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UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

OUR SQUIRRELS WILL HAVE ELEPHANT EARS: INDIGENOUS PERSPECTIVES ON CLIMATE CHANGE IN THE SOUTH CENTRAL UNITED STATES

A THESIS

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By

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Norman, Oklahoma
2015

THESIS
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OUR SQUIRRELS WILL HAVE ELEPHANT EARS; INDIGENOUS PERSPECTIVES ON CLIMATE CHANGE IN THE SOUTH CENTRAL UNITED STATES

A THESIS APPROVED FOR THE
DEPARTMENT OF GEOGRAPHY AND ENVIRONMENTAL SUSTAINABILITY

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Dedicated to the ancestors that came before me, children yet to be, and all my relations.

NeYiWa

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Abstract

As climate change impacts areas around the world Indigenous communities are being impacted disproportionately. In the US a number of tribes are in differing levels of response and adaptation. In the south central U.S. there has been little research done and this study attempts to fill that gap and looks at how Native Americans in the SC region are identifying climate change. Through a series of workshops that collaborated with the South-Central Climate Science Center (SC-CSC) and other agencies to facilitate discussions with Native participants on their perspectives of climate change and variability, a space was created for indigenous peoples to communicate their stories of place in their own words in relation to climate change. Participants identified not only climate change mechanics but also the impacts that come from these and also shared varying levels of adaptation and preparedness.

Chapter 1: Introduction

For thousands of years the Shawnee people have followed environmental signals and celebrated the transition of season through Bread Dances, a celebration of ceremony, dance, food, and songs. Relatives gather together from all over our region and from afar to participate in this sacred ceremony. My introduction to the impact of climate change on Indigenous people originated at one of these Bread Dance ceremonies from traditional knowledge conveyed by an elder.

I had traveled from Haskell Indian Nations University in Lawrence, Kansas to Little Axe, Oklahoma to participate in our Absentee Shawnee ceremonies. It was an exceptionally warm day that second weekend of May in 2011. We were well below normal for rainfall that year and temperatures were already well into the 90s and 100s. The heat and dust were thick and dry in our throats. The Sandbur stickers had already developed, making walking in moccasins or bare feet impossible. There was a constant re-watering of the camps with hoses from strategically placed hydrants to quell the dust and cool the ground to provide relief for the children and elders.

It was already unbearably hot at 10 o'clock in the morning as I sat with one of my relatives at a family camp during the time of our spring Bread Dance ceremony. We sat underneath the traditional Post Oak pillared, canvas-covered camp. Watching the children play and people busy themselves at each camp, my relative looked up into the trees and said, "If we're going to have bread dance this year, our squirrels will have elephant ears." Struck by this comment I was curious to ask questions and waited until an appropriate time and place to ask her to clarify her statement. She laughed and explained to me how each spring our tribe looks to a particular tree's leaves to be the

size of the squirrel's ear as an indicator for our tribe to come together to prepare and perform the Bread Dance ceremony. Then she went on to explain that if I looked at the trees now they were all in full-bloom, meaning we should have performed the ceremony 2-3 weeks earlier. My tribe has been following the phenological signs of spring for thousands of years as an indicator for spring planting. The timing of these blooms has shifted from the first or second week of May–which my elder had identified as when the signs "normally" happened throughout her life–to current blooms happening in the second or third weeks of April. Spring was coming earlier more consistently, and fall arriving later. It was from this conversation that I realized the impact climate change was having on my culture as well as the widespread acceptance of climate change in native communities, as well as their vulnerability to it.

This experience, coupled with scientific reports and other evidence, peaked my interest to learn more. I wanted to know if other Native Americans and Indigenous Peoples were experiencing changes related to what scientists are calling climate change in the region my Native community resides in. There is research available about extreme events and climatic shifts in other regions regarding Indigenous communities, but little or none in Oklahoma or the south central region where my tribe was relocated.

Research Objectives

I was struck by this lack of material regarding Native American Indians and climate change in the south central region of the U.S. I was unable to locate material on how tribes in the southern plains were affected by extreme weather events such as the Dust Bowl of the 1930s. This gap of climate information specific to the region my tribe

lives in, which also houses more than 60 other tribes, inspired me to learn more, and to learn it through the epistemology of a Native American woman from the region. I set out to work with other people who could together create a place for Native Americans to come together to discuss climate change information, to express their needs, and to ask questions of professionals in the field of climate and weather research. In doing so I centered my research around three major goals:

1. Establish if and how Native Americans in the SC region of the United States were identifying and experiencing climate change.
2. If so, how were Native Americans defining climate change and what impacts were they attributing to climate change in their region?
3. What are Native Americans or their Nations doing about climate change if anything?

Thesis Summary

This thesis seeks to fill the gaps in research on information available in the south central region relating to the experiences Native American Nations have had and are having with climate change and weather variability over their lifetimes, as conveyed in oral traditions, memories, and stories. This thesis consists of five chapters as well as photos and maps in appendices that provide a detailed explanation of research into climate and its impact on Native American experiences in the south central U.S.

It is through the lens of Geography, especially Indigenous Geography, I reflect on questions posed to Native American participants at each of five inter-tribal workshops on climate variability and change. Workshops extended climate information, introduced climate research partners in the area and their tools, and discussed the

potential to co-produce participatory video. Native American participants were asked questions about their climate change understandings, impacts, and adaptations in focus group discussions and filmed interviews. The responses from these discussions and interviews inform my research questions.

The workshops were held in Oklahoma and New Mexico where I worked with an interdisciplinary, multicultural team to design, facilitate, and moderate the workshops. I transcribed, coded, and analyzed data collected during the workshop discussions and interviews. It is from these data that I learned about climate change from the perspectives of the many Native participants. This paper documents their stories of change, the impacts these changes have had on their communities, and how they are able to address the changes.

Chapter 2 will look at literature related to the importance of Traditional Knowledges (TK), Traditional Ecological or Environmental Knowledges (TEK), and how these knowledge systems can complement and supplement Western science. It will also show how important self-representation is to the peoples as Indigenous methodologies are growing within different disciplines, especially as more Native Americans and Indigenous Peoples enter the science, technology, engineering and mathematics (STEM) fields. The literature shows how Native Americans and other Indigenous Peoples are already implementing adaptations to climate change through community resilience that offers possible solutions for others grappling with changing environments. Indigenous Geography is active and growing in its support and advocacy of issues relating to Indigenous Peoples and climate change in regions around the world and within the U.S.

Chapter 3 will describe the workshop methods and research design that link some of the best practices established in the literature with my research questions. Here I present the research design, the nature, origin, and location of the five workshops, their objectives, and the questions asked the Indigenous participants of the workshops. I share the Indigenous methodologies I utilized in collecting and reviewing the data.

Chapter 4 presents a selection of the oral testimony that comes from a combination of excerpts from focus groups and individual interviews. This chapter is rich with direct quotations from participants as they describe climate change. I coded these and created categories to make sense of the many hours of oral testimony. The first of these categories defines their understandings of climate change. The next one describes impacts related to climate change and any adaptation efforts. The final one concerns participants' perceptions of whom or what is responsible for problems associated with climate change, as well as the solutions.

Chapter 5 is presents an analysis of what I learned from the participants as well as from the research process and its successes and failures. I discuss the common ideas and problems shared by diverse workshop participants from across very different landscapes, as well as unique issues specific to each region that people are struggling with. I will show how "place matters" and that there will need to be continued collaborations between policy makers, Native American leaders, and researchers to collaborate on culturally and spatially relevant solutions to climate-related problems.

Chapter 6 offers concluding remarks about how the participants view climate from their own particular worldviews. I also express the need for decolonizing knowledge production and for the co-production of collaborative pluricultural

knowledges. I further explain how far more research could be done on the wealth of information gathered and learned during the workshops.

Chapter 2: Literature Review

This literature review provides a foundation from which to value of the research I performed in the south central U.S. I will also show the value and importance of creating space for Native Americans to contribute to the discussion of climate change in their region, to share this discussion in their own words, their experiences, and observations on what they understand to be climate change and weather variability. I am not attempting to prove or disprove the extent to which climate change is occurring in south central U.S. but to simply observe the interaction between native communities and their perceptions of climate change. I am offering the reader the opportunity to understand the perspective of Native American peoples' relationship to place and how that is valuable to the science of climate change. I will demonstrate the need for more climate change research with tribes in the south central U.S. to go along with the wealth of information on climate change research already done in other regions with other Indigenous Peoples.

The literature details how Indigenous Peoples outside the south central climate region of the U.S. have not only identified climate change to be significant in their lives, but also are already in the process of adapting to these changes. The lacuna of this same type of information from the south central U.S. includes major environmental impacts of past climate and environmental changes as associated with the so-called Dust Bowl. In the past, Native American peoples have experienced climate changes but have been able to adapt over time or move to a more suitable region. Due to governmental restrictions many Native Americans are tethered to place through jurisdictional boundaries that increases vulnerability (NCA, 2014).

Climate Change and Native Americans

Many scientists agree that climate is changing and is human influenced (IPCC, 2014; NCA, 2014). All life will feel the impacts, but the most vulnerable will be the poor and marginalized peoples, which includes Indigenous Peoples worldwide (NWF, 2011; Nakashima et al, 2012; NCA, 2014). Peoples in the Arctic and most northern regions have already felt the extreme impacts of climate change in the form of ice sheet depletion, shoreline erosion, and sea level rise for longer than science has documented the phenomenon (Maynard, 1998; Wildcat, 2009; NCA, 2014). Fewer studies of the effects of climate change on Native Americans in the south central region have been made (c.f., Peppler, 2011).

Martin (2011, 1) stated that "for American Indians, the effects of climate change are neither geographically nor temporally distant." Through subsistence-based livelihoods and cultures, Indigenous people have traditionally experienced more direct contact with the environment and non-human beings, which has made them the first to undergo the consequences of climate change (Koppel-Maldonado et al., 2013). Furthermore, the mobility restrictions imposed on American Indians through the reservation and allotment system made adaptation disproportionally difficult (Glunz, as cited in Weinhold, 2010; also Koppel-Maldonado et al., 2013). Once again, American Indians are experiencing a removal from their land, but this time it is the land that is changing, leaving tribes with severely altered forms of what they had come to know throughout generations (Wildcat, 2009; Koppel-Maldonado et al., 2013).

Climate change will worsen this economic disparity, and impact spiritual traditions (Wildcat 2009), and create social, political, and environmental dynamics and problems. Native Americans' relationship with the environment is a major aspect of tribal sovereignty (Wilkins, 2007; Krakoff, 2008) and identity (Sakakibara 2010). Climate change is altering the geography and thus affecting tribal rights in the areas of subsistence, economics, culture, and intellectual property. Climate change also is a human rights issue (Crate, 2009; UNDRIP, 2008). Native Americans must be afforded a voice in the climate change decision-making process especially in relation to adaptations and mitigation.

This point of having a voice in the decision making process of regulations, policies and adaptation is imperative and vital to the Native Americans. Native American Nations should have the opportunity to provide input regarding decisions and policies that affect them. Each Nation should re-evaluate their traditional laws and create their own policies on how they will respond to climate change issues. Native American leaders should be deeply concerned and on the forefront of climate change adaptation and mitigation alternatives for themselves and as an example to the rest of society on sustainable living. "The Indian voice in this issue is both a right and an asset, and there are conceptual and pragmatic spaces where Indigenous and Western knowledge can and should be integrated, in order to form environmentally, socially, and economically sustainable solutions to climate change" (Martin 2011, 4). There are others that consider the inclusion of Indigenous perspective as a way to supplement and enhance understanding of many disciplines of science, both social and physical. Many

articles make this point by showing the value of interdisciplinary research with and by Indigenous Peoples (Agrawal, 2009; Berkes 2009; Murphy, 2011; Huntington & Watson, 2012; Wildcat, 2013; Williams & Hardison, 2013; Whyte, 2014) and the wealth of knowledge co-produced through such collaborative research. Native Americans not only possess an incredible wealth of local ecological information, they also have their own forms of science specific to them.

Native Knowledge in Academic Disciplines

The value of Indigenous voices in conversations of climate change has grown as disciplines such as Geography have worked towards creating space for multiple epistemologies and ontologies in research. This transition has not been easy nor is it close to the decolonization necessary to embrace differing and often opposing ontologies and epistemologies (Howitt & Suchet-Pearson, 2003; Rundstrom, 2003; Shaw et al., 2006; DeLeeuw et al., 2012; Coombes et al., 2013). Some geographers have exposed the inequality and oppression of colonial systems of knowledge production and acceptance (Rundstrom & Deur, 1999; Rundstrom et al., 2003; Shaw et al., 2006; Berry, 2008; Panelli, 2008). Other scholars are Indigenous and have contributed their own epistemologies to their research in an effort to decolonize knowledge production and its uses (Johnson et al., 2007; Pualani-Louis, 2007; Whyte, 2013).

This shift in thought and the emergence of more Indigenous and Native American scholars has opened the doors to pluricultural conversations in research and paved a way for a broader acceptance of Indigenous thought. Geography is a leader in

cross-cultural interdisciplinary studies, especially in the emerging contemporary challenges Native Americans face. The wealth of place-based knowledges possessed by Native Americans can supplement Western science by providing in depth, holistic, and short- and long-term insights. These insights have potential to offer solutions to projected climate changes challenges.

Traditional Ecological Knowledge

Traditional Knowledge (TK) and particularly for this context, Traditional Ecological or Environmental Knowledge (TEK), is pluricultural and most often place-based. TEK is increasingly seen as being important for the development of an interdisciplinary approach to climate change policy in the United States (Williams and Hardison, 2013). The Native American long-term, experiential, holistic, and land-based way of knowing provides insightful understandings of the "nature-culture nexus" (Wildcat 2009, Martin 2011).

TEK is a subset of Indigenous knowledge that can be understood as collective knowledge passed down through generations the failures and successes through stories, songs, and oral traditions about the interconnected relationships between people and place, humans and non-humans (Berkes, 1999). TEK is often an integral part of the local culture and environmental management adapted to specific areas (Wildcat, 2009, 2013) TEK can include diverse kinds of narratives or observations by an Indigenous person or group. These narratives, in turn, can provide intergenerational observations of various kinds of natural resource phenomena (Alexander *et al,* 2011). Native Americans narratives can supplement scientific and technical solutions to climate change problems.

Berkes and others suggest similarities and differences between TEK (Native Science) and Western science. (Berkes, 1999; 2009, Cajete, 1994, 2000; Dunbar-Ortiz, 2014).

"Native Science operates according to cognitive and linguistic 'maps' that chart both collective and individual wisdom" (Cajete, 2000, 65). The foundations of TEK, Native Science, and other Indigenous Knowledge come from generations of learned experiences of successes and failures based on reciprocal between humans and non-humans and to the place they live. Native Americans live the science as part of their survival as their existence and survival depends on knowing plants and their properties (botany), animal patterns and foods, (zoology) weather patterns and season (climatology) then being able to pass on the knowledge to assist the next generations survival (Cajete 1994). Native Science or TEK has generated information about place and the shifts of patterns of place specific to each Native American Nation and their relationship to place (Basso 1996).

TEK as Adaptation and Sustainability

The recent and increasing academic and scientific interest in TEK has created a new reciprocal relationship between Western and Indigenous scientists that fosters new dialogues and possible new knowledges (Huntington, 1992; Rundstrom & Deur, 1999). Although the path for integration of TEK with Western science for environmental management is fairly new, there are now constructive opportunities for Indigenous and scientific communities to collaborate, as in this case, on the crucial issue of climate change (Wildcat, 2009, 2013; Murphy 2011; NWF, 2011; Nakashima et al., 2012; Huntington & Watson, 2012; NCA, 2014). This collaboration particularly has been

taking place in the Arctic (Sakakibara, 2010; Cochran *et al*, 2013; Maldonado *et al*, 2013) and in vulnerable coastal regions but little has been done with Native Americans in the south central region of the United States. There have been some attempts to address the latter, with very positive results such as with Peppler's work with tribes in Oklahoma (2011) and meetings with tribes in the south central US region conducted by SCIPP (Riley *et al*., 2012) and the SC-CSC. With the concentration and diversity of the Indigenous population in this region and the climate projections for the region (NCA, 2014; IPCC, 2014), the issues of climate change and Native American peoples in this region need additional attention.

Various advocates of TEK promote its benefits on several levels, including: improvements to scientific research and management through more and sometimes better information (Freeman & Carbyn, 1988; Johnson, 1992), identification of new paradigms by which we can understand the natural world and our relation to it (Colorado, 1988; Kawagley, 1995; Deloria, 1996; Wildcat, 2009, 2013), and broad societal change away from the positivist and amoral and toward the holistic and ethical (Colorado, 1996; Kremer, 1996; Wildcat, 2009; Whyte, 2014). There are opportunities for collaborations with tribes (Agrawal *et al*., 2007) across boundaries, disciplines and other areas such as science. By including political and Native American leaders in discussions with climate change scientists, there could be collaboration to produce more relevant policies and laws.

