Students
Key Messages:	"Climate change is real, and specific impacts are occurring." (Emphasize tangible examples tied to local places.) "There is still a lot we don't know." "There are specific actions you can take to help." (offer examples; personalize and focus on the positive)
Message Delivery Considerations:	Use interactive online activities and content development tools; incorporate technology.

	Keep things simple.
	Incorporate messages into existing nature-based education programs (learning from what works for other issues), and make it fun for kids!
	Messages should demonstrate how climate change is important and relevant to them; communicate how they can make a difference with their actions.
	Link messages to local issues, local places and local charismatic wildlife.
	Carbon footprint calculators are an example of a strategy that could be used to reach kids as well as adults.
	Link children to children of the same age group in other parts of the world where climate change impacts are evident (e.g., via online discussion), so they can learn about what others are experiencing.

10 Key Principles for Communicating about Climate Change

Based on current research about communicating climate change, coupled with the practitioner expertise present at the workshop, we propose a set of 10 key principles for effective climate change communication. While many of these principles are based on the principles of effective communication in any situation, several are particularly relevant and effective for land management agencies communicating about climate change. Ultimately, these principles, taken as message design suggestions create a coherent set of guidelines to help land management agencies, journalists, scientists and citizens produce more effective messages about climate change.

1. Know your audience and select a credible messenger for that audience.

2. Know what type of claim, argument you are asserting and why it is appropriate for your audience. Lead with your strongest argument or your most confident point.

3. Connect your message to cultural values and beliefs; people react to traditions, experiences and shared values – not abstract concepts and scientific data.

4. Make the message meaningful; appeal to values that are meaningful for your audience.

5. Make the message empowering; tell your audience what specific actions they can take to make a difference.

6. Encourage your audience to engage in systems-thinking, and help them to understand dynamic interrelationships and interconnections.

7. Partner with other organizations, key players, leaders, employees, rock bands, and neighbors.

8. Start from the inside – get your organization's top leaders involved, inspire action internally first, then communicate about it.

9. Communicate about actions and remember that actions and events are an effective mode of communication.

10. Situate the issue in a specific location or place.

Scientists, communicators and stewards of public lands should consider these strategies when developing climate change messages. They can begin by focusing on presenting local climate change impacts that are occurring right now, making climate change an issue that is current and salient to community members and decision-makers. Providing relevant, contextual examples will encourage and influence individuals to

make positive changes to combat climate change on a local, regional, national and global scale. In order to make a significant impact on visitors' awareness and behaviors, land agencies must create a way to link people to tangible and accessible climate change issues that occur on the land (Thomashow, 2002).

CHAPTER THREE

COMMUNICATING CLIMATE CHANGE WITHIN THE NATIONAL PARK SERVICE

Introduction

In this study we propose that a resilience framework is an effective strategy for assessing organizational change. Global climate change presents significant ecological and organizational challenges to organizations and institutions. In most cases, organizations were not structured to undertake dynamic, interdisciplinary issues, such as climate change and consequently suffer in slow response times. A systems approach has not been the norm of past organizations and institutions. Yafee (1996) found that a systems focus requires cross-jurisdictional decision-making, which generally violates the current organizational structure of land management agencies. As environmental pressures become inescapable realities, organizations of all sectors have acknowledged the need to restructure their organizational framework to better respond to climate change. Ginsberg (1988) provides a framework to analyze internal and external changes organizations face; the model explores how changes can hinder and encourage change. A resilience approach builds on this preliminary framework in order to better understand organizational change in times of complexity and uncertainty. Further research is needed to understand how to create resilient organizations that can effectively manage themselves as they respond to rapid global environmental change. In this study we apply

an organizational resilience framework to the United States' National Park Service (NPS) and their initial approach to managing and responding to rapid climate change. We offer the following research questions to frame our investigation:

RQ 1: *What enhances the NPS's potential to build organizational resiliency as the agency responds to climate change?*

RQ 2: *What challenges the NPS's potential to build organizational resiliency in response to climate change?*

The goal of this project is to apply the principles of social-ecological resilience theory to the challenges inherit in responding to climate change at the institutional level. We focus on the history and transformation of ecological resilience into frameworks currently being used for evaluating and developing resilience in social-ecological systems, such as federal land management agencies. For the purpose of this study, we define an organization as a networked or structured group of people who work together to achieve a specific mission or set of goals.

We developed an organizational resilience framework, which became the basis for an in-depth case study of the NPS. This investigation examined the agency's ability to react, cope, and change to an environmental stimulus, specifically climate change. The findings from our case study allow us to test our theoretical understanding of organizational change and resilience, and help us to better recognize how climate change pressures transformation within social systems.

Ecological Resilience

The theory of resilience in ecological systems was first introduced in Holling's (1973), *Resilience and Stability of Ecological Systems.* He uses the spruce budworm and

spruce-fir forests of eastern Canada to discuss these two types of behavior in ecological systems. Holling (1973) defines resilience as "…the persistence of relationships within a system and is a measure of the ability of these systems to absorb changes of state variables, driving variables, and parameters, and still persist" (p. 17). Today, the Resilience Alliance (2008) defines ecosystem resilience in a similar way, "...the capacity of an ecosystem to tolerate disturbance without collapsing into a qualitatively different state that is controlled by a different set of processes. A resilient ecosystem can withstand shocks and rebuild itself when necessary" (p. 1).

Holling (1973) measured resilience by examining the boundary of a domain as opposed to centering on the equilibrium through a stability lens. He recognized that while measuring stability is more convenient, it does not show the true character and interconnectedness of an ecological system. Holling (1973) discussed the need for land managers to stay flexible in order to develop the capacity to adapt to uncertain and unexpected environmental changes that the future holds.

Ecological resilience models are often used as tools for understanding ecosystem processes including population and landscape ecology in adaptive resource management practices. Holling (1995) proposed an adaptive cycle model that was originally designed to interpret the resilience of complex ecological ecosystems. Every system circulates continuously through exploitation, conservation, release and then reorganization. This insight, founded on the understanding that the natural system is one of change rather than one of equilibrium, has provoked researchers in many fields to ask questions about how they view and measure the systems in which they study.

Holling's adaptive cycle model provides a better understanding of system dynamics that links together system organization, resilience, and complex dynamics. This model has also been used to understand the relationships between social-ecological dynamics (Berkes & Folke, 1998). This same cycle can be used to examine land management organizations. The foreloop explores the slow phase of an organization's growth and accumulation of potential while the backloop examines the rapid transformation and restructuring within an organization. The following section, we explore opportunities for interpreting ecological resilience in the context of organizational change.

Social-Ecological Resilience

Adger and colleagues (2002) defined social resilience as: "…the ability of a community to withstand external shocks and stresses without significant upheaval" (p. 358). Likewise, the Resilience Alliance (2008) assures us that, "Resilience in social systems has the added capacity of humans to anticipate and plan for the future" (p.1). Resilience scholars have studied the ability of social systems to reorganize and renew following environmental change (Berkes et al.,2003; Tompkins & Adger, 2004). The concept of social-ecological resilience is centered on understanding how society behaves and adapts to environmental changes. When social systems have the capacity and flexibility needed to manage these stresses, such as a natural disaster or rapid climate change impacts the community remains resilient.

Adger (2000) provides examples of the connection between social and ecological resilience in his Vietnam mangrove case study. He explains, "The ability to absorb these changes depends on social capital but also on the role of surprises and the characteristics

of the resource system" (p. 359). The resilience of a social-ecological system is also determined by the dependence of a social group on a single ecosystem, in this case, the mangrove ecosystem. The dependence on a single resource can lead to high levels of social vulnerability and stress within a social system. Decisions and actions taken to counter environmental changes are often intended to reduce vulnerability and enhance the resilience of a social system and its adaptive capacity (Nelson et al., 2007; Tompkins & Adger, 2004). For example, a social group may decide to change crops, timing, or the species in which they sustain life from in order to increase resilience and maintain their desired way of life.