> *Inclusion of Native Nation's concerns and Native American governance in a sustainability dialogue is a necessity for two related reasons. First, as Native Americans are significant ecosystem participants, they play an invaluable role in environmental policymaking. In addition, addressing jurisdictional uncertainty in a manner that protects individuals and Native American integrity can help Native*

> *Americans sustain their communities and exercise their sovereignty. Sustainability requires providing fair legal and policy frameworks that are enforced impartially and that are responsive to present and future societal needs in an accountable, effective, transparent, equitable, and inclusive manner.* (Burleson, 2001, 1)

Tribes possess rights that give legal rise as well as moral claims for specific redress (Krakoff, 2008; UNDRIP, 2007). It is important that tribes in the south central region, as well as other places in the U.S., evaluate their own circumstances, current and projected, in regards to climate change, and how they choose to respond and adapt.

Relationships with Water

In his book, *God is Red: A Native View of Religion*, Vine Deloria Jr. describes the philosophical and thematic differences between American Indian religions and western, Judeo-Christian religions (Deloria, 2009). One crucial difference is that of organizing principles: American Indian religions emphasize space while the Judeo-Christian religions emphasize time (Deloria, 2009; Krakoff, 2008). This deeply significant relationship and worldview that intertwines everyday life with places (Basso 1996) is significant to how Native American peoples identify environmental transformations. This kincentric ecological relationship, a epistemological and ontological understanding of being related to place and all that exists within place as relatives, makes many of them exceptionally aware of changes and vulnerable to impacts from changes (Salmon 2000). Often it is Indigenous peoples that are the first to be impacted by climactic shifts (Nakashima *et al.*, 2012; Cochran *et al.,* 2013; Wildcat, 2013; Williams & Hardison, 2013; NCA, 2014).

The Oklahoma Climatological Survey released its climate projection from 2011 on implications for Oklahoma that include but is not limited to: earlier and longer warm seasons; increased year round evaporation from the ground and transpiration from plants; increased drought frequency and severity; increased wildfires, and longer rain-free periods but more intense periods of heavy rain that will increase run off and flooding (OCS, 2011). These changes are already being observed and are altering the quantity and quality of water in the region. This is not limited to Oklahoma and as such represents a larger regional challenge. The need for water is having drastic affects. Agriculture is desperately dependent on aquifers due to lack of consistent or dependable precipitation. Ranchers often feed their animal imported harvested grass because local grass is often dried up and heat has increased the intake of water for all creatures and plants alike. Factor in the urban need for water and all the communities in the south central region border on crisis.

Indeed, projections of increasing temperatures, faster evaporation rates, and more sustained droughts brought on by climate change will only add more stress to overtaxed water sources (NCA, 2009; Cozetto *et al*, 2013; IPCC, 2014; NCA, 2014). The issue of water already has sparked conflict between Native American Nations, state, and local governments.

Vulnerability of Native Americans to Climate Change

Cultural Traditions

Traditional Native practices and relationships with the natural world form the spiritual, cultural, and economic foundation for many Native American nations—

foundations that will be, and in some cases already are, threatened by climate change (Hanna 2007). Vulnerability is greater for those who have few resources and few choices, according to a U.S. Global Change Research Program report and other sources, Native Peoples are more sensitive to changes as many have relationships with place that they are deeply dependent on physically and spiritually. This sensitivity makes them increasingly vulnerable to changes in their environments (NCA, 2009; Wildcat, 2013; Whyte, 2013). This is true for most Native American Nations.

There are several issues that will become increasingly more apparent as the climate changes. The challenge will be how tribes in this region will handle the issues specific to them in their area (Maldonado *et al.,* 2013). Hanna (2007) suggests that because regions are different and climate changes will cause different shifts in multiple ways, the differing Peoples in a region are being forced to change as well, and that one policy is not going to be effective or relevant.

Policy Limitations

The relationships between Native Peoples and the federal government are determined by treaties, executive orders, tribal legislation, acts of Congress, and decisions of the federal courts. These agreements cover a range of issues that will be important in adapting to climate change, from responsibilities and governance, to use and maintenance of land and water resources (Maynard 1998). The boundaries of the reservation homeland are fixed, but if the natural environment of the reservation is changed, degraded, or destroyed, tribal culture and any subsistence way of life are concurrently destroyed (Evers 2000).

Hanna (2007) suggests many aspects of tribal culture—for example; subsistence practices and water rights for tribal lands—have been recognized and protected by treaties, statutes, and judicial decisions. In the event of growing scarcity of natural resources and other effects of climate change, tribal enforcement of these interests could pose problems for current patterns of use and consumption by non-tribal parties. Native American nations cannot depend on the federal government to respond to every nation's needs adequately. Events in the U.S. make it clear that it is unprepared to address the needs of vulnerable populations in areas that will be affected by the long-term consequences and short-term disasters produced by climate change (Lueck 2011), such as large hurricanes, tornadoes, extreme drought, and continued rising temperatures of the oceans and Earth. Native American Nations across America have a long history of neglect and apathy from the government when it comes to issues affecting them (Deloria, 1998).

In summary, my review of the literature shows that Native Americans and other Indigenous Peoples are faced with climate change in many regions around the world and in the U.S. With evidence that the Native Americans in other regions are experiencing changes, suffering impacts, and struggling to adapt, Native Nations in the south central U.S. likely are experiencing climate change, too. The value of their knowledge could complement scientific findings and collaborations could expand understandings of climate change in all directions because all would learn from the other.

It is important for scientists to understand that they should not attempt to represent Native American or any Indigenous group without the approval of the group

and its leaders. Native Americans are observing and experiencing climate change in the south central region in the form of drought and increased heat, loss of surface and aquifer waters, and migration and depletion of important plants and animals, with resultant impacts to their culture and sustainability (Peppler, 2011; Riley et al., 2012; NCA, 2014). They are attempting to adapt in ways appropriate to them and their culture through farming practices that provide some food security and that perpetuate their relationship with place (Peppler 2011) as well as implementing adaptive practices. However, more research is needed to fully understand the extent of the effects, which this thesis will contribute to.

Chapter 3: Workshops and Methods

Background

The methods used in my project were loosely based on methods used for an Intertribal workshop held for Oklahoma tribes in December 2011 in Norman, Oklahoma, at which 22 of 39 federally recognized Tribes in the state came together to discuss climate change as seen through their eyes. That meeting revealed that Tribes wanted climate information that was place-based and as such relevant to their own concerns. To do this, a grant was awarded by the U.S. Department of the Interior, United States Geological Survey (USGS), and run though the South Central Climate Science Center (SC-CSC). It allowed me to expand upon that workshop and utilized some of the same methods, plus the use of Indigenous and ethnographic research methods. The study design for this research is cross-sectional in which I collect data from Native American participants at one of five regional workshops held over the summer of 2013 to ask about climate change.

Objective

The objective of my study was to understand whether climate change is an issue for Native Americans in the south central region of the U.S. The study aimed to answer the following questions:

What does climate change mean to you?
Is your tribe discussing climate change and variability?
Have you experienced or observed any changes in climate?
Has there been any extreme weather event that your tribe has experienced that has long-term affects?
What is the biggest concern impacting your tribe today related to weather/climate?

Filmmakers who were part of our project asked these questions, in recorded interviews, to Native Americans from different tribal participants. These participants had given their informed consent through signed documents informing them of the purpose and extent of the study. I explained to interviewees that their responses would be shared for the purpose of educating people on the issues Native Americans are experiencing in the region. The filmed interviews were just one part of this large and multilayered project, as there were four components in total: SC-CSC familiarization, education related to participatory video, creation of a video that represented the aims of the project and interviews and interviews of participants responding to my thesis question.

The Workshop Team

The grant for this project was designed to support six inter-tribal workshops on climate variability and change. The project team included Dr. Renee McPherson, Director of Research for the SC-CSC, Rachel Riley of the National Oceanic Atmospheric Administration (NOAA) Southern Climate Impact Planning Program (SCIPP), University of Oklahoma (OU) Associate Professor in the Department of Geography and Environmental Sustainability (DGES) and Principal Investigator Dr. Laurel Smith, myself as co-Principal Investigator, and Filoteo Gómez-Martínez, one of the two filmmakers. Others who assisted included Dr. Randy Peppler, NOAA Cooperative Institute for Mesoscale Meteorological Studies (CIMMS), Dr. Kimberly Winton, Director of the SC-CSC, and April Taylor, who is the Chickasaw Nation

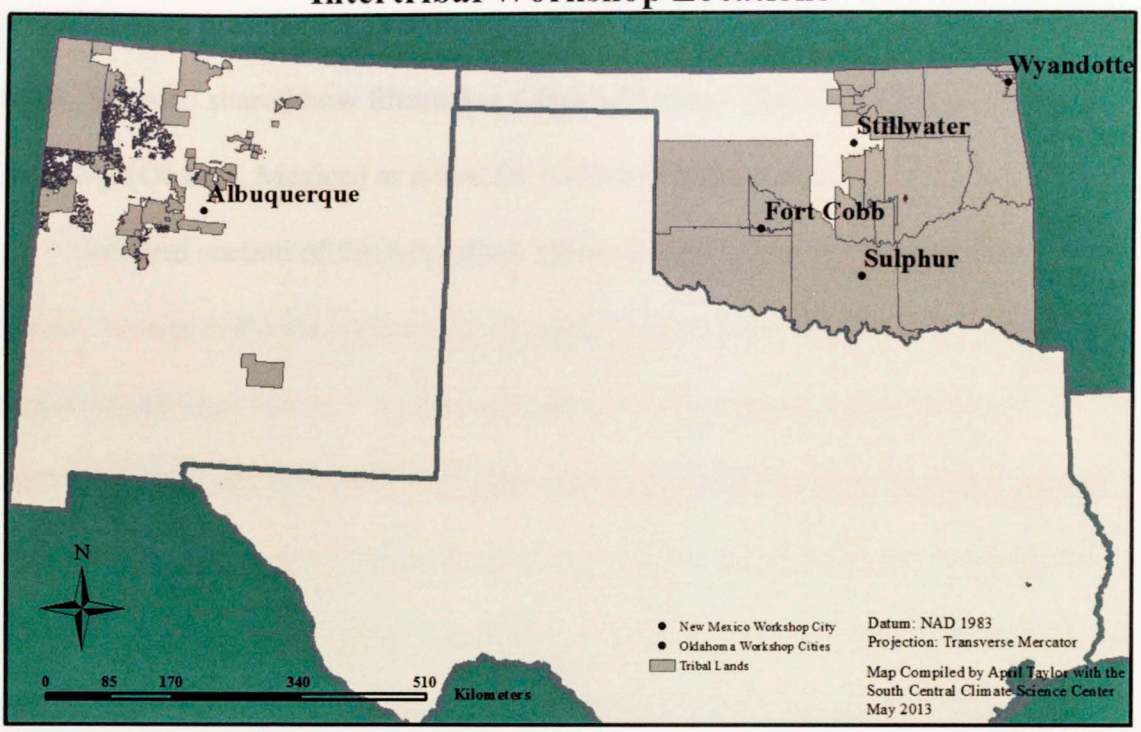
Sustainability Scientist for the SC-CSC. Indigenous filmmaker Jeffrey Palmer (Kiowa) also was part of the workshop team.

Workshop Organization

The workshops were organized to extend presentations and tools on climate information with the participants, and to show how participatory video can serve as a tool to address and document climate change. Lastly, the workshops were structured so that attendees could respond to my research questions on a come-and-go basis throughout the day in recorded interviews. A short documentary film from these interviews evolved from the workshops titled *Listening for the Rain: Indigenous Perspectives on Climate Change* posted on Vimeo, https://vimeo.com/87696613.

Five intertribal workshops were held, four in Oklahoma and one in New Mexico, inviting Tribal Peoples from the surrounding areas to come together and discuss climate change, meet representatives of the SC-CSC, SCIPP, and also Department of Interior Landscape Conservation Cooperatives (LCC) (Figure 1). In planning the workshops, it was important to choose locations that were centrally located at equal distances between tribal participants as to not create unfair hardship and neutrality.

Figure 1- Map of Workshop Locations, Courtesy April Taylor, SC-CSC



The workshops offered opportunities for participants to learn more about climate change tools and participatory video and to share their stories about their observations and understandings of climate change. The first part of these workshops consisted of introductions by the SC-CSC, SCIPP, and OU representatives to introduce climate tools and information. There was also an introduction of the Landscape Conservation Cooperative (LCC) representatives in each workshop region and the types of information they might provide to the tribes. Dr. Smith led the second part of the workshops, which focused on how participatory video could be used as a tool by Native nations as a tool to document and present in their own culturally relevant manner how climate change and variability have impacted their tribal communities and cultural resources. She also discussed how a participatory video project led by Indigenous

filmmakers could have important benefits for Tribes in the region. She showed the attendees a few brief video examples to contrast how Indigenous and non-Indigenous filmmakers have presented the relationship between climate change and Indigenous peoples. She also shared how filmmaker Gómez-Martinez had used video in his own community (Oaxaca, Mexico) as a tool for historical preservation.

The third section of the workshops allowed tribal members to sit for an interview to answer the research questions I designed. The interviewers gave each interviewee the opportunity to review and ask questions regarding the Informed Consent form that they were asked to sign, developed by the project team leaders and approved by the OU Institutional Review Board (IRB). The form had been emailed to participants prior to the workshop for review. I explained what an IRB is and its role in protecting the interviewees. I encouraged the interviewees to refrain from disclosing anything culturally sensitive or tribally specific in order to protect tribal interests. This was important to prevent potential exploitation of such information as once such information is documented it becomes public. Although collecting Native participants climate insights was important, the funded workshop proposal contained vague language referencing "cultural resources" – it turned out that some of the participants were uncomfortable with complying with such requests. Gómez-Martinez and Palmer filmed interviewee responses to my research questions and told them that the project team would likely develop a short film that could be used by the interviewees or other institutions to educate and inform a number of audiences on their observations and experiences of climate change and weather variability. Participants were informed verbally and through prior and the informed consent process that they would have the

opportunity to review the final product before public release so that they could review how they were represented in the editing process.

The fourth section of the workshops consisted of facilitated focus group discussions that asked participants about their knowledge of climate change, how they know it, and their impressions of, and interest in the climate science information and tools that had been presented to them earlier in the workshop. These discussions were audio recorded and later transcribed. This part took place near the end of the workshops.

The project team designed the workshops originally to include participants specifically from Tribal Environmental Departments within the 63 federally recognized tribes in the region covered by the SC-CSC (Figure 2). The proposal was to fund six workshops, four in Oklahoma and two in New Mexico. After discussions with some Pueblo citizens, I learned that the Pueblo Peoples often hold activities at the Pueblo Cultural Center and would prefer to meet there. For this reason, it was decided it would be more accessible for those in the region and more culturally appropriate to hold a single workshop at their common meeting place – so just one workshop was held in New Mexico.

Tribes in the South Central Climate Science Center Region

List of Tribes:

Louisiana:
1. Jena Band of Choctaw Indians
2. Tunica-Biloxi Indians
3. Coushatta Tribe
4. Chitimacha Tribe

Texas:
5. Ysleta Del Sur Pueblo
6. Kickapoo Traditional Tribe
7. Alabama- Coushatta Tribe

Oklahoma:
8. Choctaw Nation of Oklahoma
9. Chickasaw Nation
10. Citizen Potawatomi Nation
11. Absentee-Shawnee Tribe of Indians of Oklahoma
12. Kickapoo Tribe of Oklahoma
13. The Seminole Nation of Oklahoma
14. Shawnee Tribe
15. Seneca-Cayuga Tribe of Oklahoma
16. Wyandotte Nation
17. Eastern Shawnee Tribe
18. Peoria Tribe of Indians of Oklahoma
19. Modoc Tribe of Oklahoma
20. Ottawa Tribe of Oklahoma
21. Quapaw Tribe
22. Miami Tribe of Oklahoma
23. Apache Tribe of Oklahoma
24. Comanche Nation
25. Kiowa Indian Tribe of Oklahoma
26. Fort Sill Apache Tribe
27. Caddo Nation of Oklahoma
28. Delaware Nation
29. Wichita and Affiliated Tribes
30. Cheyenne-Arapaho Tribes of Oklahoma
31. Thlopthlocco Tribal Town
32. The Muscogee (Creek) Nation
33. Sac & Fox Nation of Oklahoma
34. Iowa Tribe of Oklahoma
35. Pawnee Nation of Oklahoma
36. Otoe-Missouria Nation
37. Ponca Tribe of Indians of Oklahoma
38. Kaw Nation
39. Tonkawa Tribe of Indians of Oklahoma
40. The Osage Nation
41. Cherokee Nation
42. Alabama- Quassarte Tribal Town
43. Delaware Tribe of Indians
44. Kilagee Tribal Town
45. United Keetoowah Band of Cherokee Indians

New Mexico:
46. Ute Mountain Tribe
47. Navajo Nation
48. Zuni Tribe
49. Jicarilla Apache Tribe
50. Pueblo of Taos
51. Pueblo of Picuris
52. Pueblo of San Juan
53. Pueblo of Santa Clara
54. Pueblo of San Ildefonso
55. Pueblo of Pojoaque
56. Pueblo of Nambe
57. Pueblo of Tesuque
58. Pueblo of Jemez
59. Pueblo of Zia
60. Pueblo of Santa Ana
61. Pueblo of Sandia
62. Pueblo of San Felipe
63. Pueblo of Santo Domingo
64. Pueblo of Cochiti
65. Pueblo of Acoma
66. Pueblo of Laguna
67. Pueblo of Isleta
68. Mescalero Apache Tribe

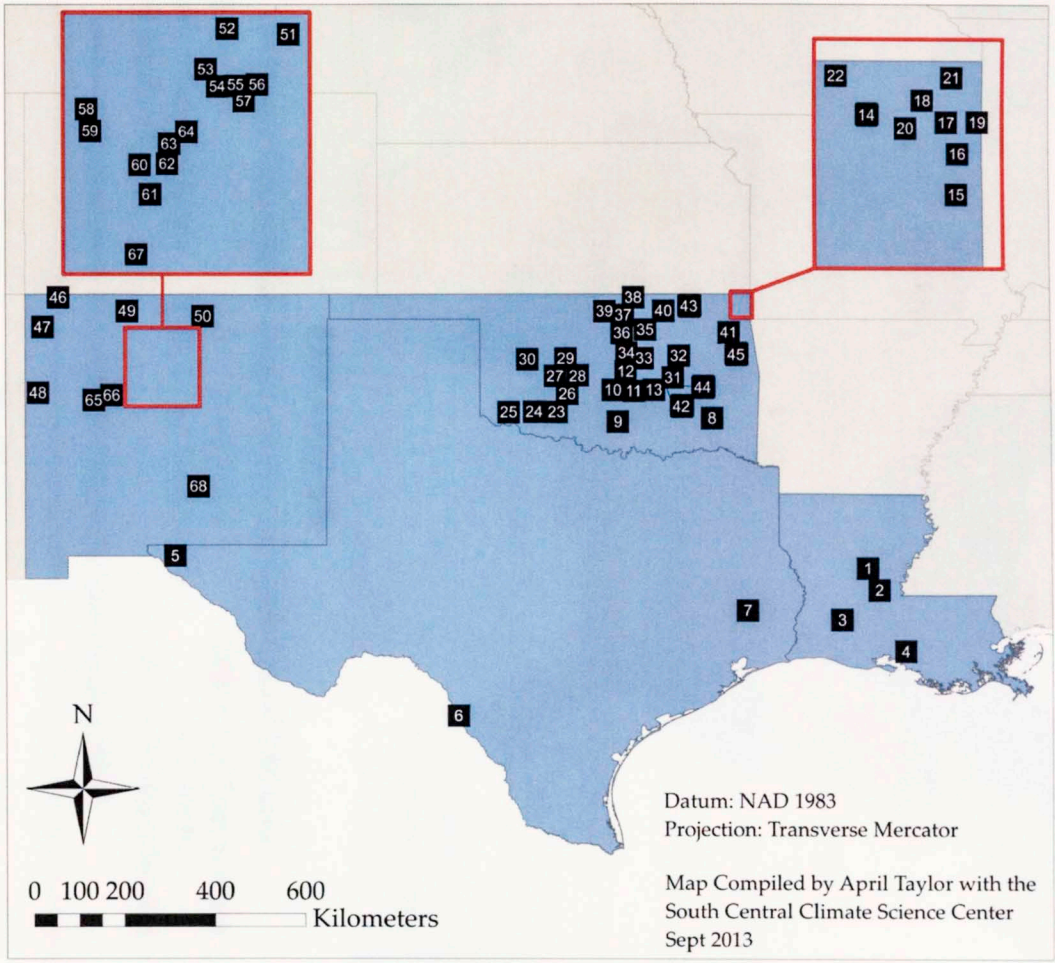
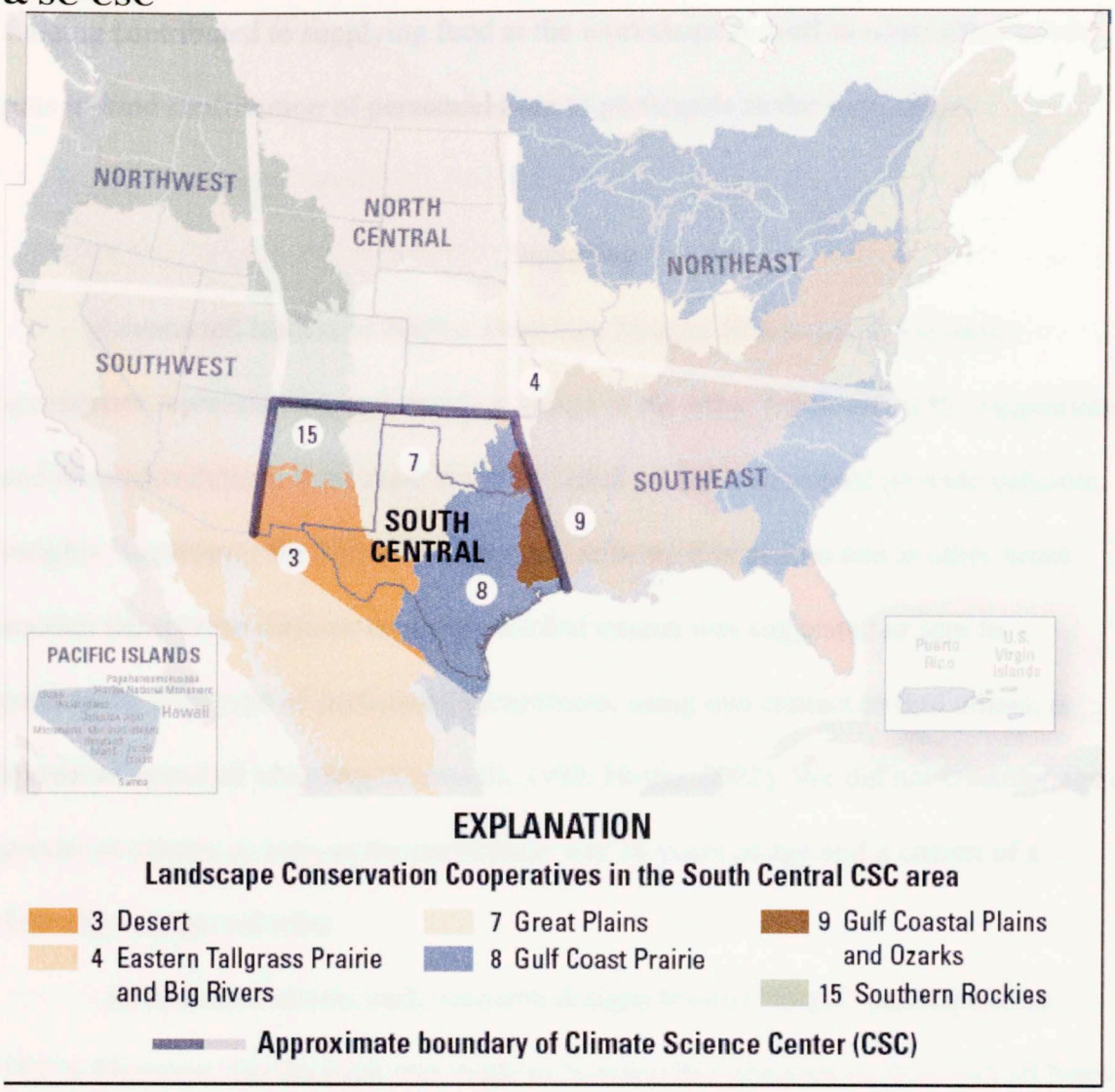


Figure 2- Native Nations within the SC-CSC Region

Figure 3 - SC-CSC Region with LCC's, Courtesy of Dr. Kimberly Winton, USGS & SC-CSC



Funding

The South Central Climate Science Center (SC-CSC) funded the project through the U.S. Department of the Interior's USGS, with other support provided by the NOAA SCIPP project. The amount funded was $55,407 and its duration was from July 1, 2012, through December 1, 2013. The initial funding ultimately was not sufficient to cover the extra financial costs of hiring an audio-visual technical supervisor and some of the other costs related to the video portion of the project that had been included in the original grant as deliverables. Subsequently, Smith and Gomez-Martinez proposed to and

received funding from other sources to supplement this portion of the project. SCIPP's funding contributed to supplying food at the workshops as well as some other needs, plus in-kind contribution of personnel time to participate in the workshops.

Sampling

I contacted leaders of Native American Nations first to invite the most appropriate representative and decision maker of the tribe. I then asked for suggestions and recommendations from them for other tribal citizens who could provide valuable insights. Sometimes the TEP was suggested as being that person and at other times another department director or simply a tribal citizen was suggested or sent to participate. This type of participant recruitment, using one contact to find others, is known as snowball sampling (Creswell, 1998; Hoyle, 2002). We did not consider age or gender as criteria as long as the participant was 18 years of age and a citizen of a federally recognized tribe.

As indicated above, early research designs limited "target" participants to TEP's. However, the decision was made to broaden that criterion because not all Native nations have a TEP or an Environmental Department – this might have excluded some Native American Nations from participating. After expanding this criterion, participants ultimately included a variety of Native American leaders, professionals, scientists/researchers, farmers, Tribal employees, teachers, and Tribal citizens. This even included a few from outside the SC-CSC region who were able to offer rich insights into climate change in their home regions. In the end, we sought a wide

spectrum of Native American participants to participate in order to achieve a more diverse sampling.

Snowball sampling was made relevant to Native American contexts. Contact was made with Native American Nation leaders to invite them first. I did this out of respect for the sovereignty of the Native American Nations. Contacting leaders first is not only respectful; it allows the main decision makers for Tribes to decide if they choose to attend and if not they designate whom from their community they chose to participate. It is proper etiquette when approaching an Indigenous Nation to ask permission and formally invite the leadership to attend such gatherings when the goal of the gathering is to ask for information from their citizens and extend information that could help the Tribes protect their Peoples. Therefore, cultural competency was important in planning for the eventual success of the workshops.

Cultural competency refers to how individuals are trained or educated in the norms, histories, epistemologies, and ontology's of the Peoples one sets out to work with. A pluricultural team, that is, a team with multiple cultural backgrounds, often is valuable in cross-cultural research as long as there exists cultural competencies to balance different and sometimes opposing worldviews and biases. It is suggested that the researcher possess or at least be cognizant of the knowledge, attitudes, and skills of the ethnic or cultural group one is working with (Vonk, 2001).

Indigenous Methodologies and Indigenous Geographies

I was provided a lot of freedom by Smith to infuse my own ideas, techniques, protocols, and worldview into this research project to design it in a way I felt

appropriate and respectful to the Native American groups we were attempting to work with. Some of these techniques allow for decolonizing of research (Smith, 1999; Shaw et al., 2006; Louis, 2007; Tuck & Yang, 2012) in that the Indigenous student led the non-Indigenous researchers in some decisions and methods as Kovach mentions (2009). This I believe allowed for bridging of the differing and sometimes opposing methodologies of knowledge production, an "insider/outsider research" approach (Smith, 1999,138). I was allowed to combine my own epistemology into the research in effect attempting to decolonize the research being done (Kovach, 2009).

Indigenous methodologies are based on principles of respect and etiquette and reciprocal relationships between Peoples and place, including everything in a place (Smith, 1999). It is based on "(a) tribal epistemology (b) decolonizing and ethical aim (c) researcher preparation involving cultural protocols (d) research preparation involving standard research design (e) making meaning of knowledge gathered (f) giving back" (Kovach, 2009, 45).

I often depended on my own relationships with Native Peoples I know to recruit other Native American participants. I hoped to leverage this research opportunity to support the self-determination and sovereignty of the Peoples that participated by creating space for the participants to self-represent and tell their stories (Louis, 2007) of climate change. This desire to promote sovereignty and reciprocity are deeply embedded Native American and Indigenous traditions that when used as research tools can benefit both researcher and communities in qualitative studies. I did not just do this research for myself, I did it for my Native American and Indigenous community and extended communities in Indian Country. I did it to address pressing issues that have

historically been silenced and I have a responsibility to my homelands, my family, my tribal community and all my relations, those seen and unseen.

Data Management

We recorded the interview data on video and kept it in a locked office drawer as well as backed up copies on multiple external hard-drives, the university computer and Digital Video Disc (DVD). After obtaining the audio taped discussions of the focus groups, both these and the video interviews were transcribed. In this way, the data were kept safe, and allowed for easy use when needed.

Making Sense of the Data

I started the process of coding the oral testimony after I completed transcription of the audio and video recordings using voice recognition software. I identified four major themes as emerging from the responses to my questions. These themes are: (1) 'The Nature of Climate Change' – the respondents explanations of climate change; (2) 'Impacts' – the observations and experiences related to climate change that the participants shared; (3) 'Adaptations and Mitigation' – the levels of preparedness and adaptation to climate change the participants had done or knew of; and (4) 'Responsibility' – this breaks down the ownership of the response to and accountability for the problems and solutions.

From these major themes came several subthemes, coded as water, weather, and specific transformations of place that participants related to climate change. The most important subtheme issue was water. From water emerged three subthemes,

precipitation or lack of, surface waters, and subsurface waters or aquifers. Another major subtheme was extreme weather events. This included temperatures, especially heat. Other subthemes were the residual impacts of water such as drought, including topics such as lakes and rivers drying up, species migrations, and insect and parasite problems. I coded the subthemes based on their frequency of discussion by different people so that their priority could be identified by region.

These data are presented in detail in Chapter 4. The objective, overall, was to compare and contrast the workshop regions and the people's experiences within the places they live and how all of that connects to what scientists are saying about climate change.

Chapter 4: Voices from the Workshops

What follows is a presentation of Indigenous voices organized by workshop and by the four themes that emerged from the interviews and focus groups: Nature of Climate Change, Impacts, Adaptation and Mitigation, and Responsibilities. People's thoughts and voices are not so easily classified into a single theme but I found that some form of organization and structure was necessary to compare the thoughts and ideas of speakers from different workshops.

Stillwater, OK, June 4, 2013

Nature of Climate Change

The first workshop was held in a conference hall at Oklahoma State University in Stillwater, Oklahoma. Even though the research team outnumbered the guest participants, meaningful discussion was had, and the participants made a number of key observations.

Daniel Wind's statement was typical and blended both scientific and traditional explanation of climate change:

> *Climate change means just a shift in like our weather, our atmospheric activities that are beginning to change either from one extreme to another extreme, whether it be from extreme periods of drought, to heavy rain falls, to heavy snow falls, just kind of more extreme. Not really that steady historical way it's been.* - Daniel Wind, Sac and Fox, TEP

Daniel's quote illustrates a main observation about climate change, in which participants agreed their regions were experiencing atmospheric and environmental changes that included some changes from the norm. Some connected these changes to temperature and precipitation patterns. Almost half of the group connected changes in

temperature and precipitation to a holistic context of all changes being experienced within their particular places, which included plants and animals.

Casey Camp-Horinek chose to explain climate change in terms of the experience of place and the changes she observes with respect to living things within that place. As she explains:

> *Climate change is a part of a new adaption for all of our peoples. Not just the Ponca people but [peoples] around the globe. We see different animals coming up from the South now that never existed among us in [earlier] periods of time. We see that many of the ones that lived among us have now moved further north. We see that the fish have changed [regarding] what is local and what is not local anymore. We see that the plants themselves have many changes: when they come around and how they come around and what grows what doesn't. We see that the seeds that we have reclaimed from our original place sometimes don't work here as they [used to]. They don't grow at the same rate, they don't produce seeds. So we see that some of the bugs, the little creepy crawlers that prior to [now have] not been a problem are now huge problems and they're frightening because they're killing the deer and they're killing the little animals that others feed on. We see that the water is often times nonexistent in the ponds and lakes and rivers that we fished in you know. So there's tremendous change and a good deal of that for the Ponca people is not only because of the drought that is being caused by the climate change [but also] from the extractive industry and what it's doing, [including] the direct effects of environmental genocide that's happening to my people there in Ponca country...*- Casey Camp-Horinek, Ponca, Respected Elder, Actress

Casey also drew upon changes in her local environment to describe climate change and, in this way, much of her discussion revealed a holistic understanding of atmospheric and land-based processes. To her it is not only weather, but also a transformation of place and all life within that place that are changing. She discussed the land shifting in its appearance. She linked the issues of global warming and climate change to all aspects of her local surroundings.

Impacts

Stillwater participants discussed the impacts of climate change in subtheme terms of water problems, food and agriculture stresses, weather extremes, and seasonal and migration pattern shifts in plants, animals, and other species. The issues involving water included precipitation variations, surface water problems, and aquifer impacts. The impacts to the people are described in subthemes coded by frequency of topic discussions as priority.