Nkhata, Breen, and Freimund (2008) suggest that a resilient social system must understand the complexity of the relational change that is taking place in the environment to successfully re-organize. There will always be a degree of uncertainty about how ecological processes will unfold, and because of this, it is even more important to determine how we can create resilient social-ecological systems that have the ability to withstand unanticipated change and disturbances. Institutions and organizations are the key determinants linking the non-linear relationships between social and ecological resilience (Adger, 2000). Because of this significant relationship, we conceptualize organizational resilience, and the possibilities that it offers for understanding organizational and institutional responses to the unpredictable impacts of global climate change.

Organizational Resilience

The concept of organizational resilience is relatively new and provides a unique lens to understand how institutions remain resilient in the context of rapid change.

McManus and colleagues (2008) defined organizational resilience as "…a function of an organization's overall situation awareness, management of keystone vulnerabilities, and adaptive capacity in a complex, dynamic, and interconnected environment" (p.82). We believe this definition is easy to comprehend and covers a broad spectrum of resilience qualities for all types of organizations. At present time there is very little research on how organizational change can actually benefit the natural environment (James et al., 2007); however, conceptualizing organizational resilience with organizational change may help to better understand how institutions respond to and impact environmental changes. It also allows us to evaluate and understand how organizations perform and prepare before, during and after large-scale environmental changes (McManus, 2007). Organizations and institutions can play a huge role in building resilience in communities by managing for a state of continuous change rather than a state of equilibrium. Brundson and Dalziell (2005) stressed the importance of staying focused on the future in order to create more resilient organizations, and ultimately communities.

It is important to remember that environmental changes do not always lead to negative outcomes for organizations, institutions and society. Folke (2006) reminds us, "…a resilient social-ecological system, disturbance has the potential to create opportunity for doing new things, for innovation and for development" (p. 253). Environmental changes force us to adapt and be innovative, especially in how we organize and communicate. High resilience allows for institutions to successfully cope with environmental changes by promoting organizational and social learning and developing new creative ideas to address external environmental pressures. Collaborative management, adaptive management, co-management and interdisciplinary work have

been shown to be effective strategies for collective decision-making to build resilience in social-ecological systems (Walker et al., 2006, Berkes et al., 2003). Adaptive management and active learning is necessary in a world of assumed constant flux and change. Tompkins and Adger (2004) suggest that, "…adaptive management processes, increase present-day resilience, which can in turn increase the ability to respond to the threats of long-term climate change" (p. 2).

We build our framework on a limited set of case studies, most from the Resilient Organisations program in New Zealand. We used principles from McManus' (2007) work on natural disaster events and organizational resilience and adapted them to understand how the NPS was dealing with issues related to responding to climate change.

Organizational Resilience: A Climate Change Framework for NPS

We propose an integrated framework to understand organizational responses to climate change, rooted in the recent work and case studies of resilience theory. Our proposed framework provides a foundation for how organizations, specifically land management agencies, change and adapt in the context of climate change. Many agencies have recognized that there is no structured mechanism for coordinating climate change communication and management efforts. The traditional agency structure does not have the capacity to change as quickly as the climate is changing. They now need to manage at landscape scales instead of traditional boundaries and jurisdictions, which is forcing a shift in responsibilities. Effectively responding to the challenge of climate change will require thoughtful and coordinated responses across the agency. By analyzing organizational change, from this perspective, we hope to create an integrated

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mechanism to help organizations, such as land management agencies increase their resilience to climate change.

We chose to look at one specific case to better understand the complexity of climate change issues within an organization. We explore Stake's (2005, p. 443) epistemological question: "What can be learned about the single case?" Through our investigation, we were able to identify current needs for effectively managing resources and evaluating past performances, achievements, and failures in responding to climate change. This case is a combination of an intrinsic and instrumental case study (Stake, 2005). It is considered an intrinsic case study because we are interested in better understanding NPS as one specific case. The NPS case study we present is an analysis of past experiences and present needs which has a practical application as well as instrumental theoretical implications. We believe this analysis provides the agency with a foundation to determine future opportunities to build NPS' adaptive capacity and resilience across multiple disciplines and scales.

Theoretically, we offer insight into the operationalization of a resilience framework as an evaluation tool for analyzing how NPS responds to climate change. Through this operationalization we aim to understand how NPS enhances or hinders the potential to building resiliency toward an effective climate change response.

Method

In order to test our theoretical framework and identify organizational challenges to building climate change resiliency within the NPS; we took an in-depth case study approach, including qualitative interviews with members situated at multiple scales

within the organization. We interviewed 36 NPS employees through open-ended electronic surveys or semi-structured interviews (Patton, 1990). Twenty six employees completed the open-ended survey and sent the results back electronically. We conducted 10 semi-structured telephone interviews in the place of electronic surveys. Interviews ranged from 20 minutes to two hours in length. Interviews were audio-recorded and transcribed with the permission of employees.

This was a nonprobability sample in which participants were purposefully selected by NPS' Climate Change Coordinator to represent the different levels of employees within the agency: National, Regional, and Park. This sampling strategy was intended to provide a representation of the agency as a whole as opposed to a top-down viewpoint. Other interviewees were suggested as the interviews progressed using a snowball sampling method.

We asked eight open-ended questions to encourage in-depth organizational reflection among the participants. These interview questions were developed with insight from NPS' Climate Change Coordinator. This inside perspective allowed us to test questions for clarity and richness (Glesne, 2006). Probing questions followed key questions to encourage a deeper response from the participants (Patton, 1990). In attempt to ensure anonymity while illustrating cross-scale perspective, employee participants will be referred by their position within the agency. Questions addressed topics such as the main challenges in dealing with climate change, long-term issues, barriers to responding to challenges, organizational structures that limit communication, the NPS's effectiveness to cope with climate change, and the opportunities in working to respond to climate change.

Interviews and open-ended electronic surveys were analyzed using a modified grounded theory coding process (Straus & Corbin, 1990). We explored the data through interpretive approaches such as written memos, taxonomies, and domains in order to view the data through different perspectives.

We conceptualized categories for the taxonomies and then created domain variables. We began to consider a few analytical questions that stimulated the domain and taxonomic analysis. What are the organizational barriers to managing climate change? Are there any internal or external motivations for working with climate change issues? Is climate change leadership needed and what already exists? How does NPS need to reorganize in the future to best manage climate change? What resources are needed now and for the future? In addition, we discovered that we saw reemerging themes that we previously had created in previous code books. This reaffirms that our past codes are accurate based on reoccurrence in the data set. The taxonomies were also used to study relationships within and across the different domains. We found new ways of thinking about the data and generated new domains that were not previously seen in the same way during the previous process of analyzing and coding.

Qualitative analysis of the data proceeded as follows: reading all data, developing inductive themes and categories, then engaging in a process of constant comparison that allowed new insight and revision of categories. Throughout this process we identified key themes regarding NPS's climate change response and resiliency potential.

Interviews were supplemented and reinforced by a larger project in which we were participant-observers for two years. During this time we facilitated, participated, and observed: official documents, e-mail listservs, climate change working group calls,

and meeting summaries. This background allowed us to further our understanding of the climate change issues facing NPS. We believe the following results capture a representative sample of the NPS' climate change experiences. In the following section, we explore how a resilience framework can be used to understand how the NPS is responding to rapid climate change.

Results

We present results through five codes that emerged through analysis: (1) leadership, (2) communication and collaboration, (3) science, training, and decision-making, (4) holistic view (5) money, time, and employees. In particular, we offer insight into elements that enhanced resilience and those that hindered resilience as NPS responds to climate change. Additionally, we include opportunities for NPS to build resilience when appropriate.

Leadership

Leadership is one of the most important elements for overall resilience in an organization (McManus, 2007). Effective leadership can improve the organization's adaptive capacity by supporting daily tasks. This not only improves the working environment but prepares the organization for larger problems beyond daily operations. In the case of NPS, the majority of employees who participated in this study noted a lack of leadership and direction from members who hold influential or supervising positions (86%). A National level member noted this weakness:

…there are members of the senior leadership of the National Park Service who simply do not believe in climate change, who only grudgingly permit staff the resources to think about and work on it, and who have demonstrated a lack of

willingness to advocate for or commit resources to address it. Individuals in leadership positions need to lead, not stifle.

Stanton (2008) found that hierarchical top-down actions must generally be taken in order to change priorities of federal agencies. Respondents verified this by expressing the need for their supervisors to declare climate change as a priority and allocate the necessary resources. Many employees and regions have been left floundering as they wait for leadership to follow through. Sixty nine employee participants noted feeling overwhelmed, not being able to affect climate change, or lost as to what action was appropriate.

Throughout the interviews NPS employees expressed a desire for a consolidated approach that would unite all levels of the NPS under one climate change vision. One employee noted the current frustration, "It's clear that there is an organizational response to climate change but I am not necessarily sure it is an organized one which is unfortunate." Another suggested:

…[NPS needs to] start with a common understanding of the issue. Develop a common vision for the where we want to end up in 10, 50, and 100 years. Expectations, responsibilities and authorities need to be clear. If we expect people to focus on something, it should be in their personal performance plan.

Interviewees revealed that National leadership has the ability to empower or hinder climate change initiatives. One Park level employee reported the need for, "Progressive and enlightened leadership that understands the magnitude of the challenge we face from climate change." It seems that employees eagerly wait to rally behind this

cause; however, this remains a lost opportunity for increased resilience as employees wait

for guidance.

Communication and Collaboration

Communication within the agency is necessary; however, 83% of study

participants recognized a number of issues that prevent effective communication at

various scales of NPS. A Regional employee stated:

> Our NPS culture tends to work mostly within our disciplines and teams, not
>
> always taking the time to develop relationships with other teams and strategize
>
> ways of working more closely together. We don't have many communication
>
> networks that cross between disciplines or take the time to inform them about the
>
> projects being planned and gain others' perspectives on ways to accomplish
>
> projects or solutions.

We also discovered that even if accurate science is available it does not mean that

it will be communicated appropriately to make decisions. This may be caused by

different variables depending on the situation. Often times it may go back to the structure

of the organization, the motivation for employees to communicate and confusion of job

responsibilities. One employee emphasized, "In part is that our approaches are all

decentralized and there is a lack of communication across the many fields on what we are

doing." Ninety-two percent of participants discussed the need for more climate change

collaboration efforts including internal collaboration as well as larger efforts with other

land management agencies. One employee suggested:

> Here's a big idea, get together with the other land management agencies, figure
>
> out how NEPA can be streamlined to help parks better respond to climate change,

then approach Congress with the ideas. A big task to be sure but it's very much needed.

Eighty-three percent of respondents were quick to admit that they did not have any or all of the answers that climate change demanded of them. As an employee stated, "In order to be successful in this endeavor…it will require use to work with partners inside and outside the government." Interdisciplinary collaboration was suggested as an opportunity to work across agencies to solve this monumental problem. Increased communication and collaboration, if done effectively, has the potential to increase resiliency to climate change issues. NPS will be able to work in interdisciplinary groups to disseminate information and reduce the time needed to transfer knowledge.

Science, Training, and Decision-making

Seventy-eight percent of the study participants were concerned that they did not have the proper training or decision-making tools to tackle long-term management plans for climate change. A Park level employee noted, "We need to train professionals in many disciplines in tools and techniques we expect them to use to deal with climate change." She continued in a concerned voice, as she admitted that she was unaware of the proper training that actually needed to take place. To increase resiliency in this context, it is important that everyone who is in a position to make climate change related decisions understand the information related to the issue.

But in order to include climate change in long term management plans accurate science is essential. An employee noted, "The other key to this is having accurate information by which to make those judgments in the plan. We need accurate science for the environmental impacts. Without that, a plan that includes climate change is

meaningless." Another Regional employee noted, "..[We have a] lack of knowledge as to what to do, lack of good information on what is projected to happen in this place." Eighty three percent of participants stressed the importance of building NPS' capacity to respond to climate change by improving and increasing the amount of science that is currently being done on the issue.

It is important to note that not all participants welcomed the idea of new methods to address climate change. A Park employee suggested:

> …NPS would make faster and more efficient progress using existing management
> approaches to decision making. We tent to resist and even actively fight
> approaches to decision making that are new and different. So we will be much
> better off using the existing decision structures to make the needed decisions for
> climate change.

Holistic View

The importance of the organizational vision for resilience is shown to be significant (McManus, 2007). It is critical for all employees to have a clear understanding of the agency's current state and where they want to be in the future. The mission will ultimately form a unifying purpose for how employees respond to climate change. The mission of the National Park Service (NPS) is:

> ...to promote and regulate the use of the...national parks...which purpose is
> to conserve the scenery and the natural and historic objects and the wild
> life therein and to provide for the enjoyment of the same in such manner
> and by such means as will leave them unimpaired for the enjoyment of
> future generations" (National Park Service Organic Act, 16 U.S.C.1, p.1).

As participants addressed climate change 83% expressed confusion as to how to incorporate this issue within the mission of NPS. Ten respondents feared that the mission is no longer relevant in today's world of rapid global environmental changes. A National employee explained, "We need to assimilate and incorporate addressing climate change into everything we do, not establish it as a separate division."Another National level employee reported:

> Responding to climate change will require a whole new way of thinking about natural and cultural resources. The notion that it will be possible to meet the mission of preserving resources unimpaired is no longer tenable, yet that remains our mission. For almost 100 years, we have taken the view as a society that things are protected by virtue of being included within the boundaries of National Parks. Yet with the effects of climate change, we can no longer take such protection for granted. The old assumptions simply do not apply, but many people cling to them still.

Money, Time, and Employees

Employee participants noted that financial resources are not currently allocated specifically for climate change projects. Eighty nine percent of participants expressed the need for financial support to be secured and distributed to indicate the urgency and magnitude of global climate change within the agency and to the public. One employee saw this as a well needed challenge, "Funding is always one barrier, but we are becoming imaginative in accomplishing things on minimal funding changes."

Other employees addressed the issue of the agency's current priorities; 72% expressed the lack of time and staff dedicated to working on climate change projects. A

Regional employee commented, "The real question is whether there is adequate time and capacity to truly maintain such [climate change] relationships." Participants reported feeling overwhelmed by current responsibilities and unable to address issues related to climate change. One Park employee expressed the concern of already being weighed down with responsibilities, "Most of us are so busy managing the existing challenges that dealing with something so amorphous and uncertain is very difficult."

As the NPS prepares to respond to climate change they may want to consider the five emergent codes that our case study analysis revealed: (1) leadership, (2) communication and collaboration, (3) science, training, and decision-making, (4) holistic view, (5) money, time, and employees. These organizational elements provide guidance for NPS to maximize potential opportunities to create a resilient agency that can effectively respond to rapid global environmental change.

NPS' Progress and Present State

Since the time of these interviews, several important initiatives have taken place to support climate change action and research. On September 14, 2009, Secretarial Order No. 3289, *Addressing the Impacts of Climate Change on America's Water, Land, and Other Natural and Cultural Resources*, was issued. Section three of this order mandated a coordinated Department-wide strategy to address the impacts of climate change on America's natural and cultural resources. In addition, Executive Order 13514, *Federal Leadership in Environmental, Energy, and Economic Performance*, was signed into effect on October 5, 2009. This requires NPS to meet a number of energy, water, and waste reduction targets as well as measuring and reporting their sustainability

performance, which has direct implication for the agency's level or organizational resilience.