Subtheme Water Problems – Drought

All of the participants mentioned water at some point, and many of them referred to the lack of precipitation or drought and its impacts on the surface water resources in their areas, especially streams and ponds. Direct effects on livestock and agricultural water were mentioned because of water use by extractive industries and associated concerns about contamination. Some Tribes and their members were drilling new wells to access underground water for agriculture though there were concerns expressed about the health of the aquifer. Also, concerns about food security were acknowledged as increased aridity changes migration patterns and the carrying capacity of the land for both wild and domestic animals. Again, statements made by Daniel Wind were typical:

> *Drinking water has been, for the Sac and Fox Nation here a pretty big deal because our [limited] water supplies. Previous water supply has already been contaminated, from not so much climate change, [but] by drilling, oil industries. So it's one of those things that we are*

[concerned] about is our water supply now. With droughts and things like that other people are beginning to ask, "can we get some of your water?" Whether it be for agricultural use, industrial use, we're hesitant on it, for anyone right now because we know that we have to be able to maintain our safe water [for] drinking water supplies, for our future generations of people. When there's a drought the groundwater doesn't get recharged as much and I think that it puts us on alert that we need to pay careful attention to what is going on with the weather, and with the drought. - Daniel Wind

Other issues that elicited great concern were the increasing temperature and stagnation of already low levels of surface water, causing oxygen levels to decrease and some water sources to totally evaporate. This has led to increased fish mortality. Yvette Wiley and Casey Camp-Horinek relate:

As far as tribal citizens, the drought has affected everyone. We've had fish kills because the water gets too hot... for an extended period of time you know. Say your fish population will crash with a rebound usually. We've had creeks and streams dry up that I had never [known to dry up]. - Yvette Wiley, Muscogee Creek, TEP

Because of the drought situation, because of the situation of these massive rains occasionally happening, because of the past droughts that have happened and the global warming is going on as a result of this, we know that within the last 10 years since the century turned, that 10 of the 12 years there's been warmer than ever before. We can't dig in the ground, there's no such thing as a root cellar anymore, the berries that we used to pick: the drought has killed them. The trees that are here about one in every eight has died. Our fruit trees are not producing at the same rate as they were before, the ponds have completely dried up in areas where people used to go fish and know that they could have food, because they dried up over the five-year period you cannot go fish there anymore. – Casey Camp-Horinek

Subtheme Water Problems –Flooding

Too much water was sometimes a topic of discussion. Participants mentioned erosion and runoff, chemicals and other materials as impacting ponds, rivers, lakes, and streams. Also, heavy rain events have created runoff that washed away seeds planted for

families and communities. This impacted gardens, community crops, and traditional wild foods plants. The stress to the soils from drought and heavy rain caused erosion of topsoil and increased the need for chemical support for plant growth. Casey put it this way, "We have areas there that the drought is so effective that you can't grow anywhere without chemicals in the ground. But also…these massive rains…washout the crops that are planted."

Subtheme Food and Agriculture Stresses

Dan Cornelius discussed the impacts of climate change on food security, and the importance of having a healthy ecosystem that provides sustenance for those that live in it:

> *It's interesting with my job because I work in food and agriculture and we've been having some extreme weather. Just lately [the temperature] got up to 80° [Fahrenheit] in March and then got cold again. Then it rained a bunch and the rain wiped out [different foods] At first the really hot weather pretty much eliminated the maple syrup harvest last year in Wisconsin, Minnesota, and Michigan. So that was the first thing and then it got warm. All of the blossoms came out on the trees and it got cold again, so they [tree blooms] died and had an almost complete failure of cherries. Apples were significantly affected [negatively]. I've got a cornfield up by Duluth, and right after we planted it rained a few inches and then got cold [which] stunted the growth of corn. But, really across the whole region last year the extremes in climate really impacted agriculture. It got wet and [then] it got really dry, there was severe drought. So I guess I kind of look at it through food, or that's one of the big lenses that I look at it through. With the wild rice we had all that rain it wiped out pretty much [most wild rice], it completely wiped out the wild rice beds from Eastern Minnesota all the way across Wisconsin. That's a big impact on people's lives and being able to harvest and really have food products that still sustain people's diets to a very large degree. The other thing too is that it puts stress on the ecosystem and I really think that a healthy ecosystem provides sustenance. In addition to the rice, the syrup and the fruits, and the impacts that the drought had on vegetable production, you also have major stresses on the forests and a lot of the wetlands. Already, right now you are seeing with the Emerald Ash borer that the stress the drought has on the ash trees. In the winter of 2012, it being pretty mild, you had a pretty big explosion of the emerald ash borer*

> *that takes out all of the ash trees, black ash trees, which is one of the traditional, important traditional products for a lot of the tribes in our region. So it's got a pretty wide-ranging impact. I don't really think we really, Scientists or "experts," don't even really fully understand what the ultimate impacts are going to be.* – Dan Cornelius, Oneida, Indian Agriculture Council

Dan, in his capacity with the Indian Agricultural Council, works with tribes on their food crop and other agriculture needs. His skills relate particularly to the impacts of climate change on tribal food systems.

Changing ecosystems resulting from parasites and invasive species also affected food security. Casey put things this way:

> *We see that some of the bugs, the little creepy crawlers that prior to this [climate change] have not been a problem, are now huge problems. And they're frightening because they're killing the deer and they're killing the little animals that others feed on. We see that the water is often times nonexistent the ponds, lakes and rivers that we fished. So yes we are recognizing that [climate has changed] and certainly our elders did. Certainly our elders recognized the changes that were going on and pointed out the different plants that no longer existed and how big the fish used to be when they would go and you know [fish for food]. And how the deer were plentiful in this area and they're not there anymore and how the coyotes are now looking all pitiful and eaten by mites and on and on and on. We see it and yet we still are just struggling to live.* – Casey Camp-Horinek

Subtheme Weather Extremes

Participants expressed belief that climate change also has increased violent weather occurrences and the intensity of violent weather events. Tornadoes were an indicator, including their intensity, size, and frequency according to almost half the participants. There were a few people who believed tornadoes have increased due to climate changes but felt there needed to be more science to connect them to

anthropogenic actions. Phillip Cravatt and Dan sum up typical opinions offered on perceptions of climate change:

> *Well climate change is ambiguous science somewhat because some people are just now starting to come around and say yeah it's a fact. Climate change I believe happens cyclic, that it naturally happens. I do think that the greenhouse gases that humans are producing are increasing, making it [climate change] increase faster. But as far as quantitatively, simply, besides temperature itself maybe some of the rainfall, it's hard to [be exact]. There hasn't been enough research, I don't think as far as species effect, you know along the lines whether it's plants or animals, humans, long-term to really gauge maybe the total affects, of climate change. So to me climate change would mean that [it is] something that we're still learning about. Something that we still haven't completely figured out the long-term effects or how it's going to affect us.* - Phillip Cravatt - Chickasaw, TEP for Iowa Tribe of Oklahoma

> *That's where climate change is a tough one. There have always been extreme variations and fluctuations in climate and so, how much of it right now is deviating from whatever [is the] historical norm? It's tough to say but it's definitely become more extreme.* - Dan Cornelius

In sum, the most discussed impacts at this workshop related to food security and agriculture in general, increased heat and drought, and safe water. The participants were quite aware of how their landscapes are changing due to perceived changing climate, and what those changes are.

Subtheme Seasonal and Migration Pattern Shifts in Plants, Animals, and Other Species

Some of these environmental transformations have impacted traditional knowledge of the population and species diversity of birds, snakes, insects and other life forms that have declined. Such decline has been seen over the lifetime of one participant's father, which she learned though the oral histories he shared. Many participants expressed concern for forced changes to cultural activities, some of which

involved location shifts by moving outdoor dances indoors to find relief from the heat and dry conditions:

> *Interestingly enough in our part of the area, out there where the Kaw people are, they have moved their powwows from August to October. You know, which to me is a huge cultural significance because they're Kanza, they're the people from Kansas. So they been here since the late 1800s and they're having to make this huge shift in one of their cultural practices. That was really hotly debated in the last few months.* - Casey Camp- Horinek

Adaptations and Mitigations

Due to the nature of the questions asked in the focus group discussions regarding use of, and interest in climate tools such as drought histories, and the questions asked in one-on-one interviews, participants spoke at length about adaptation and mitigation. All of the participants except for one agreed that the climate tools shared by the SCCSC and SCIPP during the workshop would be useful for agricultural and development purposes as well as for water management and planning. They discussed how understanding drought histories in Oklahoma, specifically in their region, would help them plan for future water and resource management.

One participant pointed out that climate data provided the ability to communicate information, and the hope for potential outreach within tribal communities to help understand the complexities of precipitation rates and temperature in the area. She discussed time frames of drought and wet periods, and explained how it could be easier for an average citizen as well as tribal leaders to understand the graphs and the images that some of the drought history tools provided as well as easier to plan for future changes. Others shared one female participant's sentiments in the group:

> *I was already familiar with it, but yet it's very useful, it depends on what your job is. Even if you're doing outreach to your community and your tribal community, you can take a lot of the information and then just make it easier for a layperson to understand what might be expected. What are the ranges, the normal ranges to be expected over the time period, the temporal range between drought and wet periods? Because when you look at some of those graphs, especially that 30 year wet period, that seems to be the anomaly right there. It seems like we cycle between these just from that time period from that graph. The cycle between very dry and very wet seems to be kind of our normal. If you look at a long period of time, you know people might be concerned but it's like, we'll plan for it [cycling between wet and dry periods] and to help people understand that.* - Unidentified Female

Dan also discussed the exchange of ideas and collaboration between tribes as a strategy for adapting to climate change. One of the strategies he employed in his region was creating a new marketing strategy for Indigenous Peoples in that area to exchange food products, what he called a "mobile farmers market." He felt this idea would serve as a form of climate change adaptation, something that would move foods from one tribal region to another during extreme weather events or as a result of climate shifts that impact food growth and productivity. He mentioned the preservation of traditional foods and the opportunity for food sovereignty as well.

Casey reflected on how the people of the Ponca Nation had long ago experienced forced climate adaptation through forced relocation to Oklahoma. She shared stories of hardship and adaptations her grandfather passed down to her. Casey also reflected on the environmental transformations of the new homeland in Oklahoma, as discussed earlier. Adaptation was not a choice, but a requirement for survival.

Agriculture is an area of adaptation many people discussed. Casey mentioned collecting lost strains of traditional corn seeds, particularly those that were not genetically altered, and reintroducing them into farming practices. She talked about how

her Tribe was attempting to re-learn "how to cross germinate the plants so that they would exist no matter what the weather was." A difficulty in their desire to create a secure food source is the inability to grow organic foods due to the gas and oil industries in their region that have polluted water, air and soil resources. The frustration with the government's lack of regulations to protect resources native peoples depend on was reiterated many times, with climate change making difficulties worse.

Multiple participants expressed frustration towards the inaction of the United States government to mitigate climate change and the contributors to it. Yvette asked, "Why are they [the government] not doing something? We know the science is there. But I think they're aware of that, and I think that is what the plan is, more for adaptation. I don't think they're going to try to mitigate." There were suggested solutions of taking adaptation and mitigation actions as a tribe, a community, or an individual. Individual and community actions were seen as more effective methods to address climate change adaptations.

Financial resources, political will, and the availability of aid were seen as the main obstacles participants shared in implementing adaptation strategies. Many mentioned the daily struggles to survive and that climate change was a situation they couldn't afford either in costs or personnel.

Responsibilities

All participants made reference to the oil and gas industry as being the leading cause of not only environmental transformation and weather pattern changes in the region, but also the larger issues of global warming and climate change. All agreed that

the fossil fuel industry had a responsibility to enact higher standards for protecting and cleaning up water, especially as it related to the tribes. Daniel discussed the importance of managing how agriculture and industry consume tribal water supplies as these often become sovereignty issues as Native American Peoples are forced to fight multiple groups for water rights. Casey spoke at length about the devastating impacts the fossil fuel industries have on her community in north-central Oklahoma:

> *There's tremendous change and a good deal of that for the Ponca people is not only because of the drought, that is being caused by climate change from the extractive industry and what it's doing, but from the direct effects of environmental genocide that's happening to our people here in Ponca country, where the extractive industries have become so forceful in their destruction of our mother earth, air, and the waters, the ground waters, that we are literally dying of cancers and autoimmune diseases.* - Casey Camp-Horinek

Casey places direct responsibility for community illnesses, air pollution, water pollution, and soil pollution in her region squarely on the hydrocarbon extraction industry and governmental policies that hurt the Ponca and other Indigenous Peoples. The pollution, she said, is killing her community at a high rate and called the process "environmental genocide." During the workshop she pointed out that the suffering and poor environmental conditions brought on by the petroleum industry has infiltrated the community for so long that the people have conceded to its impacts as part of their daily lives. Casey stated some were "literally trying to live at this point," and that tribal leadership is not addressing these long-term ongoing problems.

Casey connected drought with extractive industries in her area, coal burning power plants, and what Casey called the "toxic soup coming from the refinery north of her community." Other participants pointed to farmers' use of chemicals on wheat, corn, and other foods livestock animals eat, which in turn the people eat. These actions

create fear about consuming chemicals and pollutants that are produced by the petroleum industry and used in fertilizers, pesticides, and herbicides and consumed as oil, gas, and energy. All these acts are believed to create short-term problems that have led to long-term climate changes.

All participants recognized the shared responsibilities in protecting water resources. There were concerns over water rights, protecting water supplies, honoring water treaties, enacting better Environmental Protection Agency (EPA) regulations, enforcement of regulations, BIA representation of Tribes over government interests, and honoring laws and policies, past and present, for the betterment of the Indian Peoples. There has been confusion and sluggishness in water resource protection because of what is perceived as the soup of regulation and policy. Yvette and Casey were united about the U.S. government's responsibility to honor the contracts and treaties made with the tribes. They believe the EPA needs to protect the environment and people, but that it has failed. These women and other participants felt the government should be responsible for recognizing the rights Native American Peoples have to be protected from impacts brought on by what they perceive to be human induced climate change:

> *Climate change, that's happening all around the world and one of the things that I would like the powers that be to pay attention to is the United Nations Declaration on the Rights of Indigenous Peoples, because it directly addresses the rights that we have in terms of our cultural property and in terms of our traditional territories and in terms of our Indigenous rights to continue to survive.* - Casey Camp-Horinek

Another issue discussed involved the relationship between Indian Peoples and scientists. The issue of lack of trust Tribes have for research institutions and federal agencies was a main theme. There is a level of responsibility expected for those in

positions of power to take action to address the problems participants were experiencing. The lack of action and 500 years of broken promises, dishonored treaties, and breached contracts and laws enacted by the United States government and Supreme Court against Native Americans have established a pattern of actions towards Native Americans that leaves little to no reason to trust the government. The research community has not fared better as Indigenous Peoples have been targeted subjects of research since first contact. There are still isolated cases of research exploitation and unethical practices involving non-Native American researchers and Native Peoples. Yvette talked about how lack of trust of those in positions of authority created difficulties educating the general public about important issues of climate variability and change:

> *You can show them all the graphs in the world, the hockey stick, anything, but if they're kind of in that group that does not trust the groups sitting up in the ivory towers and academia, the graphs don't matter as much. They're going to be more likely to believe their pastor who has no training in climate change, and so that's what we're dealing with.* - Yvette Wiley

She pointed to lack of trust between communities and academics, researchers and those she identified as "in the ivory tower." She explained that for the average citizen to understand the science of climate change, it would have to come from trusted sources. Yvette states the lack of information the public has on the effects of climate change in her area is partly because of the fossil fuel industries and their attempts to misinform and confuse the public through marketing and propaganda. She strongly believes the fossil fuel industry paid for marketing campaigns to mislead the public's perceptions about the risk associated with their practices. She points it out by saying:

> *Then of course there has been a planned effort to market anti-climate change, an anti-climate change message. It has been well funded and it's put out there to confuse people...they want the general populace to be confused because if you stop and think about it, the entire global economy is based on fossil fuels. You start moving in a different direction, that's a spoke you're pulling out of their wheel and things are going to topple you know. It's going to be a paradigm shift. And they are the most profitable, whether it's oil and gas or something else, or coal, the fossil fuel industry is the most profitable global industry in the history of mankind. And they, I think, have more power over our politicians then our constituents do, they have through various NGO's, think tanks and tax-free nonprofit marketing, a denial message which confuses people and has given way more credence to the few scientists that think that this change in climate is not driven by greenhouse gases and mankind.* - Yvette Wiley

There was consensus among all participants about how they are being misled by the fossil fuel industries.

There was much discussion about respect and responsibility for protecting TEK. Oral traditions are a way of passing on knowledge and educating the next generation of Native youth. Some discussions involved the importance oral tradition has within Indigenous communities. Casey made a pointed observation when she stated: "You know the scientific world often calls our data anecdotal instead of real. We are really experiencing these things and they are not going to show up on a graph." This is how Natives feel their knowledge is seen as having less value than 'mainstream" academic knowledge sources.

Discussions also took place regarding co-producing hybrid knowledge a blend of Western sciences with Indigenous sciences and then utilizing traditional practices of oral transmission of information to tribal members, including youth. This would respect the traditions of science and the historical transmission of knowledge within tribal communities by not dismissing the processes Native American Peoples use in educating. Casey compared it to "peer review."

The Stillwater workshop also revealed a pronounced expectation on the continued responsibility of each group – scientists, federal agencies, and Tribes – to collaborate and exchange information for the benefit of everyone. There was mention by Phillip for better tools to assist tribes in decision-making processes related to plants, animals, fish, and tree migrations for planning and resource management. Daniel closed by mentioning how culture is an important consideration to keep in mind for decision making when it comes to land and resource management.