Proxy measures and flexibility are necessary in order to respond and monitor resilience systems in the face of ongoing environmental and social change, especially when the stimulus is a long term pressure. Some even argue that resilience offers a better approach to study long term environmental changes rather than rapid changes (Nkhata et al., 2008). This confirms our proposal to use resilience as a framework to investigate and understand how organizations respond to climate change. NPS will need to create an effective climate change response plan that allows the agency to reflect and evaluate on their resiliency to climate change. NPS will need to transform current organizational barriers into opportunities for innovation and flexible on-going change and adaptation as the agency confronts future climate stresses.

Conclusion

Gunderson and Holling (2002) argue that understanding how people respond to change and how society reorganizes following change is the most neglected issue in natural resources systems and science. Further research is needed in order to fully understand how to create a resilient ecological and social system. This demand is being heard now more than ever with the increasing global environmental problems facing the world. Measurement, re-organization, and institutional learning are all issues that need to be explored within the context of rapid, global climate change.

The recent trend in interdisciplinary collaboration and research, including the Resilience Alliance, shows advancements in understanding the nonlinear complexity of resilience. The Resilience Alliance has recently published workbooks for practitioners

and scientists to assess and manage for resilience in social-ecological systems (2008). This is an example of how resilience theory is moving from conceptualization to operationalization, as well as the movement from theory to action.

This project strives to understand and narrow the knowledge gap between people and climate change. This study tested the theoretical understanding of resilience, and how it can be used to analyze how organizations, such as the NPS, change in response to climate change. This research will contribute directly to NPS and other organizations to better recognize how climate change pressures are causing transformation within social systems.

To end with a thought of change, Kessler and Salwasser (1995) remind us: "Change is not just a fact of life. It is the very essence of life. To remain relevant and viable, institutions must adapt to the changing environment that is the context of their existence" (as cited in Knight & Meffe, 1997).

CHAPTER FOUR

COMMUNICATING CLIMATE CHANGE TO THE PUBLIC

Introduction

Nearly 30% of the United States is designated as federally owned and managed public lands and with this privilege comes a monumental responsibility and opportunity to communicate the impacts of climate change to the public. The U.S. National Park Service (NPS) has the power to effectively disseminate information and educate audiences through in-depth place-based experiences and discourse. In 2008, the National Parks captivated the attention of 274,852,949 visitors; enthralled with majestic landscapes and historical-cultural treasures. Thus, the National Parks seem to be an ideal venue to inform, influence perceptions, and empower behavioral action concerning climate change; but are the Parks utilizing this opportunity?

In this chapter we explore how America's National Parks are communicating about global climate change through a generative rhetorical analysis of a combination of artifacts. Through our analysis we propose that Parks offer an opportunity for place-based discourse about climate change. Place-based discourse is our conceptual framework for making sense of public communication about climate change connected to specific and unique landscapes. We use this framework to analyze artifacts collected at three popular

national parks in the Western United States – Rocky Mountain National Park,

Yellowstone National Park and Glacier National Park.

The Challenge: Communicating Climate Change

Numerous writers have described climate change as one of humanity's greatest

challenges (Silver, 1990; Speth, 2004). Many factors have explicitly challenged the

effective communication of climate change science to the public. First, there is an

enormous time lag in the change in climate and changes in our social system coupled

with the assumption that the impacts of climate change most directly affect the

developing world (Moser & Dilling, 2004). Second, there is a widening gap between the

public's awareness of what action is needed and what actions are being taken. Without

an understanding of what to do, individuals are left feeling overwhelmed and frightened

(Moser & Dilling, 2004). In addition, Maibach and colleagues (2009) identified six

different target audiences within climate change issues in the United States. The distinct

audiences range from alarmed to dismissive, varying in level of concern and action

towards climate change. This diversity forces climate change communicators to tailor

messages to meet the needs of each group's beliefs, perceptions and understanding of

climate change impacts. Streamlined messages will undoubtedly fail to reach all target

audiences.

Complicating this lack of understanding is the problem of when climate change is

reported on the news it is often accompanied by images of weather disasters. From

earlier research (i.e., Bostrom, Morgan, Fischhoff & Read, 1994; Read, Bostrom,

Morgan, Fischhoff & Smuts, 1994; Trumbo, 1995) we know that the public understands

weather and natural disasters as "acts of god" and fails to see that their actions influence

the pace of climate change. Overcoming this challenge requires that climate change communicators connect human choices and behaviors to the cause of climate change events by educating their audience on the complexity of system dynamics.

Another potential challenge to communicating about climate change is the fact that the message has no single or uniform voice. There are hundreds of well-organized groups and agencies with agendas for dealing with climate change, but it seems that this polyvocal public sphere has facilitated more polarization than understanding. To overcome this challenge, organizations and agencies should seek opportunities to collaborate by creating clear, concise, and consistent messages about climate change.

The ultimate challenge in communicating about climate change with the public is that we do not have many local examples or illustrations that argue global warming is happening now and impacting our current life and landscape. The perception of global warming is that it is uncertain, controversial, far off in the future, and out of the public's hands (Leiserowitz, 2007).   We argue that these perceptions may be modified through a discourse that emphasizes context, provides a systems-based explanation, and identifies specific actions that the public can do – today – to slow the impact of climate change.

Scope and Approach

We collected and examined climate change artifacts and communication techniques used by the Parks through a generative rhetorical analysis lens. Generative rhetorical analysis allows the flexibility to generate units of analysis based on relevant theory (Foss, 1996). This analytical process focuses our lens and illuminates significant features of the artifacts, which allows us to answer our research questions: How do

National Parks in the Western United States currently communicate about climate change; are they utilizing a place-based approach?

We chose to focus on three National Parks that are revered as wonders of the American West. Yellowstone National Park and Rocky Mountain National Park are both ranked among the top ten visited National Parks (NPS, 2008a). Despite lower attendance, Glacier National Park was essential to include in our study because of the unique influence of climate change on resources within its boundaries. Where would communicating climate change be more relevant than in a park that was home to more than 150 glaciers? Unlike most parks, the melting glaciers confront visitors forcing them to viscerally experience and comprehend the impacts of climate change. There is no denying what is happening right in front of their eyes. The landscape is an opportunity to connect the visitors' behavior to the impacts they are experiencing in the Park.

This study is an analysis of the artifacts collected and seen at these parks during extended visits between May 2008 and August 2008. We began by experiencing and interpreting many of the messages a typical visitor would be exposed to while touring these parks: ranger-led programs, photographs, films, tours, brochures, books, and exhibits. We also propose an analysis of the landscapes themselves – the glaciers, animals, water cycles, plant species and other ecological signs – as additional artifacts, which influence the tourist's interpretation of climate change within that landscape.

The primary purpose of this analysis is to identify how messages and landscapes of America's National Parks may influence the visitor's perception and understanding of climate change. Protected landscapes, such as National Parks, have a unique opportunity to educate visitors about climate change through a visceral, material and emotional

experience. We begin our project by asking are National Parks utilizing this unique communication opportunity?

Place-based Discourse

Place-based discourse about climate change provides an opportunity to link the impacts of climate change on specific landscapes to human choices and behaviors. Through this connection, communicators have the opportunity to inspire behavior change by considering the audience's connection to place and ability to learn in a place-based context. We propose this conceptual framework to make sense of the artifacts we have collected. This framework allows us to analyze multiple dimensions of climate change communication and argue for the potential power of landscapes to tell the story of climate change. With carefully crafted messages, park representatives, or stewards of any landscape, can: (1) illustrate the impacts of climate change by emphasizing impacts in the immediate local context, (2) connect climate impacts to human behavioral choices through systems-based explanations, and (3) provide concrete suggestions for specific actions; thus, overcoming the typical challenges of communicating about climate change.