Fort Cobb, OK, June 11, 2013

Nature of Climate Change

Many participants at this workshop used scientific language to explain their ideas of climate change, but they also chose to make cultural connections to these ideas, a blending of the two paradigms about climate, Western and Indigenous understandings. Representative of the contrasting perspectives of the science of climate change and the impacts observed and experienced on the ground, Curtis Munoz states:

> *Some are now arguing 'well, okay, now that these are happening, are they just patterns again? Or how is this caused?' You'll see videos and people explaining what climate changes is, the greenhouse gas affecting all that. All I know as a native scientist is that something definitely is happening. You can gather the data from rain amounts, temperature extremes, and you can compare [these] to the past and we know that something is definitely happening now.* - Curtis Munoz, Kiowa, Tribal Environmental Director

Another participant, a geography professor at the University of Missouri and member of the Kiowa Tribe, considered climate change with respect to past climates and the time scale at which such changes are considered:

[To me, climate change] means the changes in climate patterns,[changes] to the precipitation and temperature that has occurred over time. Preferably the longer time period should be sampled, last 50 years period could be the climatology and the last 10 years could be the climatology. So the scale of time differs from study to study...but rarely do the scientists get together and say this is a process. – Mark Palmer, Kiowa, Professor of Geography at the University of Missouri

Participants repeatedly discussed health impacts on people, with drought and heat being the biggest concerns, especially for the elderly and children. Maya Torralba connected climate change to her son's health. Her son is sensitive to allergies and she stated that the droughts, high winds, and plant pollens create a situation that causes her son to struggle with breathing. This health issue results in financial stress on her family due to medication costs as well as the physical toll on her son.

Impacts

Some of the major impacts participants connected to climate changes were related to water and water security, especially with drought being a heavy factor, as many concerns were of surface water features drying up and aquifer features depleting. This directly connected then to health and human safety and cultural concerns of inability to perform certain ceremonies. Other issues are animal, plant, and insect migrations into and out of the region.

Subtheme Water and Water Security

Water was the most commonly discussed topics in terms of impacts. The reasons varied from threats to accessing drinking water, impacts on agriculture, livestock, grasses, and food crops, and threats to water for ceremonies. Extreme rain events that caused floods were also mentioned as a concern.

Farmers within the group voiced their concerns about the amount of aquifer water extracted to irrigate crops such as cotton, corn, and melons. One farmer mentioned that when he went to the local "Ag agency office" after the period ideal for planting corn, he was encouraged to plant water-dependent crops such as cotton, melons, and alfalfa. These types of crops create increased stress on aquifers and other water resources. Another mentioned how disconnected he felt these Ag agency office personnel were to the needs of tribes. This concern for water resources is made local in a statement from Curtis:

> *Like one of our waterways that we monitor every month is Jimmy Creek, and Jimmy Creek now for the last two summers has dried up. [We] had never seen [this] before since most of our creeks that we monitor are aquifer fed. That goes to show that the water levels, not just on the surface waters, are depleting. The waters in our aquifers are starting to deplete. And there's not any rain to really recharge those aquifers and give us our waters. And also, like I said, the temperatures [contribute to surface water evaporation]...*- Curtis Munoz

Fears of drought created concern among participants. One of the main issues discussed was the lowering or disappearance of ponds, streams, and natural springs the people have depended on for water access for generations. One man shared his story of the experience of seeing his local rivers and streams drying out:

> *Last year was the lowest I've ever seen the Washita River. I mean it looks like a low creek or low stream. And I've never seen the South Canadian [River] dry up and it was dry last year. And a lot of these rivers that never go [dry] or they've always got flow, they were very small.* - Unidentified Male

Others noted the specific impact of lack of precipitation, record high temperatures and extended drought.

> *I remember growing up and going out to the Fort Cobb Lake. You find those shells all along the shore there. You never see them anymore and it*

used to be very abundant and in the Washita River... they [the mussel shells] used to just be lying all over and you hardly ever see him now, and if you do they're very, very small. They used to be large. - Vanessa Vance, Wichita Tribe and Affiliated Tribes, Citizen

Subtheme Human Safety and Health

There have been multiple deaths attributed to extreme weather events such as heat and flooding in this area. Two events in particular were still fresh on the minds of multiple participants: An extreme weather event that dropped significant amounts of rain that caused flooding of major roads, killing a family, and the extreme heat and drought that caused dancers at a Kiowa ceremony to die from heat related illnesses.

What we're talking about is impacts on people's immediate health. Passing out at a gourd dance because of the heat, you didn't see that often you know even though it's hot. I guess maybe getting hotter you know. The aspect that it might interrupt ceremonies, 'cause Kiowa war clan is ceremonial activity, and I wasn't awareness that they're thinking about moving or altering it. Yeah that's going to have an impact on what we do ceremonially. - Steve Barse, Kiowa, Medical Consultant

Flash flooding in certain areas... in 2007 there was a freak tropical depression that came over Caddo County. Certain roads were washed out and there were tribal members, in fact one of the tribal members wife and granddaughter and I think daughter were swept away. So that did affect the whole tribe. So flash flooding, It took out one of the old roads they call Indian Road for several years, [flooding impacted] county roads, people's crops... I think a lot of that flash flooding happened because of drought. We've been in constant drought years so the water doesn't soak in when it rains. When it rains hard it's [the ground] just so dry that it hardens, soil hardened earth, it just washes [away] and goes and hurts people. I can see how that has affected us long-term. - Maya Torralba, Kiowa, Educator

Environmental changes that contributed to flooding and heat exhaustion are not the only changes happening that are impacting the health of the people in the region. Other complications mentioned by those in attendance were poor air quality from dust, and as discussed above, allergens and pollution causing upper respiratory illnesses,

sinus problems, asthma, allergies and other illnesses. These complications are made worse during drought, days of high winds, and excessive pollens from plants and trees, especially cedars and ragweed's:

> *I've lived in this area for over 60 years and I've been nursing for 30 of those years and I see a lot of upcoming interest in how the climate will affect our health. How are we going to adapt and be sustainable in these upcoming situations with the climate change? I dealt with some upper respiratory illnesses within the last year. I believe it's due to climate change because, I've had more [illnesses]. I guess it would be due to more sinus problems and [also] upper respiratory [complications]. I know there have been quite a few other family members that have been going through the same things that I've been going through.* - Dorla Tartsah, Kiowa, Retired Nurse

Wildfires resulting from long-term drought and warmer temperatures ("so hot that it does not cool at night") also are contributing to respiratory complications. Prolonged dry weather and high temperatures cause excessive evapotranspiration in trees and plants, fueling fire problems:

> *I mean, I guess y'all seen the extreme fires that we've had the past few years, you know because of this drought taken' place. You know along with the droughts comes fire and what are we doing to protect our surroundings, our homes, and what are we doing to prepare for that? You know there should be things that we should be thinking about doing, like creating fire breaks, around [homes]... not only that, but around our sacred cultural sites, cemeteries and everything like that.* - Unidentified Male

> *You see there again, that some of that management where they've had no fires, but they found that when they do have a fire it's a hotter fire, and instead of burning the underbrush and things it burns the whole tree and it changes the soils. It gets so hot that it changes the chemicals of the soils and then when you do get the rains, the rain runs off, it doesn't soak in.* - Unidentified *Male*

Subtheme Culture

Participants emphasized the importance of water during ceremonies such as Sweat Lodge, Sun Dance, and Gourd Dance ceremonies and the cultural impact decreasing water resources and increases temperatures have. Impacts such as the inability to perform or complete ceremonies and or dances because there is not enough water available. Or a Sweat Lodge ceremony cannot be held because the water needed for the ceremonies is bad or unavailable. There are springs that because of special qualities or some other event that has happened are considered sacred. Some of these springs are drying up or changing causing concern for the people that rely on them for cultural significances.

Many of the plants used for medicine, food, and prayer, which are important to the different ceremonies or religious practices, have been impacted by climate variability especially drought, although it is not the only influence. Participants suggested that plants have disappeared from areas the people historically collected them from, or have moved to new areas because of temperature increases, precipitation changes and shifts of phenological cycles. These shifts in seasons impact Native American Peoples ability to plan planting cycles, collecting cycles and the cycles of ceremonies that coincide with these and other indicators.

Subtheme Insects

Farmers in the group noted changes in insect populations and behaviors. Grasshoppers were discussed as being a particular indicator of climate change, as multiple participants mentioned how the grasshoppers had done significant damage to their gardens and other food crops already stressed by droughts and high temperatures. Randall Ware mentioned higher numbers of grasshoppers during drought, "…along with the drought, did you see there comes the darn insects. You know the ones out in the country; we got thousands and thousands of little bitty dang grasshoppers. They were all over the dang place, imagine when they get bigger…" One female participant mentioned her observation of the grasshoppers eating the oak trees, which she mentioned she had never heard of being observed before. Invasive and drought driven insects mentioned included the bark beetle and ash beetle that had attacked already stressed trees in the area causing increased tree mortality.

Subtheme Animals

A decrease in some animal species dominated many conversations, and to a lesser extent the cultural impacts of the decline in animal life. A local quail species is widely considered extinct in the region. Another participant mentioned that a species of rabbit they referred to as "swamp rabbits" were fewer in number or gone from the area, as well as fewer jackrabbits, lightening bugs, and horned toads.

Subtheme Trees and Plants

More than one discussion reflected the importance of cedar trees in the area. It was discussed from the perspective as both an invasive nuisance species and as sacred trees. There are two species of cedars that participants discussed at length during the workshop, the Eastern Cedar and the cedar that exist on Longhorn Mountain in south central Oklahoma. The Eastern Cedars are invasive and consume significant amounts of water, are prolific reproducers, and highly combustible. In contrast, the unique cedar species specific to Longhorn Mountain are considered important for ceremonies and spirituality to some Native American Nations (e.g., Kiowa) in the region.

There was significant concern about losing the Longhorn Mountain species to not only the encroachments not only because of drought, fire, and climate change, but also due to lack of access from a company that bought the land. Many felt the climate was changing faster than the plants in the area were able to adapt to or survive. Multiple people expressed this sentiment about plant species:

> *You know another thing we need to think about is tribes and landowners and everything. We need to look at traditional herbs and everything, roots and everything else that are in the ground. They're being affected by this drought.* – Unidentified Male

> *...what we can do to preserve them [food and medicine plants] because we're losing them an extreme rate right now...they're hard to find. [Medicine people] can't locate them anymore where they used to. Before you were able to walk in your backyard and able to dig it out and pick it out and clean it and you can't do that [any] more.* – Unidentified Male

Adaptations and Mitigations

> *And me personally, my quest is to find out, okay what can we do to you know, stop this? Well number one, one person can't stop it. Can it be stopped?* - Curtis Munoz

Participants at the Fort Cobb workshop seemed most interested in climate tools and in tribal or personal responses to climate change. The issues most discussed were related to planning and management. The concerns discussed varied from land and resource management, federal Indian law, alternative energy, and climate tool access and usage. Of particular focus was how tribes felt the BIA, especially in areas of leases and management, was restricting them from making decisions relating to their lands.

Subtheme Alternative Energy

Some tribes are attempting to address climate change on their own terms in their own ways, including with alternative energy. The Kiowa Tribe of Oklahoma has already implemented some mitigation strategies to reduce their carbon footprint and dependency on fossil fuels by purchasing and installing energy producing wind turbines and by investigating solar energy. Other tribal governments are following suit, and the hope is for increased revenues and reduced consumption of power produced by local coal burning power plants:

> *To reduce the impact [of energy consumption], one thing that Kiowa tribe of Oklahoma has done is to utilize the department of energy stimulus grant and we were able to install two wind turbines. They are small in nature but they're a step forward and can generate clean renewable wind energy. And we're looking at solar energies and what that does for reducing the Kiowa tribes, which you would call carbon imprint, or how we're utilizing less electricity from the coal fired plants.* - Curtis Munoz

The focus on alternative energy is part of a larger acknowledgement that the problem of climate change can only be solved if everyone on all levels work together towards solutions, according to some participants:

> *For one, one person can't do this by themselves it's such a big issue. The more minds that are put together the better. And I believe in working, as they use the term recently, poly-vocally, many voices I think many voices coming together could really address this issue.* - Curtis Munoz

Subtheme Collaboration

Many participants expressed the enormity of the problem they felt, as what their own part in the solutions might be. It was agreed that no one person or tribe could address the issues the region faced, and collaborations between tribes, research institutions, agencies, and local communities was essential. Collaboration was of interest, but there still was doubt or insecurity in trusting outside groups. There were other conversations around jurisdictional issues, politics, and grass roots support and involvement in climate discussions and education.

Another complex issue for collaborations between Native nations relates to relationships between Native nations, Tribes and other regional municipalities and federal entities. Many boundaries are made through federal agencies and the tribes are often left out of policies and regulation conversations relating to them and their lands. Government policies created fractionalized lands made worse through generations of descendants blurs management responsibilities, making collaborative decisions regarding resource management, adaptation or mitigation and implementation difficult, if not impossible in some cases.

> *...the other part is there is so many different tribes that have overlapping jurisdictions, nobody knows who is in charge of what. And like I*

mentioned the tribes still look out for the allotted people's land for the allotted people so it not a concerted effort. It makes it a lot more difficult to do anything, to get the whole shebang together. So there's a political side to it that holds everything back even though the community would be very much in favor [of supporting improved management practices.] It takes the agreement of the tribes. - Vanessa Vance, Wichita and Affiliated Tribes, Citizen

Subtheme Community Needs

There was emphasis on community led involvement and education to better understand climate changes and adaptations. Not only does the community need education on the issues, but also the community leaders. There was mention of the need for more tribal leaders to be made aware of and engaged in the issues to make better-informed decisions for their communities. This was also directed at the BIA agency. Participants ridiculed how those tasked with advocating for the tribes often were the least forthcoming with useful information to assist the tribes.

Even with the general distrust of government agencies and researchers, participants recognized a shift of interest in approaching Indigenous Peoples. This included looking for answers in the "spiritual realm" and scientists reaching out to tribes for better understandings of their historical and current experiences of environmental transformations relating to climate change. The new opportunities to self-represent and lead in the conversations of climate change adaptations are important to the participants:

Letting the Indian people take the lead, encouraging them to gain control of their own destiny. You didn't used to see that here so it just seems it's that time now, that time in history that Indian People's voices are going to be heard in a variety of settings, whether it be spiritual, or whether it be Indian child welfare, whether [it is] climate change. - Steve Barse

Subtheme Food Security

There were stated food security concerns regarding preservation of the plants used for ceremonial and medicinal purposes through replanting measures or relocation. Some suggested using greenhouses to reproduce seedlings to relocate and replant in protected areas. Others mentioned sustainable growing using hydroponic watering systems to control water use and loss. Some families are producing foods and raising animals and animal products using self-sustainable and cost-effective production methods. Education of the community and youth about traditional and alternative practices to protect important plants and animals was also discussed as an adaptation measure.

Subtheme Education as Adaptation

Education was stressed as important during different parts of the workshop discussions and interviews. It varied from how to educate their people to return to old ways of living, using elders and ancestors as standards, to systems that allowed for survival during harsh times under extreme historical weather events.

> *How can I get my children back to my great-grandmother's generation where she still was living off the land, somewhat, and being closer to Earth and to the elements? Also, I'm trying to teach myself this and my kids that as well.* - Maya Torralba

Education also was a topic discussed with respect to engaging and preparing the young people for not only the environmental changes already occurring, but for the projected changes and extremes. Concern was voiced about the hurdles to getting youth to engage with the environment at all. Concern is that Native youth are captivated by modern conveniences and disengaged from the environment and that educating Native

youth will have to part of curriculum early in school as well as at home. Discussions included technology as a tool for them to transmit knowledge across generations. Video was one of the tools discussed as a useful technical tool to collect, preserve and transmit information to their youth.

Addressing the science of climate change and weather in K-12 schools was an idea that sparked excited conversations on how to implement programs and what kinds of programs could be created. Ideas were offered for middle and high school aged students and possible uses of technology and videos as tools. Others discussed the importance of high school being that transition period where youth are vulnerable to multiple paths. Joshua Woosypitti, a Wichita and Affiliated Tribes citizen, commented on how creating youth leaders at the high school level, especially in the agricultural fields such as Future Farmers of America (FFA), acted as an important part in developing new environmental leaders and for inspiring young students to consider college careers in the science, technology, engineering, and mathematics (STEM) fields. Developing programs in STEM in smaller communities in southwestern Oklahoma would be beneficial to Native and other youth.

The consensus was that education about climate change was critical to understanding what is happening and how to develop and implement change in every community:

> *I think of education. I think we have to get the [climate change] message out there. And it's not just about our people; it's not just Indigenous tribes in the various portions of the United States. I think this information is to go not statewide, not nationally, needs to go worldwide.*
> – Richard Torralba, Comanche, Educator

Youth are not the only ones who might benefit from technological tools, as video could also be an affordable way to share information and train farmers and the older generations that may not be as tech savvy as younger generations. Other education methods suggested were brochures with contact information that farmers and others could utilize to contact professionals in the field and access valuable resources. Putting climate information into understandable language that is not filled with jargon and technical terminologies was advocated:

> *... some education and awareness of something along this line [of climate change] can be presented to them [farmers and rural community members]in a form or fashion they can understand, you know. How this functionally works [because] we're all assuming that everybody is on certain level [of understanding] and without belittling or saying anything to somebody a lot of people just don't understand some of these things [climate science]. And it [climate change information] needs to be brought to a level where as that they clearly can understand the same as a lot of others do right here.* – Willard Tillman, Seminole Freedman, Oklahoma Black Historical Research Project Inc.