Connection to Place

What happens to one's connection to place when climate change impacts are seen and our valued landscapes begin to change? What happens when people no longer feel the same connections and meanings to treasured or inspiring landscapes? These are legitimate concerns that could impact a person's perception of climate change. It would be beneficial for climate change communicators and Park managers to understand the bonds and different forms of attachment that people have for landscapes (Williams & Vaske, 2003). Extensive research has covered place attachment in public space, and

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nature and wilderness experiences (Low, 2000; Bricker & Kerstetter, 2000; Steel 2000; Wickham, 2001; Vitterso, Vorkinn, & Vistad 2001) but place attachment alone cannot explain the meanings people place on landscapes and how those meanings are altered as environmental crises arise. Stedman (2003) points out our chance to take advantage of peoples' bonds to specific places: "Place-protective behaviors are especially likely to result when attachment and satisfaction are based on preferred meanings that are threatened by potential changes to the setting" (p. 567). Moore and Scott (2003) also discovered in their Cleveland, Ohio study that residents are more likely to become active opponents if they sense that what they value about the place or landscape is at risk. We propose that connecting the appreciation for a specific landscape with an individual's ability to learn in a place-based context may empower visitors while educating them about climate change in the National Parks.

Place-Based Education

The practice of learning outside has been called many names; including bioregional education, environmental education, outdoor education, place-based education, and experiential learning. Despite different labels these concepts are often interconnected and have similar meanings. For the scope of this project we focus on place-based education and experiential learning as communication tools to link climate change education with landscapes and visitors. Both of these paradigms are based on connecting people to the land through applied learning and firsthand experiences in the field. Relevance is the key to engaging visitors in a learning experience within one of their favorite landscapes. Thomashow (2002) points out that the most effective way to

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understand and learn about the changes in the environment is by developing an intimacy with the land around you.

Much of the current place-based education research is focused on children's learning experiences but we believe that the underlying principles are applicable to educating audiences of any age level. It is essential that park visitors are encouraged to understand and appreciate natural environmental processes before trying to digest the complexity of global climate change and make appropriate behavior changes. Sobel (2004) observed that:

> Authentic environmental commitment emerges out of firsthand experiences with real places on a small manageable scale (p. 34). What's important is that [people] have an opportunity to bond with the natural world to learn to love it, before being asked to heal its wounds (p. 9).

Sobel's research reinforces that it is important for individuals to establish a connection with nature so that they will feel empowered to protect that landscape.

Reading Climate Change at America's National Parks

We collected and analyzed artifacts to discover how National Parks are communicating about climate change and if they are using the full potential of a place-based approach. Each examination of the artifacts allowed us to discover further information, relationships, and patterns linking the whole set of artifacts (Foss, 1996). We engaged in a closely conducted analysis in which we identified key terms and themes allowing us to explore the context and meaning of the communication tool. Conceptual frameworks such as place-based discourse, connection to place, and place-based education all helped create units of analysis in which we analyzed the artifacts.

Through open coding we identified and analyzed common climate change themes across various forms of messages (i.e., brochures, ranger talks, interpretive boards) in the parks. We began with an open-reading and open-coding of all of the collected textual materials, then the co-authors compared open codes, discussed and negotiated to reach five main coding categories: (1) general information about climate change, (2) climate change impacts on the local landscape, (3) social and management aspects of climate change in the park, (4) opportunities to include climate change in place-based education messages, and (5) sustainability initiatives and green management efforts. The co-authors agreed that these codes captured the main messages about climate change presented in literature received at the Parks. Table 1 lists and describes the coding categories and provides an example of each.

Table 1. Open coding categories for communicating climate change at the National Parks

Category Label	Initial Coding Notes	Description	Examples
Climate Change (general)	General info on CC Scientific facts Global statements about CC	Writing about warming trends and precipitation – not necessarily in the context of the park, but possibly the nation/region	"The earth has experienced fluctuations in temperature and climate with extremes of glacial ice and extended periods of warming & drought. Human activity is now playing a role in these fluctuations." (C.C. in RMNP, p. 2)
Climate Change Impacts on Local Landscape	Information about climate change impacts on flora, fauna, ecosystems, natural systems, glaciers	Detailed and scientific information specific to the area or region of the National Park	"The Park's glaciers are shrinking, says Visty, but not at the alarming rate of those in Glacier National Park to the north. Rocky Mountain National Park's signature alpine tundra is at risk as the underlying ice, called permafrost, melts."

		Based on science that has already been conducted/completed about climate change in the area.	(http://www.nps.gov/romo/parknews/pr_climate_change_rept.htm)
Social & Management Aspects of Climate Change in the Area/Park	Management of science Management decisions Managing for climate change Mitigation options Education Communication Policy implications	Specific information about that Park's management of science and climate change data collection, as well as management decisions and public communication and education about climate change in the Park or regional area	"Park managers will also have to consider how to interpret climate change for their visitors." (C.C. in RMNP, p. 4) "Budgetary constraints will likely prevent the park from single-handedly undertaking more than a few of the research and monitoring projects important to understanding climate change impacts." (C.C. in RMNP, p. 4) Action words: "identify, study, monitor"
Opportunities to include Climate Change in Place-based Education Messages	place-based educational messages Pine beetles	Messages about the landscape – without climate change included Opportunities to include climate change science relative to that landscape	"Ecosystem of the Rockies" – detailed information on front page of Rocky Mountain NP brochure distributed at Park entrances. "Moraine Park Visitor Center… Interactive exhibits on the past and present landscape, and a bookstore." (RMNP Spring newsletter, top of p. 2)
Sustainability / Green Management	Green initiatives	Messages about efforts to operate the park in a	"The Park is actively engaged in green practices, including using many hybrid/alternative fueled

| Efforts | Sustainability

Green management

Eco-friendly

Climate Friendly Parks | more sustainable manner – could be linked to climate change mitigation messages | vehicles, a bicycle for mail delivery, low-wattage compact fluorescent light bulbs and active recycling of office materials." (RMNP Spring newsletter, bottom of p. 2) |

Our goal was to analyze each park as a complete artifact; we read the Park's communication as well as the Park's landscape to determine whether a place-based discourse was being used and whether it was an effective strategy for visitors to make sense of climate change.

In determining whether a place-based framework was used we analyzed the park's messages for evidence of appeals to one's connection to the place and messages designed with an understanding of place-based education. Through this process we identified examples of place-based discourse. These examples are characterized by three main principles: (1) messages that emphasize the impact of change on the immediate landscape, (2) provide a systems-based explanation connecting human behavior and landscape change, and (3) provide specific actions that the public can do to mitigate climate change while connecting to their desire to preserve the park's landscape. The open codes combined with the three principles of a place-based discourse, informed by theory, provide a framework to interpret messages about climate change at three of America's favorite National Parks.

Rocky Mountain National Park

Rocky Mountain National Park has been one of the most visited parks since its creation in 1915. Over 150 million tourists have been drawn to the majestic Rockies now spanning over 265,000 acres (NPS, 2008a). Ecosystems include peaceful montane meadows to the harsh elevations of the alpine tundra. We were greeted with a heavy mountain rain when we arrived at the East entrance visitor center. Our first priority was to examine every interpretive sign and scout the scene for messages about climate change, we started by asking the ranger if he knew of any places we could see evidence of climate change impacts in the Park. He replied that they had no information available. He continued by explaining that there was a lot of speculation as to what causes global warming. The ranger said he heard that people blamed global warming for the elk calving earlier and the pine beetle infestations. He stated that there was no evidence that glaciers were retreating in Rocky Mountain National Park. After appearing uncomfortable with the subject, he quickly left us to answer other visitors' questions. We listened as they asked which hiking trails would not be muddy and which trails they could complete in an hour.

We spent the next 20 minutes watching a short film presentation in the visitor center auditorium. The film, *Rocky Mountain National Park Spirit of the Mountains,* is played every 30 minutes for the rotating visitor population. The video had several scenes that fit into our place-based communication rubric, one scene emphasized climate change directly: "Since the end of the last ice age, about 10,000 years ago, the park's glaciers have gradually retreated warmed by the Earth's changing climate and melted back by the sun's persistent and powerful rays" (NPS, 2001). Another scene illustrated the connection to nature that the park provides: "The Park's wild landscape contains some of

the most spectacular scenery on Earth and provides an opportunity to restore our connections with the natural world" (NPS, 2001). While not explicit, there was an attempt to provide a system-based explanation of the interrelationship between human and ecological processes, but it was not connected to climate change: "…[W]hile these high altitude specimens are extremely hardy they are vulnerable to human trampling" (NPS, 2001).

The film also emphasized the importance of preserving the park for future generations, appealing to the visitors' family and civic values:

> Recognizing that lands are vital to the human spirit and diversity of life on Earth, the movement to save our national treasures in the name of future generations became symbolic of the democratic ideals of a growing nation…
>
> … Today's travelers to Rocky Mountain National Park join in enduring human perception across time and place seeking to experience the same wildness as those who went before and those who will inevitably follow (NPS, 2001).

After the film, we browsed the bookstore, and amongst a small collection of children's books we found *The Down-to-Earth Guide to Global Warming* by Laurie David and Cambria Gordon. This Scholastic book discusses climate change at the third to sixth grade level. The book is divided into four parts: the science of global warming and an explanation of why it's happening; the effect on the Earth's weather systems; the impact on plant and animal life; and simple things that children can do to help reverse the problem. We also found this book at another visitor center inside the Park, and after our conversation with the first ranger, we were delighted to see that the NPS was promoting this book

In our search for messages situated in the local landscape and targeting the wider visitor audience, we toured all of the visitor centers and museums and none had brochures or exhibits specifically related to greenhouse gases or climate change in general. There was a series of interpretive posters about weather and quickly changing mountain climates in the museum, but no mention of the impacts of the global climate change process we were curious about. This theme was again reinforced during the open-coding of communication messages. Educational messages centered on ecosystems provide an opportunity to include climate change science relevant to the landscape.

We concluded our visit by stopping at the North entrance visitor center. Here we spoke with two more rangers, the second ranger was much more willing to make an effort in answering our request for climate change information. The ranger confirmed that they did not have any brochures but he was optimistic that the park will offer new interpretive programs that could possibly cover climate change and supplied us with a phone number to check for program updates. This ranger was much more knowledgeable about global warming and appeared more comfortable sharing information; he entertained us with a 10 minute discussion of the shrinking polar ice caps.

We called later in the summer and found that the Park added a climate-change specific interpretive talk to their line-up of summer ranger-led programs. The program, *Never Summer, Ever Summer* is offered every Friday (June 15 - September 1) at 10AM. Participants are invited to "View the sun through a telescope and learn of potential effects of climate change on this park" (RMNP, 2008). With a deeper web-based search we found a June 16, 2008 report on climate change in the Park. The report, *Climate Change in Rocky Mountain National Park: Preservation in the Face of Uncertainty*, highlighted

anticipated effects of climate change on the Park's birds, mammals, lakes, streams, wetlands, ecosystems and in relation to fire. The report focused on climate change impacts on the landscape as well as social and management aspects of climate change. The report was concise and informative and promoted making management decisions related to climate change. There were three bullet points related to their education and interpretation strategy

- This report will serve as a general outline of expected climate change impacts and collaboration opportunities.

- The information gained through the workshop will be presented to park staff during a one-day workshop and at the Park's 2008 Biennial Research Conference.

- The Continental Divide Research Learning Center will distribute this information in other formats and with other audiences as opportunities arise (NPS and Center for the American West, 2008 p. 17)

We interpret these three bullet points as the starting point for Rocky Mountain National Park's development of a place-based climate change communication strategy. In this report they have combined explicit examples of climate change impacts on the Park, and now their challenge is to translate the scientific evidence into visitor-friendly messages. We believe we have witnessed the early stages of this translation with three different interpretive programs offered in August. The Park offered special ranger-led programs in the evenings at the in-park campgrounds. *The Pika – Ice Age Fortune-teller*, described how the

tundra Pika's evolutionary history is traced back to the Ice Age. The ranger explained that this species is signaling climate change today because of its rapid relocation to higher elevations. Another program, *Climate Change at Rocky and Beyond*, explored the causes and effects of climate change at Rocky. Again the ranger explained how the landscape has changed, focusing on shrinking glaciers, reduced stream flows, and the influx of nonnative species and diseases. One of the major climate change culprits was pollution and using the Park's shuttle bus was promoted as a simple solution for park visitors. In earlier visits, sustainability initiatives and green management efforts such as the shuttle buses included in the Climate Friendly Park program were not directly linked to climate change mitigation messages. A third program, *Balancing Human Use and Preservation at Rocky Mountain National Park*, explicitly used systems-based explanations to link human behaviors to environmental impacts, with appeals to enjoying the park as stewards of the park.

While the evidence during our May 2008 visit did not provide much beyond a children's book and promotional video, three months later we found numerous examples of place-based discourse in ranger-led programs and campfire talks. We can only speculate that this transformation was related to the June 16 report on climate change and that we are going to continue to see an evolution of climate change communication at Rocky Mountain National Park. Rocky has a rare opportunity to use its landscape as a climate change communication medium, reaching an average of nearly 3 million captive audience members annually (NPS, 2008a).

Yellowstone National Park

Yellowstone National Park opens its gate to more than 3 million visitors per year and more than 140 million visitors since the park opened in 1872 (NPS, 2008a). Yellowstone consists of over 2.21 million acres at the intersection of Wyoming, Montana and Idaho. Similar to our visit to Rocky Mountain, our time was spent talking to rangers, discovering exhibits, and touring visitor centers in search of climate change messages. We arrived at the information station and bookstore located in West Yellowstone as they were opening. After wandering around the station with no luck finding information on climate change, we approached the closest ranger with our questions. The ranger politely stated that she was unaware of any publications, programs, or information that the Park had about climate change. We pursued our quest by asking if she knew anything about the topic that she could share with us and she quickly responded that she had not received training on the issue.

We then headed to the Jr. Ranger Station. We entered the station, as a park ranger was playing an environmental education game with a few attentive children. We approached the front desk to request information from the ranger on duty about our interest in climate change. While the ranger seemed very interested and upbeat about the subject she stated that this station was intended for young children and did not cover such complex topics. She encouraged us to look at the other visitor centers.

We then stopped at the Old Faithful Visitor Center. Along with many other visitors, we swarmed straight to the visitor center door to find out when Old Faithful was predicted to erupt again. We learned the show would not begin for another 30 minutes, so we entered the building to inquire about climate change from the rangers. As the ranger gazed up to notice the line of tourists with questions he excused himself to help us.

He immediately stated that the Park did not carry any information specifically on climate change or global warming. The Old Faithful visitor center predominately focused on wildlife and matters concerning geysers. Busy with other tourists, he moved to the next visitor in line. With minutes to spare we headed out under our umbrella with the other hundreds of spectators as we waited in anticipation for Old Faithful. Following the brief minutes of the geyser we overheard a couple comparing the size of today's eruption to a trip they made in the past to Yellowstone. As other tourists were eavesdropping on their conversation, a young woman offered that she heard there was a drought causing Old Faithful to be smaller. Could these park visitors have their own systems-based explanations for changes in the Yellowstone ecosystems?