Subtheme Education and Water

Participants at the workshop mentioned their interest in better understanding water resources in their area. Most of the discussion of water revolved around aquifer depletion from unsustainable farming practices and the needs of the gas and oil industry. Concern was raised about lack of understanding and monitoring of ground water. It was mentioned that surface water is monitored closely but because of different laws regulating subsurface water, there is no monitoring or even a solid understanding of how the aquifers in the area are utilized and recharge. There was interest in more research studies to collect data and information about aquifer quantity and how they are impacted by drawdown and threats to quality. Some talked about surface management

of water, including increasing the number of ponds built and possibly deepening existing ponds:

> *It's just common sense and survival to plan what [water] you need to have, that shows the tribes that maybe we need to look at going out on our tribal lands, and maybe building more ponds, and maybe more water storage structures that help us in the dry years to have water resources.* - Randall Ware, Kiowa, Kiowa Native Farms LLC & Indian Country Agriculture and Resource Development Corporation (ICARD)

Some participants asked about various parts of the water cycle systems and how they interact. Mentioned was the need for more research about this and how it interacts with geological features. Rupert Nowlin suggested a more holistic approach to research:

> *I don't know if it's really climate, but I would like to see a lot more geological data into these things like, [climate data and information] soil moisture content, aquifer levels, the connectivity between ground water and surface water, that has been ignored for a long time. The majority of our tribal members [rely on] rural water wells. I mean water wells are going to start drying up if we're in this long-term cycle. I mean that's the type of other things [interconnected, holistic information] that need to be included ... when you talk about climate change.* – Rupert Nowlin, Cheyenne-Arapahoe Tribes of Oklahoma, Citizen, Rancher, Educator

Subtheme Relocation

Relocation as an adaptation strategy was discussed in light of extreme weather events such as flooding, extended droughts, and land contamination. Points made included competition over resources such as water and food, as well as places to live where populations could be supported, with access to clean water and enough useable land to produce food. Also discussed was the possibility of having to move large populations of people to areas where resources are more available and how this stresses other areas, resources, and populations already there.

> *...but maybe that's the lesson that needs to be learned. Maybe everybody, not just the indigenous people, need to understand what relocation is all about. If you destroy your environment you become marginalized and you become dependent on other people and places to take you in. Are [we] guaranteed that that can happen?* - Mark Palmer

Some, like the Kiowa, are have a long history of relocation over long distances over hundreds and thousands of years. Other Native American nations experienced forced relocation to Oklahoma. Even with this history of survival through relocation they all have spiritual, cultural, and emotional attachments to place. Moving now, however, is unthinkable as cost is a concern in relation to being able to move somewhere else, as well as the unthinkable notions of being separated from relatives' graves and abandoning sacred places.

Responsibilities

Many participants at the Fort Cobb workshop pointed their collective finger at the fossil fuel industry as being responsible for negative short and long-term transformations to their region. Most discussions addressed the physical impacts the oil and gas industry has on their land and water resources. There were references to how chemicals produced from petroleum-based products used for farming have contaminated their land and water.

Subtheme Leases and Land Responsibility

Other impacts discussed included lack of oversight by the federal agencies responsible for managing their land leases to protect them from contaminations and exploitations. All of the participants shared concern about how their lease is managed as

well as written. The concern is about lack of input for conservation verbiage in the leases when developed or renewed – those who write the leases should be more responsible to the long-term needs of the region and employ more conservation strategies. The participants wanted more say regarding how their land is managed by those leasing the land. There was interest in how improvements and conservation were implemented or if they are even considered. People appreciated the Federal role in regulating outside users of Indian lands but they would like to see greater transparency and input.

The oil and gas industry in this region of Oklahoma is still active. Part of being active requires companies to lease land from tribes. Often these leases are made by the BIA and the tribes that are affected are subjected to a lease that they did not write, they do not often fully understand, or did not have the opportunity to provide input on. Some of the leases are old and have been renewed without review, some participants believe. Many feel they are either cheated or misled, and powerless to change. Native landowners that have land leased for oil and gas extraction are dependent on the BIA or EPA to regulate the companies or individuals that lease the land effectively. Some participants stated that the agencies responsible for oversight and regulation fall short of their responsibilities leaving the tribal landowners with the contamination that is often left behind.

A couple participants have caught oil and gas company employees disposing of wastewater or waste products on Native American's land or in the areas surrounding their communities. These areas included creeks and roadside ditches. Some tribes gathered together to form an Oklahoma Indian Mineral Association to collectively

advocate for protecting their land from non-Natives and from companies spilling extraction wastewater and other contaminated material onto roadsides or dumping illegally. Due to the wealth and power of the groups and organizations that work with these oil companies, Indian people often feel powerless and victimized:

> *The Mineral Owners Association, we fought the oil companies and it costs a lot of the landowners a lot of money. Some of my uncles were fighting them and they won their cases but it cost them an arm and a leg to fight the oil companies because of their revenues they were generating for the counties. They didn't want to lose that revenue. So we had to not only fight the oil companies but we also had to fight the County Treasurer.* - Leslie Standing

> *In today's world I would consider environmental [issues] at the top of the list because as a landowner I lease land to oil companies and farmers. In this type of business, I consider it a business because it makes revenue for my family, I have to be knowledgeable about what is occurring with our land and also with our air quality issues you know?* - Leslie Standing, Wichita, Former Chairman of the Wichita and Affiliated Tribes

Extraction companies often are allowed contracted oil leases on tribal lands and participants felt the companies were not held to standards of environmental protections that protected other Indian land. They also indicated perceptions of dishonesty in how these industries provided information. Many felt input, inclusion, and control over land management practices and resource management is needed.

Subtheme Native Perceptions of Responsibility

All participants identified as having collective and individual responsibility and relationship with place. They acknowledge the connections and interconnections between them and their environment. Their epistemology and ontology culturally connect them to the land as part of the environment, not outside of the environment. Indigenous and Native Peoples are connected to the environment through kincentric

ecological relationships (Salmon, 2000) and they recognize that what happens to the land happens to them. They are affected by and in turn, affect the life around them. There is acceptance they are related to their place, human and other than human, and have relationships that reflect their relationship, or kinship. This is common among all the Native Peoples at all the workshops. There is acceptance of their responsibility to the land as well as the impacts humans have on the land.

> *People like to tiptoe around the issue of how much impact the humans have on climate. From a traditional standpoint the tribes have always been very environmentally connected. In with all the origin stories they talk about how they were created and the animals. We were put here to live within as custodians, not own the land, but the custodians of the land, guardians of the land for future generations.* – Rupert Nowlin

There was emphasis on working collectively to contribute knowledge and understanding to the conversation of climate change. There was importance emphasized about exchanging knowledge between each other as Native Peoples, to help each other and possibly find answers to local problems. The point was brought up that everyone in the community had something to offer to the conversation about climate change and that every voice was needed to work together for realistic and viable answers to real problems. Community was seen as critical to the solution:

> *I would just tell people share your ideas don't be scared and hold back because you don't have the science degrees, or you're not a sociologist or meteorologist, or any particular profession. You may be a tribal elder and we need those elders' voices and their knowledge and wisdom. Maybe a leader, we need your wisdom to show us what does the tribe want, when we got to look forward to whatever your gift is from [Creator] we want you to utilize that, gets so we can bring it together because were one, or symbiotically rely on each other. We need one another.* – Curtis Munoz

Another responsibility discussed was being proactive and participatory in activities that engage young people. Exposing them to environmental issues while encouraging them to offer their ideas and participate in the conversation about environmental solutions to climate change was seen as essential.

Subtheme Tribal Politics

There were some valuable and often animated discussions regarding how Tribal politics get in the way of moving forward on climate adaptation, understanding, reaction, planning, and educating. Tribal governments have failed in their responsibility to effectively and efficiently create policy and regulation that benefit their people. Vanessa Vance mentioned how the community may want an idea or a plan to go forward on a project, but the Tribal political structure at the time can often get in the way, prohibiting action. Mark Palmer countered this as he addressed how one person may only be one vote but the information to educate oneself is not just for the governments that make decisions – it also is for the people who vote those officials into positions of decision-making. So, he encouraged people to consider how they choose their leaders, not just at the Tribal level but also at the national level.

Albuquerque, NM, June 25, 2013

Nature of Climate Change

The New Mexico workshop differed fundamentally from the Oklahoma workshops in that the tribes in the region have never been completely displaced from their homelands. Their connection to the landscape is far older and the cultures

connected to place remain for the most part unbroken. Although some tribes in Oklahoma have held tightly to their cultural traditions, relocation had lasting impacts. So, place is particularly important to the relationships these Indigenous Peoples have with their environment, and this was reflected in the responses participants gave at this workshop about climate change.

The way the tribal participants from the New Mexico area understood climate change was directly connected to how they were struggling to survive culturally and physically. Climate change is not a far away idea that was abstract. It was described in clear detail about how the changes in their landscapes were forcing drastic changes. Climate and environment was described as part of who they are and struggle to maintain being.

People interviewed directly connected climate change to their home. It was sometimes acknowledged that there were world or national issues in other places but all the conversations started with place, their own place, and how they saw things change in what many said have happened in one generation. These changes addressed water in the forms of rain, snow, and subsurface aquifer amounts. Other major changes identified were droughts, farming challenges, haboobs, sand dunes, changes in plants and animals populations, invasive species, and declining wetland areas.

Many discussed their connection to the land. They talked about what an area was like when they were children and stories their family members told about the way things used to be, or how things have changed. Comments like those of Ann-Marie Chischilly and Cordell TeCube were typical:

> *I'll take it from the perspective of being a child and on the Navajo reservation I remember being a lot greener and the Arizona region*

plateau Colorado Plateau has been experiencing one of the most, longest droughts in history. So one of the things that happens is without water with high wind, which is what we deal with a lot there, sand dunes are forming at an alarming rate. A very different environment for my son just one generation down is the reason, it what I think climate change is, seeing our environment change within one generation. That's what climate change means to me. - Ann-Marie Chischilly, Diné (Navajo), Director of Institute of Tribal Environmental Professionals

Growing up I remember winters meant snow, and it kind of got to the point to where there was a whole new generation that never experienced that. I think when you say climate change that's what I think about. - Cordell TeCube, Jicarilla Apache, Environmental Director of Environmental Protection Office

Subtheme Drought

Many focused on how recent physical changes to landscape were directly connected to precipitation. Each participant expressed how dry the land was. They discussed it in descriptive ways that connected deeply to not only how things used to be in their environments, but how have changed. Drought and the issues that go along with it such as less snowpack, plant and animal losses or reductions, water access, surface water security, aquifer depletion, and decreasing wetlands were discussed:

What we see, the most noticeable impact to the Pueblo has been realized through drought, and the conditions that are related to drought. What it does to the landscapes, what it does vegetation. The concerns that come from not being able to find plant life or animal life that are important to cultural identity, cultural practices... – Evaristo Cruz, Ysleta del Sur Pueblo of Texas, Director of Environmental Management

You see a decline in our wetlands because people are drawing water for domestic uses, irrigation and for things like that. You know the hotter drier climate people need to graze their animals still. - Cordell-TeCube,

Personally means hotter and drier summers, less water resource, more increased wildfire, which I observed personally... – Robert Gomez, Pueblo Taos, Environmental Office Program Manager

Drought creates insufficient vegetation to support domesticated animals and wildlife leading to overgrazing, often allowing invasive species to move into new spaces created by native species moving out or being unable to compete. Another major impact of drought that all participants discussed was impacts to traditional plants, foods, and medicines. There were discussions about how certain medicinal plants have become extremely difficult to locate. Traditional foods are more difficult to grow and traditional systems of farming are being challenged. Drought-increased fires have heavily impacted many traditional farms in parts of New Mexico. These wildfires burn forests and landscapes upstream or in the surrounding hills. When it does rain, ash, soot, and debris flow into streams:

> *More wildfire events and with the wildfires comes ash and dust [which] settles into that water bodies and, so like, for example at Nambe' Pueblo there is a huge wildfire nearby and their reservoir which was once was there economic engine and a large revenue stream, has been reduced because it's been filled with ash, from that ash that drains down to the rest of the hydrologic system into the acequias, [then] their farmlands. They're having to unclog their acequias. So I see that happening and that in Santa Clara there was a fire. It burns so hot that the soil was sterile so, they are saying there could be a decade or two for it to come back.* – Laura Harjo, Muscogee Creek, Assistant Professor of Planning at the University of New Mexico

> *So climate change is meant to us that last year, with one of the larger fires in the western United States, the Los Conchos fire, we were irrigating our fields with black water and that comes from soot because the mountains that are on fire and the mountains are where our headwaters come from. So that's the water used for life and our agriculture so it's a very important place to us and it's very important obviously because of the use of water...*- Roger Fragua, Jemez Pueblo, President Cota Holdings, LLC

The New Mexico workshop participants all expressed very clear understandings of the mechanics of climate change and its impacts, and clearly connected those changes to place and to them as well:

> *That while there may be questions to whether or climate change is real or not, that seems to be the question that is always debated. One thing is very clear, first nations are at the forefront of having to deal with this issue. So while we may have portions of the country that may or may not believe, First Nations are dealing with this firsthand and it's affecting the way that they [live]...they're having to modify the way that they practice their culture. So that should be enough reasons to see that there needs to be efforts, and needs to be resources put into this, because there are nations being affected. There are groups of people that are being affected that are seeing it firsthand.* - Evaristo Cruz, Ysleta del Sur Pueblo of Texas, Director of Environmental Management

Change was something many participants recognized as part of who they are as Peoples, and adaptation to it is how they have survived past difficult and harsh environmental shifts:

> *We have fossils, fossilized clam beds at about 8 to 9000 feet elevation so climate change is nothing new; it's nothing new to our people. We continued to adapt and evolve since the beginning of time and were just kind of filling our space in that lineage of our people, but we're having to adapt and change also. I think we're just doing our part. So I think that's where climate change means, you know, we were born Indian, were probably going to die Indian, and in that process we're... we adapt and we continue to do that and we will probably continue to do that as well.* – Roger Fragua

Impacts

When participants were asked if they have seen impacts in their region that they attributed to climate change, there were numerous answers in the form of many stories and rich discussions. Everyone connected climate change to impacts observed and experienced in their surroundings and lives.

Subtheme Water

The most pressing and frequently talked about impact was to water. Water in all its forms was impacted in multiple ways, but the most pressing appears to be lack of or depletion of water resources. Reduced precipitation in the form of rains and snow had

the longest and far reaching impacts. People referred to how as children, the climate of the region always provided snow accumulation in high elevations and often in the lower areas. Current patterns have provided little or no accumulations in the upper elevations with often earlier snowmelt, while the lower elevations very rarely accumulated snow.

> *They got terrible winters, I mean the storms and everything they would come till February when things were just wet and snow. But what I'm talking about is when we were kids there was 3 feet of snow on the ground. It was enjoyable and I think when you say climate change that's what I think about. You see it, I'm old enough to see it change. Sometimes the River is a little bit lower than normal because, again it's just the snowpack in the mountains. There were times when we would have a high snowpack in the mountains and the streams in the river run for a month from runoff. Now it's gone in about a week and I mean gone. It doesn't soak into the ground like it used to it just sits on top and escapes. Even these rains that we're waiting for a lot of times, they would just run into the gullies or arroyos and they will go on their way you know. And I don't think that ever happened in the past, you know it was different.* - Cordell TeCube

Precipitation reduction over the course of years has placed the region in exceptional drought, similar to the other workshop regions. Because of the prolonged drought, drinking water was a very sensitive and deeply important issue discussed as all participants identified one or more ways in which drinking water has been threatened or affected in their communities, and for wildlife and livestock.

The lack of rain and snow forced the peoples in the region to depend on aquifer water and springs instead of surface water. More wells are being drilled into the aquifer for irrigation and other needs. Many of the old existing wells are being drilled deeper to compensate for drawdown and lack of recharge; other wells have been abandoned due to running dry. The remaining water often is of lower quality:

> *We need to use more ground water. Before we had a lot of [water], [we] made use of the Rio Grande, We've had such a hard time getting water we have had to make more use of ground water. The Pueblos had to dig. I think*

we just finished our third deep well and in some of those areas we are having to go to depths of 150 feet. So we're using a lot of that ground water for traditional crops. The concern we have is introducing salts, and heavy metal to our agriculture. So those are concerns, having to require more ground water when we are accustomed to using more water from the Rio Grande for our irrigation, more surface water - Robert Gomez

Because of the location of where the tribe is, its drilled into very far reaches of the Hueco Bolson, where that aquifer just tends to become real brackish, so there are concerns about [water}. Well one of the things we have been concern about, well, we just don't have the resources for a water study, to develop a water profile. So we don't have the resources, we have drilled those wells, [and] we don't know what really the projections are, as far as how much water there is. But for the mean time it's important to irrigate those crops. – Evaristo Cruz

The changes in the cyclical patterns in the different areas that the participants come result in issues of water quality, quantity and accessibility, drought, wildfires, invasive species, natural and cultural resource degradation. Some areas have very unique issues such as sand dunes and haboob dust storms. There are serious concerns about water to survive as they have little or no surface water remaining and are heavily dependent on the aquifer waters for life. All of the participants discussed how their cultures are being impacted by changes to their plants, animals, and every part of their environment. They identify and connect to what changes happen in the places they are part of physically, culturally, spiritually and historically. Climate change is very real and drastic in these places to these peoples and there have been multiple signs of climate change described in traditional ways that are consistent with scientific models and projections. Change is happening and at accelerated rates in areas. Roger's statement is typical;

Water is so, so very important, and again you can't live without water. So I would say that's one of the bigger challenges that we have right now. How do we exist in a very dry climate, at least for today? We don't know what the future holds. Maybe this is the new reality we're talking about. We're talking about this as if it is a temporary drought, a 10 year drought,

> *I heard of a 20 year drought, who knows because this could be the new reality and the new reality is we have to learn to exist on much less water. We have to be very conservative with water, and how do we begin teaching ourselves, and that could take generations. Change only happens one of two ways. Either through evolution, slowly over time, or through revolution, either way we're going to have to change. Our tribal communities are gonna have to change. I think you have to take a combination of both evolution and revolution.* - Roger Fragua

Subtheme Fire

Ann-Marie Chischilly and Sam English, a local Chippewa artist discussed how the dry conditions and high winds cause dust storms called haboobs that carry dirt, soil, and sand across the region, sometimes creating sand dunes and capable of moving them "a meter or two" in one wind storm. Dust storms have impacted farming by occasionally blowing topsoil's off the fields, exposing or carrying away seeds. The dry conditions and high winds contribute to extreme fire conditions.

The drought has stressed Native trees in the region, weakening them and making them susceptible to disease and insects. The stressed trees contribute to the high fire conditions. Invasive and non-native species move into region push out native species by competing for the same space, moisture, and nutrients in an already harsh environment:

> *We've seen a lot of changes, especially with the advent of these very large wildfires that are happening. We've seen that Evergreen trees like Pinion and the Juniper trees, those are very hardy trees that can live for very long times on very little water, and even those forests are dying and are stressed out. Then the bark beetles infest our ponderosa pine forest. So we had seen a lot of changes in that, those physical changes to the plant life, affect the animal life. So we've seen changes even in our animals now. We see changes in the animals, then that effects changes in us, and subsistence still even today. [We] have our subsistence lifestyle traditional people, we've seen changes in that. So it's the domino effect, the things that really have changed and have changed the environment have affected the plants, and the plants have affected the animals, and the animals have affected us and so on and so on.* - Roger Fragua

Subtheme Seasons

Another change that all the participants have recognized is the shift in the seasons and seasonal weather patterns. The lack of precipitation is the most noticeable part of the weather pattern shift. Robert Gomez points out there used to be four distinct seasons and described how it is more like just two seasons now, "… a hot dry season and a cold dry season." Multiple participants described how the weather is unpredictable and more extreme. It was mentioned that when the rains do come, they come in short, intense, heavy downpours in smaller areas, as opposed to larger-scale moderate soaking rains.

Adaptations and Mitigations

The holistic way the New Mexico participants thought of climate change often included the counter actions that were necessary to adapt, or they as communities or families had been forced to adapt to the changes in climate in order to survive.

> *So climate change means that there's a process where the environment and the natural resource landscapes are changing, which means we as humans that live on that same landscape have to change also."* - Roger Fragua

Participants said they were in differing stages of climate response. Some were discussing it individually with their family and it was not yet a community-wide discussion, while others have community departments supported by leadership addressing impacts with adaptations strategies. Most adaptation related to water, or lack thereof. Many areas in the region have been experiencing drought in an already arid climate, pushing water resources to their limits. This creates what Roger called the "domino effect" where the area is already sensitive and one disruption to the ecosystem

creates impacts along the rest of the ecosystem. This also disrupts the lives of those dependent on resources like water and other means of survival like grazing livestock, growing food and medicinal plants, hunting wild game, and conducting ceremonies that require specific plants, animals or water.

Subtheme Farming

Aquifer draw down is drying up natural springs that farmers depend on for their animals to survive. Farming and ranching methods are changing to adapt to less water:

> *We've been in the process of implementing adaptation strategies in our farming. So this year my sons and I were farming on a third less of the land in hopefully using less than a third of the water and were hoping to achieve getting the same yield from our smaller land use and water in this area. We're hoping to get the same yield in terms of our crops so it's an experiment and were doing that as a personal contribution to the environmental climate change. Were doing that as a measure of adaptation were hoping to serve as a model for [our] community, that our community can still grow the same kinds of traditional foodstuffs that we have always farmed, but do it in a way that is adapting to the new reality, which is obviously climate change.* - Roger Fragua

Subtheme Planning

Many participants are finding it difficult to plan for changes like drought. It was pointed out that while they are often forced to deal with drought, to plan for it is difficult. They mentioned a lack of funding to address this holistically and are only able to address the individual symptoms.

> *So while we haven't specifically tackled the idea of climate change as a theme, the elements are there. We're having to discuss all other items in different elements within there, trying to plan for drought is probably where we're encountering the most difficulty. But for tribal communities that have subsistence living, they're going to see those changes. Usually they don't have the resources, the funding to be able to make those changes and adapt. So being able to keep pace with that change and*

finding the resources and marrying those resources and needs, I think presents the largest problem for our tribe, and perhaps for many of the tribal communities that are seeing these kinds of concerns. - Evaristo Cruz

But, planning is an important part of the adaptation process. Planning how to provide resource and land management that will sustain the communities' ranching needs as well as wildlife needs well into the future is a priority. Planning how tribes can reduce their dependency on fossil fuels and instead utilize clean energies is part of this, as is how to educate people to implement these ideas into their own daily lives:

Be educated enough to make your own decisions and that means learning everything you need to learn about the subject...Taking your cultural side and incorporating that, and say 'what's best for us?' and then building a plan. There's nothing stronger to me that means sovereignty is for [Tribes] to have their own plan and to incorporate it. And that takes education that takes political will, money all those things along the way, but it first starts with you knowing what you want and not letting anybody else drive your agenda. So that's what I would say, educate yourself so you can build your own plan. - Ann-Marie Chischilly

Subtheme Collaboration

Planning and educating requires support and collaborations between people, communities, institutions, agencies and cultures. Tribes have been cautious in reaching out to those outside their own communities. Climate change related challenges that reach beyond man-made boundaries push tribes toward one another and outsiders. Drought especially has caused multiple stakeholders to communicate together in an attempt to better understand how to cope with dwindling water resources, and to plan for future needs. Educating and planning is not the only issues tribes are facing, as they also are grappling with allocating or accessing adaptation funds. Struggles to meet current needs are compounded by concern for future needs in reference to a general lack

of financial resources. Evaristo talked about how collaborations with surrounding communities are an important and necessary means of adapting.

> *We also partner with other municipalities in the region to look for solutions and possible plans to try to mitigate the problems presented from climate change. We're finding that we just are ill equipped to really make those changes. Trying to adapt is something that requires a lot of the resources that we don't have right now. So the challenge that we have is trying to find resources to match the pace of adaptability that's needed to really try and make changes that are practical, that make sense. I think there is going to be more need to work with consortiums, with groups, with other tribes. So continuing to have networks and building these relationships. There are some situations where relationships of trust just aren't there. There are tribal communities that are hesitant to trust government agencies and for good reason. But through these kinds of efforts and through efforts to try and reach out, maybe we can start to build again if we're able to find these common needs behind climate change. It may turn out the climate change might be the thing that brings us closer together.* - Evaristo Cruz

Although pressed for more funding for educational needs, adaptation plans and strategies, and building solid relationships with agencies tasked with working with tribes, the people are still moving forward. As Indigenous Peoples are among the most vulnerable, they are also the most independent. They have had to rely on each other as a tribe and as extended family units. This system of communal resource allocation or redistribution of goods based on need has been an important survival technique as well as a potential key for future adaptation people might have to consider. Some people are already looking at and seeking ways to plan for adaptations with longevity in mind for future generations. The purposes are more than economic – they are cultural:

> *I would say planning, because if you arrive in mind that all of your resources, how much water you have to last people one generation, for two generations. If you build houses, where [are] you going to build them? Just matching what your vision is for the tribe with the resources that we have, and horizon line that, horizon lining that out. What do we have? Do we have the jobs? Do we have the food? How are we going to*

sustain ourselves? I think that is it. Yeah at the end of the day I think that that's the important issue... how well we sustain ourselves. How will we sustain our culture and our language and see that perpetuate? – Laura Harjo

Responsibilities

Multiple variations of responsibility were discussed at this workshop as with the others. The participants did not mention feeling responsible for creating the climate changes but they did take many levels of responsibility to how they viewed their relationships with each other, with place and with "others." As with the other workshops I break responsibilities into categories loosely related to community, personal, and government. Each of these categories of responsibility looks at how the participants view themselves in relation to their place and the climate changes happening and yet to come.

Subtheme Community

Community responsibility is to protect each other, creating programs for tribal adaptations, the education of leaders, fostering community and youth, responsibility to culture and spirituality, economic, and responsibility to all of the Earth as Native Peoples. It is relationship to place and the responsibilities that come along with having a reciprocal relationship with place, especially in the face of climactic changes. Climate change has caused people to be proactive in traditional and modern ways to adapt to sudden and sometimes extreme events that require the support of community on many levels.

Some participants discussed the challenges of working together to protect the tribal community. There were discussions about the importance of keeping traditions as

they work to find answers to address climate changes on their terms, in ways appropriate to them and their needs. One of the most important ways the community can nurture its people and culture is through family. There were many discussions on the value of passing knowledge through the family and extended family of the community to educate about adaptations and projections of climate change and variability.

> *I think the most important meetings happen, really is in every tribal family home, at the dinner table. And those are the discussions I think are the most meaningful and probably most beneficial in the sense that on the generation to generation faces, the uncles come and meet with the nieces and nephews and talk about the importance of farming in our traditional practices.* - Roger Fragua

Subtheme Culture

The importance of cultural values and norms was discussed multiple times. They serve as a backdrop to educate their people about climate change and what adaptations are appropriate for the community in relation to the impacts felt and projected. It was a way to not only stir discussions between family members about impacts and solution ideas, but also to engage people of all ages in the discussion. It appeared to be significant to participants that the time and places for these valuable discussions were as important as the discussions themselves. It was very cultural to bring together the extended family of all ages together to bond over conversation and food. In a discussion about his own grandmother teaching his family different things, one participant explained the significance of coming together over food for discussions and conversations:

> *The reason she would tell us why we would have these important discussions over food is when we ingest our food we also ingest a*

> *conversation. That conversation, the spirit of the conversation, the words from that conversation, and meanings of that conversation, we accept and digest and that stays with us for a long time. So that's why we have all these conversations that we have around food, and food is part of our spirituality, food is part of our breath, food is part of our life, so food is very important to us.* – Roger Fragua

Now to an outsider this might seem more about food than teaching someone something important, but in the tribal community it is a very sacred way for infusing information into your family and extended relations within the community. It is a deeply spiritual way of passing knowledge through generations and throughout communities. This is an important technique for educating youth and sharing information with elders in a traditional and culturally appropriate way. If the community doesn't know or understand what is happening, how will it be able to respond and how will there be buy-in of new ideas unless there is inclusion in the process of decision-making. How better to educate youth and inspire them to understand the responsibility they have to their community as well:

> *Trying to preserve and foster a new generation that are environmental stewards, people who want to go out there and come back to preserve and protect our communities.* - Roger Fragua

Subtheme Place

Protecting the community is not only about the people. It is as much about place and protecting the relationship between people and place and the intimate knowledge learned over thousands of years. It is that knowledge of place that has been the target of outsiders' interest and at times exploitation. Many participants spoke of the responsibility they have to protecting their local knowledge. This knowledge has been the interest of the LCC's and CSC's as well as other institutions and agencies in recent

years. The CSC's have even put language together to request information regarding tribal "cultural resources" as to "formulate goals and objectives." Some participants were angered and offended by this request. It was explained that the act of even asking was inappropriate and it was their responsibility as a nation or as a person of respect within the Native community to manage such knowledge:

> *But I think there is a long history of exploitation and now a very strong reluctance to share that kind of information. I think its something on one level, at least offensive, but also inappropriate. And I am not an elder, and there [are] others in our tribe that can explain it much better, but I think that maybe tribal participation is enough. Maybe on just the political level that's enough, rather than, like what he was saying, we're not authorized to even speak about this and if you ask the people to speak about this, they are not going to detail ceremonial cycles or other things like that. There's enough of that out there; you look at the anthropological work, it's fully described already. But it should be expected that we contribute uses of plants or things like that. Or also by that same token, using that existing knowledge to formulate goals and objectives, and outputs and outcomes. That's not what it's about. It's about preserving what we have. This is why we fought so long for our lands from the government.* - Cordell TeCube

Subtheme Self Representation

This leads into another area of responsibility, self-representation. Tribes generally are not interested in having an institution or a federal agency come in to collect information regarding plants, animals, and seasonal and ceremonial cycles. Many participants considered these actions rude as their systems of knowledge production and perpetuations were culturally connected to oral traditions and were also shared between specific knowledge holders within the tribe. Native Americans in New Mexico discussed being "studied to death" and mentioned that much of the information scientists needed was available in other resources. There was a clear discussion about

the relationships they have with place and how that reciprocal relations was far older than science and was theirs to maintain.

They have been managing their regions as they choose for thousands of years and still choose to do so. The participants expressed several times throughout the workshop and interview the importance they put on exercising their sovereignty of choice, and many of those decisions of sovereignty were based on managing their own resources, water, land, plants, and animals the way they choose. They mentioned the past problems of how the "white ways" often contradicted their cultural traditions, and historically the resources "managed" by the BIA and other agencies tasked with assisting the Tribes ended badly. Participants mentioned working with agencies, but want levels of respect in "nation to nation" negotiations as well as a reciprocal exchange of information.

Subtheme Personal Responsibility

Personal responsibility to stand by ones' choices, pass on culture and knowledge, implement adaptations on personal levels was expressed as important. Participants were consistent in discussing the responsibility every person has. The choices individuals make often have far reaching and long impacts. How a person decides to live in the world can be in balance or out of balance. Participants discussed living in humble ways, taking only what they need and managing their resources in ways that are respectful. The participants discussed farming and gardening from traditional and modern techniques. Another discussion expanded on food from a commodity standpoint that related food to a globalized perspective:

I think one of the first key things to think about is when you're living in an urban area, is be very conscious and present when you eat your food and when you shop for your food. I mean again if you're tracing the commodity chain of where it came from and ask 'at the expense of what land, at the expense of what environment?' I might suggest that is to try and buy local so that your carbon footprint, when you purchase something, isn't so big. So it's really interconnected and complicated but I would say try and grow your own food if you can or shop locally and that sort of thing. - Laura Harjo

The participants discussed personal responsibility as human responsibility to protect the Earth and all resources. There is a sense that humans are not only responsible for the problems, but they are also responsible for the solutions. The participants expressed how human consume and emit is the problem and solution. There was one conversation during the focus group session about power and how many Indian peoples still had no electricity. It was by choice for some and by choice of the leaders in other situations to preserve traditional ways:

It goes back to people understanding what is the root of the cause there. At my Pueblo we didn't have electricity at the Pueblo until 1974. That took an act of the Council, and by counsel resolution they allowed electric lines to be buried on our lands there. And the school has electricity, but nobody else did, but [the] clinics have electricity but none of the residents were able to get that. And when that didn't happen I suspect we saw a big change in how people thought about the relationship, or they want to pursue that, like the convenience, because before, people lived in the Pueblo no electric, no electric facilities, no running water, no indoor plumbing. So in our generations time the whole mindset is basically changed. How we can see the effects out there, like the effects of coal mining on the Hopi and the Navajo peoples. Yes, the tribes do get some royalties, they did get some training and some jobs out of it, but the overall impact has probably been much worse in the long term, outweighs the short-term benefit. - Robert Gomez

Subtheme Resource Extraction

The environmental impacts Native American peoples have experienced at the expense of progress were often discussed. The tribal participants know what happened, and who is responsible and what they have to deal with in return. The acts of the government and the different corporations who gained governmental permission to operate on Indian lands have imposed on the lands of the Tribes is very real, and ongoing. The Los Alamos facility was brought up a few times, as well as coal power plants in the areas surrounding the Tribes. These and other institutions, and businesses like them have had lifelong impacts both economically and physically on the land and the Pueblo Peoples in the areas these organizations occupy. There was anger at injustices and many Peoples felt defeated, yet, still, participants talked about the responsibility of social and environmental justice. One participant discussed ways of defending their rights to exist in traditional ways in the face of climate change:

> *So are you still able to fish if you want to fish? Are you still able to gather a particular plant and if you're not, I would figure out ways to put your concerns into action and take back to a rights platform whether it's your local, private, state, national and international, there are venues in which you can make a claim and try to get some justice around that. So whether that's the UN, your nation, your state, there are ways to try and get justice around that and I think that if we can coalesce a large movement around that that maybe we can some change.* - Laura Harjo

The discussion of change on a scale much larger than a single Native nation or group was frequently discussed in interviews as well as in focus groups. Some participants felt it necessary to empower the youth into activism. The point was brought up that the changes of climate were happening much faster than evolution could keep up with and something drastic was needed to change it. Part of the conversation was to

educate people to take action in ways such as politically through governing and policies. A revolution was brought up as a system of change:

> *I think we need more people to become that revolution group who starts taking climate change in a politically and governance standpoint, in a very different way. We really don't have that strong sense of activism, I don't think, and I really think we need more of that. Meanwhile the rest of the changes are going to happen through evolution. But what happens through abolition, that might be too late, we might not be able to respond in an evolutionary standpoint. So I think we need that spark of revolution at the same time I think. We need it hand-in-hand.* - Roger Fragua

Subtheme Hope

Then there is hope. Indigenous People have always been strongest in their deep sense of hope and future potentials. Survival depends on community and individuals coming together as community and extended communities coming together in collaborations, support, and working together. It was brought up that historically this is how Tribes survived the challenges of relocations, climate shifts, wars, and attempts of genocide on their people, by working together for common goal of survival and peace:

> *I think that this little get together here, social climate change is actually, my impression is that it's proactive and that impresses me because I need to see Indian people come together and support each other and not be tribal. Distinct tribes fighting one another because that's, that's what they [the government] want. I think we need to support and defend each tribe and each other as a community of people because that's what we used to be. It's important for survival. You know I think indigenous people of the world have a unique access to our histories, to the prophecies, to the stories, to the ceremonies and I think we were given certain strengths and we need to talk about taking on a positive role model action to help people become aware of what's happening to our climate and to help change it. I mean we are who we are and were still here.* - Sam English, Red Lake Chippewa, Artist

Subtheme U.S. Government

Native American participants acknowledge the responsibility they have as Nations and as individuals. Native participants recognize their part as minor contributors to the climate problem, as well as know the keeper of the solutions are the world leaders, especially our own U.S. government.