We then moved on to Canyon Village Visitor Education Center, hoping that because it was an education center it would offer information on the impacts of climate change to this landscape. The first ranger thought that the Park may bring in outside experts to have informative talks but was not sure if it had ever happened or when the next one would be. His colleague excitedly rushed over after hearing our questions and referred us to a book that was available for purchase in the bookstore: *Yellowstone Resources & Issues.* This book is an annual compendium of information about Yellowstone National Park and contains eight pages on climate change among the 200 pages covering a multitude of issues. The bookstore salesclerk mentioned that it was the best and most informative book that they sold in the store. He also made it clear that it was not a popular bestseller in the bookstore. The book has a scientific format with more text than photos, visitors probably opt for the glossy pages and panorama pictures in the Yellowstone coffee table book. Likewise, skimming though 171 pages before coming

across the issue of climate change may not be the most efficient manner to get a message across. Climate change in Yellowstone does not appear to be a pressing issue if it is hidden amongst layers of other problems and park history.

Many of the communication themes found at other parks were missing at Yellowstone due to the lack of climate change information. The dominant messages available to visitors fit under the category of sustainability initiatives and green management efforts. In 2008, Yellowstone founded Yellowstone Environmental Stewardship (YES!) in order to accomplish sustainability goals by 2016. The program aims to increase operational efficiencies and to reduce its ecological footprint. Yellowstone has also applied to be in the Climate Friendly Park program but has yet to meet any of the requirements. If Yellowstone is able to link green management efforts to greenhouse gas emissions it may empower park visitors to take action and reduce their contribution to climate change impacts.

Our final and last stop was Mammoth Hot Springs Visitor Center. The ranger confirmed that Yellowstone, as of June, 2008, did not have any brochures or literature that visitors could pick up to read or take home about climate change in the Park. Before we left he mentioned that *Yellowstone Resources & Issues,* the book we picked up at the last visitor center, might cover a few pages on climate change and might be worth looking at. While the book does include detailed information on climate change and impacts on local landscapes it is only available for those willing to purchase it. It appears that Yellowstone is behind the times in sharing climate change messages with visitors.

Following a fruitless onsite visit, we took a virtual expedition, and did not find one statement about climate change on Yellowstone's website. Again, playing the role of

the typical tourist, there are numerous opportunities for Yellowstone to educate park-goers on the nuances of climate change in the West, especially on this treasured landscape. Maybe our assessment is too early, and like Rocky Mountain National Park, there will be a ground swell of interpretive programs and literature in the coming months.

Glacier National Park

In no park are the effects of global climate change more apparent than in Glacier National Park. The Park was established in 1911 as the tenth national park, now making up more than 1 billion acres of land. The Park's name was influenced by the aftermath of the ice ages 10,000 years ago. While the name is still relevant, some wonder for how long as the receding glaciers, visible from the roadside, provide evidence of a quickly changing climate.

We started our journey and as we approached the entrance we predicted that Glacier National Park would provide the most extensive place-based discourse about climate change. The Park held true to our prediction as we entered and received the official Glacier Visitor Guide. On the bottom of the cover was a brief preview of the climate change story featured on page 8. It became very apparent that Glacier National Park is seizing the opportunity to teach visitors about the present and future of climate change:

> …[National Parks] help us to understand the extent of climate change, how to mitigate its effects, and how to protect natural and cultural treasure for the enjoyment of generations to come…[The] changing environment provides a powerful example of what could be lost without global action to reduce

greenhouse gas emissions...Glacier's diverse landscape…show how climate

change affects an intact ecosystem (NPS, 2008b).

The article also recognizes the extensive impacts climate change is causing in Glacier. It

focuses on a systems-based explanation of social-ecological changes that take place on

the landscapes that tourists treasure. Another section has a shocking visual appeal to

demonstrate the disappearing glaciers. A photo of Shepard Glacier in 1913 is compared

with one taken in 2005. The photo from 2005 showed significant glacier retreat, leaving

only a fraction of the glacier remaining. Despite some uncertainty in the exact number of

years, the article estimates that there were 150 glaciers during 1850, 50 in 1968, and now

only 26 glaciers remain. Scientists predict that the remnants of these glaciers will be

completely eliminated by 2030 (NPS, 2008b). To some this may be painted as a hopeless

fight but the Park has taken responsibility: "Glacier National Park strives to be a leader

in educating park visitors about climate change" (NPS, 2008b).

By the time we made it to the Apgar Visitor Center in West Glacier it was raining

with a layer of fog hanging from the sky. We pulled on our raincoats and dashed into the

building. As we looked around we saw about a dozen tourists attempting to dry off as

they meandered around books and displays.

We waited until a hiker finished reporting a sow and cub sighting off a nearby

trail. A ranger then attended to our climate change inquiry. He told us that they currently

did not have educational or interpretive programs on climate change but he was hoping

that when the rangers underwent their next training that climate change may be a topic

they discuss. Two other rangers mentioned the name of a United States Geological

Survey (USGS) climate change scientist, and they noted that this scientist occasionally gave talks to visitors and in the adjacent community.

Nearby at an environmental education classroom another ranger explained that Glacier is a unique place because climate change can be measured and monitored within the park boundaries. The ranger noted that the on-staff climate scientist measures the glaciers regularly to identify how much Glacier National Park is being affected by climate change.

While perusing the bookstore, as many tourists do, we found *The Atlas of Climate Change, Mapping The World's Greatest Challenge* by Kirstin Dow and Thomas E. Downing. This 112 page book provides the latest evidence of climate change as well as a portrayal of the past, present and what the future could hold. The book covers a wide range of topics including warning signs, future scenarios, vulnerable populations, health impacts, renewable energy, emissions reduction, and personal and public action. We asked how often the book is sold, but the salesclerk did not know.

The visitor center had one climate change brochure that visitors could pick up and take home. The brochure was specifically targeted toward climate change in Glacier National Park. The brochure emphasized the importance and meaning tourists place on glaciers within the park: "For many people, the glaciers are a key reason the park holds special significance and are a feature they expect to see when they visit" (NPS, 2007b). The Park takes advantage of the visitor's connection with the landscape to show that it has more than one meaning: "Mountain glaciers are more than just scenery, they are an integral part of the ecosystem, providing cold water to mountain and downstream environments" (NPS, 2007b). The brochure stresses the importance of individuals'

actions to save the landscapes they feel an attachment with. The park focuses on the connection tourists have with nature and the positive changes they can make: "…Any actions or choices that can result in a reduction of these emissions will put us on a more sustainable path toward stewardship of the resources we are charged to protect" (NPS, 2007b). The brochure ends with examples of how Glacier National Park is striving to become more energy efficient and dedicated to raising awareness about climate change. Overall, the brochure was used as an opportunity to inform visitors of climate change impacts on the glacial landscapes through place-based messages.

The next day we headed to Saint Mary Visitor Center in East Glacier. Upon arrival we discovered that the visitor center was closed for renovations. We continued along the National Historic Landmark *Going-to-the-Sun Road,* an engineering project that took the better part of 11 years to complete. On our way out of the park we came across an interpretive sign on the side of the road entitled *Going, Going, Gone* (Figure 1). The roadside display asks the reader to look and listen to the landscape:

> Do you see a glacier? … Visitors today see only 25% of the ice that existed in 1850, and projections are that the park's glaciers will be gone by 2030. Of the estimated 150 glaciers present in 1850, approximately 26 remain…. The park may look different on your next visit, because the recession of glaciers like Blackfoot and Jackson affects the entire ecosystem in many ways.

Figure 1. Going, Going, Gone, Wayside Interpretive Sign at Glacier National Park

Similar to the other Parks, we followed up on Glacier's climate change programs and communication messages by browsing their webpage. Glacier National Park offered a special ranger-led program called *Goodbye to the Glaciers* in mid-June. The program is offered every day of the week at the top of every hour between 11 in the morning and 4 in the afternoon. While the program is only 15 minutes long, it provides the average park visitor with the opportunity to see the impacts of global climate change on the glacial landscape.

Discussion

Our investigation and rhetorical analysis has shown that some parks are using their landscape to communicate about climate change. Protected areas, as a material medium, offer the potential to communicate and educate millions of visitors annually. Taking into consideration the visitors' attachment to the landscape, their sense of stewardship for the Parks, and experiential learning opportunities provides a platform to increase awareness of and promote action to mitigate climate change. Place-based discourse requires using place as a medium and connecting that place to emotional and rhetorical messages about the impacts of climate change. Unfortunately, many people need to see the effects of climate change before they can believe it is real and make sustainable decisions and behavioral changes.

In April 2009, a special half-day climate change program was offered at Rocky Mountain National Park. The program was a combination of ranger-led talks and walks through three different landscapes impacted by climate change: pine beetle infestations, changing dynamics of a glacial lake, and the rapidly changing alpine tundra. First, we toured the most popular campground at Rocky Mountain National Park, Sprague Lake. Piles of "beetle kill" lined the gravel road along the perimeter of the campground. In the center of the facility, there was a makeshift amphitheater, surrounded by hundreds of tree stumps. The clear cutting of Lodgepole pines looks devastating, but the rangers explained that they are using this dramatic landscape change as an opportunity to talk to park visitors and campers about humans impacts on climate change, specifically how the changing climate has made the destructive pine beetle more resilient while our trees have become more vulnerable. With warmer winters beetle larvae thrives into the springtime, but the pines need several days of deep, cold frost to kill the parasite. Without the freeze,

the beetles are free to take over the nutrient system of the trees. The rangers and park scientists explained the dynamic relationship of the pine beetle and this landscape. They also explained the need for management and intervention, despite the fact that actions such as clear-cutting, are not typical Park Service duties. Many visitors are shocked to see a meadow of stumps; however, this dramatic change has led to many more questions and discussions about the impacts of climate change at Rocky. That is just one example where place-based discourse about climate change can provide park visitors with a systems-based explanation while illustrating the impacts of climate change on the immediate landscape.

While we toured the parks, playing the role of typical visitors, we are simultaneously involved with a national level NPS research project. In the past year, we have noticed a gap between the Washington-level effort to communicate climate change and the average tourist experience at Rocky, Yellowstone or Glacier National Park. Our Park Service partners provided us with a service-wide brochure, explaining the impacts of climate change on all of the parks:

> For our national parks to thrive and for us to continue enjoying them, it seems appropriate now to do what we can to reduce climate change impacts and adapt to their consequence. Fortunately, we now have the tools, knowledge, and ingenuity to better understand these changes and make informed choices for coping with them (NPS, 2008c).

The brochure informs visitors of simple actions such as using energy efficient appliances and light bulbs, unplugging electronic devices and using public transportation. The NPS also included a list of websites for visitors to learn more about climate change

(e.g., The Intergovernmental Panel on Climate Change, The Arctic Climate Impact Assessment, Understanding and Responding to Climate Change, EPA's Global Warming-Actions and NPS/NASA Earth-to-Sky Interpretive Training).

In addition, we have seen several brochures created by USGS with the Climate Change in Mountain Ecosystems (CCME) program in Glacier National Park. The USGS has used repeat photography to assess and communicate the effects of climate change on landscapes. These features are also available by virtual tour. The USGS argues that landscape change photography provides "…powerful images, with their inherent ease of interpretation, have become icons of climate change" (USGS, 2007, p. 2).

The CCME website not only hosts the repeat photography demonstration but provides a vast amount of resources from posters, movies, photos, podcasts, PowerPoint, models, publications and projects meeting the need of almost any audience. The information is closely tied to the visitors' emotional connection with places they visit and provides a stunning example of placed-based discourse about climate change.

The NPS has a great opportunity to take advantage of these place-based climate change messages. Climate change discourse would be vastly improved even by ensuring that these resources were being shared with the everyday tourist as opposed to being handed out at Washington-level meetings. We conclude by suggesting if the NPS wants to be a leader in communicating about climate change, then they should develop and provide place-based messages for park visitors, linking the valued place they came to experience to the issue of climate change. To make a significant impact on visitors' perceptions and actions related to climate change, parks must find a way to connect people to tangible and accessible issues in the park (Thomashow, 2002).

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Scientists, communicators and stewards of public lands should focus on presenting local climate change impacts that are occurring right now, forcing it to be an issue that is current and salient to community members and decision makers. Providing relevant, contextual examples will encourage and influence individuals to make positive changes to combat climate change on a local, regional, national and global scale. Communicators should avoid crafting messages that highlight risks and uncertainty, and focus on creating messages that target personal emotions and ties to landscapes. Past research has shown that increased risk perceptions only lead to increased protective behaviors rather than motivating individuals toward effective behavior change (Leiserowitz, 2004; Moser & Dilling, 2004; Plotkin, 2004). Aust and Zillmann (1996) have shown that messages directed toward extreme emotions are more memorable and accessible when it comes time for an individual to judge or decide on an issue.

Global climate change has been eloquently connected to polar ice caps and polar bears, making it appear to be a distant problem that may only affect people and animals far away. In Leiserowitz's (2007) recent study, people are only able to list off extreme examples of the impacts climate change may have, such as the melting of polar ice caps, as opposed to the more common daily consequences. For this reason, individuals rarely see climate change as a local issue or related to places they value (Bostrom & Lashoff, 2007). Furthermore, Leiserowitz (2007) found that only a minority of respondents were even concerned about impacts on themselves, their families, or their local communities. He also discovered that local threats were generally perceived as more salient and of greater urgency and importance than global or distant problems (2007). Americans seem to accept climate change, or global warming, as a real phenomenon, but most do not seem

to have a great deal of concern about it (NSF, 2006). So, while Americans believe in the power of individual action and the ability of regular people to make a difference, they have failed to connect the impacts of their individual actions to the larger system of global climate change.

We only surveyed three popular parks in the Intermountain West of the United States, and it is possible that other National Park regions and protected landscapes, such as United States Forest Service territory, state parks, and municipal parks may have more developed communication and educational programs on climate change. Each landscape is going to have diverse and pertinent consequences from climate change that will lead to unique, place-based discourse. We encourage future research to analyze landscapes and climate change messages in other regions of the world. We also believe that the next logical step for this research is to investigate the effectiveness of such messages by surveying the audience, not the landscape. This research could play a part in detecting weaknesses, strengths, and themes of the different forms of messages.

Protected areas have the opportunity to take advantage of their landscapes as a communication, education and awareness tool. Communicating climate change in parks moves the issue into peoples' backyards. It is no longer a remote issue. Recently *Backpacker* magazine (2007) published *The Global Warming Issue* which highlighted the devastation America's parks will see in 50 years due to climate change. The National Parks have a rare opportunity to use this media and attention to deepen the public's understanding of climate change as it impacts the beautiful and grand landscapes of the United States.

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Appendix A: Data Collection Instrument

Organizational Change and Climate Change Survey:

1. What are the main challenges to dealing with climate change within NPS?

2. What are some of the barriers you face in responding to this challenge?

    a. In particular, are there historical or organizational structures that limit
       effective communication across divisions or directorates? Please explain.

    b. Do you get support for engaging in interdisciplinary activity?

3. How has the National Park Service begun to adapt structurally/organizationally to
   better address climate change?

4. Do you think the National Park Service can effectively cope with climate change
   using existing management approaches to decision making?

5. What are some of the barriers, if any, to approaching problems in a different way
   outside of the normal structure?

6. What are some of the best approaches for building capacity for organizational change
   in the face of climate change?

7. Do you have enough resources to address climate change?

    a. What do you need?

8. What are the joys or opportunities in working toward and responding to climate
   change?