All of the participants spoke at one point or another about governmental responsibilities to the Indian Peoples and the land. The U.S. government has responsibilities to honor the contracts, adhere to their fiduciary responsibilities, honor treaties made with Indian nations and hold true to their trust responsibilities. There were a few discussions regarding the role of the U.S. government, especially about the role they should be playing instead of the role currently played. For Roger this included the USGS as well:

> *I mean every federal department agency per Clinton's Executive Order has a trust responsibility, so it's not just the importance of interior; it's not just Indian health services. It really is kind of categorically throughout the federal government and so every agency, department, and program is supposed to have an Indian mission statement to deal on a government-to-government basis with tribes. So you're negotiating with the federal government over what is most sacred. I mean what kind of a profanity, language is that used to talk about your cultural resources, to say that you can even talk about them? So I think that's the real issue, looking at maybe more unified approach of going to the federal government and saying, no we want block grant programs.* -Roger Fragua

The responsibility is not the federal government's alone, as there are state and local responsibilities to the landscape, cities, and counties. All of these agencies, institutions, and organizations must come together to work across barriers to address real problems. The people are part of the formula to make things better and participants

agreed all of these people must work together. There are questions on how things will go forward and how the Tribes are to fit into the conversation. How can they have a seat at the table to be included in the conversation to voice their needs and concerns?

> *I think what my leadership is interested in is where do all of these things intersect? Is my state New Mexico doing anything about climate change planning? If so are they even going to involve tribes at all? EPA got their inter-agency plan. Is this movement right here part of another inner agency action towards the Bureau of Indian Affairs? And where are they in all of this then? Are they part of an overarching adaptation plan? I think that's just one of my questions I would like to go away with today, where does this fit in the national planning model, regional, state, local.* – Unidentified Male

There were participants who were cynical about the government's ability to come through on what needs to be done to address climate change at all. The past experiences have positioned Native Nations to recognize frequent failures in laws and policies enacted on Native Nations by the government. A participant acknowledged the lack of honor and respect the government affords them. His frustration is evident in his response to lack of funding Tribal Nations get in comparison to other programs that protect animals and plants better then people:

> *I did tell the federal government and in some of our dealings asked, why don't you label us as endangered species? According to your Western science guide we did come across with some of these old world animals crossing the Bering Strait and coming to where you have of these animals now to have better protection and are getting more funding then we as Native Americans are getting. So why don't you classify me then as an endangered species. Of the 2,000 Santa Claran's that are there on the reservation and are enrolled, let us have our land habitat protection.* – Joseph Mark Chavarria, Santa Clara Pueblo, Environmental Director

Wyandotte, OK, July 9, 2013

Nature of Climate Change

When asked what climate change means to these workshop participants, the most immediate responses identified the physical changes to their local environments. They described differences in seasonal patterns and associated them with ceremonial patterns in their cultural lives. There was understanding of the scientific mechanics although the language used was associated with traditions and impacts more so than scientific technical language:

> *Oh climate change I think encompasses many, many things and certainly temperatures highs and lows, seasonal timing months. I think our patterns of when we have spring, when we have summer, when we have a fall, when we have winter, and what happens in those months would all be associated with climate change. And climate change affects many, many things about the way we live, the way we perform due to that.* -Chief Glenna Wallace, Eastern Shawnee Tribe of Oklahoma

Some participants had opinions or theories about what is the cause of climate change, further emphasizing the experienced and observed result they are living with. All participants have observed change in their areas:

> *Climate change to me is the result of consumerism upsetting the circle and the balance of life. Lacks of water, the increased temperatures decreasing temperatures are affecting our culture. We gather medicine; it's affecting the nature of this medicine and the quantity of those medicines and the life sustainers of food, to the lack of water affecting our trees, the lack of cold winter increases in insects. Many of our trees around the forest that we live in are starting to die you know, fungus that grows with the lack of a cold winter, and so it's affecting our ceremonies. So this to me is all based on, like I said in my original statement, is consumerism, we're polluting our waters. Whether its greenhouse gases, it's causing a lifecycle change in the earth itself you know. You've got northern native seeing flowers where they've never seen flowers before, we're seeing stronger and stronger droughts and the higher temperatures, it affects our elders –* Micco Emarthla, Seneca-Cayuga Tribe of Oklahoma, Environmental Management Department, Water Quality Technician

Some of the most discussed changes were described in observations of unpredictability of weather patterns, extremes and seasonal shifts. Also discussed, were temperature and precipitation swings that many participants felt altered phenology cycles from the norm they had known for generations. One of the biggest concerns was the quickness in which these changes are occurring. The quantity and quickness of the changes in plants, animals, rainfall and temperatures in one lifetime was alarming to some participants. The increased severity and frequency of the storm events plus intensity of extreme events such as tornadoes was brought up and discussed frequently throughout the workshop.

> *So much change. We've had extreme weather here and that's a symptom, I believe, of what climate change looks like. Lots and lots of change in extremes, it's very, very hot, then it's very cool. The Cherokee nations' [there is] 14 counties in their jurisdiction, and in that [area] there's been lots of extreme floods that have devastated communities, there have been tornadoes, there have been droughts, several years of drought. So many people affected with their wells going dry. So many people having to have water hauled into them. And then making that decision should they continue to live where they are.* - Rebecca Jim, Cherokee, Local Environmental Action Demanded (L.E.A.D.) Director, Farmer

> *It seems like we have really no spring sometimes or fall. We jump right from winter to summer, or we go from summer to winter and then we don't have the snowfall or the continuous cold weather that would put the insects away. We don't have the rainfall we used to have when I was a child I knew. It seems like in the spring we had months of continuous rains. We don't have that like we used to, and there are things that are changing and they're affecting everything, our trees are dying and that's affecting the game and affecting the fish. You have lower lake levels, you have lower creek levels, have lower river levels...* - Micco Emarthla

> Extreme weather events also include tornadoes, as they have been devastating in this region – discussions of the increase in quantity, size and power of tornadoes came up several times from participants. They talked about how they observed tornadoes changing, becoming larger

and more destructive, staying on the ground longer, and becoming even more unpredictable.

Impacts

Changes to the places the participants call home involve weather patterns shifts and plant and animals changes, forcing planning and development activity and changes to economics and how these shifts impact their ceremonies and cultures. People talked about impacts in terms of holistic observations and experiences relating to the environment around them.

There were no disagreement that conditions are changing in the environment as the participants identified the problems the changes were contributing to and how they have had to think about some of those changes already. All appeared concerned for the future of ceremonies as needed items become more difficult to locate. Participants are not confident they will adapt as quickly as the changes occur now will they be positioned to afford the cost of adaptation:

> *That's a complicated question that I think represents a number of problems for the world. Indigenous people are going to experience a number of problems that are specific to them, but we have a specific relationship to our area and if our area changes, we're gonna have to figure out how to adapt to that and that's not always easy. Especially because in this day and age, it's hard for us to keep going anyway, to be who we are in this world that's changed so much.* - Brandon Everett Bandy, Quapaw, Quapaw Tribe Employee

This caused some managers and tribal leaders to consider how they build homes and design their communities. They discussed building safe houses or storm shelters for protection as adaptations to the extreme events.

Subtheme Plants and Animals

A connection to the effects of climate change on plant cycles and animal migrations was prevalent throughout the workshop. They made multiple references to how the changes were affecting the plant, animal, bird and insect life in the region and the impact Tribes were feeling from those impacts.

Participants shared stories of how plants were blooming early, late, or even not at all because of changes in temperature. There were many that were concerned that the plants were confused by the changes in weather from one extreme to another. They discussed warming winters were causing some trees not to go totally dormant and bud too early leaving them susceptible to freezes. The warming winters concerned participants who felt lack of hard freezes allowed insect populations to grow, as trees are weakened and more vulnerable to infestations and disease.

Animals were also discussed in the context of observations of new species coming into new areas. Some animals were noted as having declining numbers in areas where they are normally more common. Not only wildlife has been affected by the extreme weather events; livestock also are suffering extreme cold or heat unseasonably and have been caught unprepared:

> *Our plants are not blooming when they're supposed to. I still have blackberry bushes with blackberry blossoms on them now, after it was the middle of July the rest of the blackberry bushes dried up. So it's the plants, they're confused, as well as us because we don't know how to plan for the gardens, or what to plant, and when to plant them. We're finding changes in the way our different grasses are growing. Different plants that we never had before, invasive species like our climate now when they never did before. There's a lot of change.* - Rebecca Jim

> *It seems that we have difficulty anymore having what I would consider the spring fruits. It will turn very, very warm early in February, which used to*

> *be winter, very cold, very low temperature. But now we'll have so many warm day in February or March that it will affect all of the fruit trees, many of the plants will begin to blossom and begin to bear fruit and then suddenly will have a hard freeze and it will destroy or damage a very high percentage of that.* - Chief Glenna Wallace

> *Well, I'm only 25 and from the scientific definition of climate change, it's the average of weather for 20 years and so, yes I have seen stuff that I think is different. There seems to be a lot of armadillos around here that didn't really come around here very much in the past, our pecan trees don't seem to grow as big of pecans, our corn seems to get fried every year. We've been experiencing hundred year floods over and over the last several years and then in the summer everything fries from no rain.* - Brandon Everett Bandy

Fish are not immune to the effects of climate change. During drought the water levels drop significantly and the concentrations of pollution and material that have leached from lead chat piles in the area are of higher than normal concentrations. The fish absorb this into their flesh making them hazardous to consume. These are fish Tribes have subsisted on for generations. When the rains do arrive they wash more lead and other material from the surrounding chat hills and pollution from farms and industry into the streams and lakes.

> *The pollution coming in from… whether its chicken plants, chicken farms, turkey farms, or just industry pouring out their outflows. That all flows down in higher concentrations because there's less water to break it up and so as a result many of the fish in our lake have higher concentrations of lead levels, heavy metals you know so we have fish warnings not to eat the fish and that's one of our life sustainers. Many of our tribal members depend on those fish in various types, and were told to eat smaller and smaller and smaller quantities to keep our lead levels down, to keep our heavy metals down. We're on the downstream effects from a Superfund site.* - Micco Emarthla

Subtheme Heat

Physical impacts go beyond the natural environment. All the participants discussed how the people are impacted in their daily lives. The changes in the

environment have prompted Tribes to consider how people are most impacted by heat, and extreme weather, affecting energy needs and disaster preparedness. The extreme heat has had detrimental effects on elderly and poor Natives, as they are the ones least able to afford air conditioning units or the bill it costs to run it. Many depend on area streams, ponds, and lakes to cool off during high heat warning days. The water is lower from drought, increasing pollution concentrations and creating algae blooms and hazardous water that is unsafe and toxic:

> *We're getting hotter and hotter days and our weatherman on television are telling us about these heat advisories and telling us to watch our elders. For the most part Native Americans, and I'm speaking for the Natives, we're generally poor, and a lot of families can't afford air conditioning and you know a lot of families can't even afford water coolers and so they depend on these creeks and these lakes you know, for their children and for the sake of trying to just cool off.* - Micco Emarthla

People discussed impacts from high heat indexes, evapotranspiration, and lack of rain, which hit Tribes' agriculture and economy very hard. Many families lost cattle and other animals to the heat and drought, or had to sell off cattle due to ponds drying up, no grass or hay to feed them, or the inability to afford the high costs of importing hay from other places. Native farmers and ranchers couldn't afford to keep up:

> *A lot of people in this area have sold off cattle last summer because they were scared there was not going to be enough hay available to get through the winter. It changed the whole farming lifestyle in this area.* - Unidentified Female

> *...definitely in this area, with tornadoes and weather from one extreme to another as far as flooding, then drought. It really hurt the agricultural economy in this area badly.* - Unidentified Female

Adaptations and Mitigations

Subtheme Living and Working Conditions

Chief Wallace of the Eastern Shawnee Tribe has done a lot of work to attempt to protect her people from environmental weather related extremes. She believes that the patterns of heat extremes are becoming regular and her Tribe has adapted by scheduling with maintenance personnel and other outdoor employees different work hours to avoid working during the hottest parts of the day. This protects the employees from heat related illnesses and reduces work hours lost.

> *We have to adjust work hours for maintenance people, of course because of the weather. It is so hot in the afternoon they will opt rather than start at 8 o'clock in the morning, as most of the other workers do, they will come at six in the morning so that they do not have to work in the afternoon. We've had so many storms, tornadoes storms, we've had so many outages of power electricity because of the storms, that we've had to provide far more generators than we did in the past...*- Chief Glenna Wallace

Impacts to climate from ice storms and tornadoes have increased the need for addressing energy issues. The Eastern Shawnee have invested in backup generators to provide energy so essential operations not be disrupted. The more frequent weather extremes have caused the tribe to put their power lines underground to protect them from outages related to wind and ice.

Another way this tribe has addressed these frequent weather extremes is by designing better buildings with consideration of alternative energies such as solar power. Another important change in the community is the installation of tornado shelters, or safe rooms in buildings:

> *It does seem that we have had more tornadoes and they have been more intense and that has definitely affected our tribe in that every building that*

> *we built now, we build a safe room in the buildings. They have built a big, big beautiful FEMA gymnasium that is also the city area place for people can go for shelter during those times. Northeast Oklahoma has very few. They [city municipalities] don't have any public shelters and so it's really the Indian tribes that seem to be taking the lead in providing this because each of the tribes is trying to change the way we construct buildings. I know the Wyandotte's put in a complete tornado shelter just recently, it's a beautiful facility. We're in the process of planning one and I'm sure other tribes are doing the same.* - Chief Glenna Wallace

Not all tribes have shelters or plans for disasters. Climate change is believed to be responsible for the larger and more destructive storms that have pushed Tribes to reconsider planning and building designs. Not all Tribes are situated to address climate change and are struggling to grapple with the idea – they have more immediately pressing needs for focusing resources.

> *I would say due to the conservative nature of the state that we live in, we don't talk about it as much as I would think. But yes, we do talk about it at some level.* – Brandon Everett Bandy

> *Sad to say my tribe right now is basically concerned with the businesses and kind of trying to survive in the economic today. And yeah climate change is in their minds but it's kind of on the back burner.* – Micco Emarthla

Subtheme Homelands

The prominent realities participants mention are that they must address the changes in their homelands. There are no choices but to work on the challenges as they come. Some Tribes are struggling to exist day-to-day with financial stability and the security of their communities, so the future is something they can barely consider. Others are struggling to cope with other environmental problems that are immediate. The Quapaw Tribal lands are within the Tar Creek superfund site and the Seneca-Cayuga Tribe is just downstream. They are constantly trying to survive and protect

others from contaminates in their water, soil, and air. There are very real immediate challenges that put climate change adaptation on hold. The Tribes are deeply connected to their land and community, so leaving is not an option for many reasons.

> *What are we gonna do you know? We have a relationship to the place we are at, but even more than that, you know in the past if something happened and we needed to move, we could. We can't do that anymore. The government has us right here, we can't move anywhere and so if this place we are now doesn't work for us, we don't have any options.* - Brandon Everett Bandy

Responsibilities

All participants agreed that humans are the cause of the transformations to the weather patterns and extreme variable. There was a consensus that they would like there to be more research to show the connections between human actions, industry pollution, population increase, and climate change. They felt it important to prove further the personal and collective actions humans have on the Earth.

> *I think it's very important that the research is being done and shows what's happening I think we also need to know why it's happening, and currently we're the reason this is happening. Not maybe you and I directly, but people in general are the reason why this is happening and it's gonna change everything forever. It already has started to change things.* – William Tarrant, Seneca Cayuga Tribe of Oklahoma, Environmental Management Department, Water quality Technician

Human responsibility topics related to water, weather related impacts on ceremonies, political will, planning, and development. Most discussions involved collective responsibility as they felt it would take the collective Tribal communities working with local, state and federal entities to fully address the issues, as all participants believe the challenges to be too large for any single group. Also discussed

was the personal responsibility of advocacy for the Earth and the extended webs of life that are often not considered in the development and pursuit of consumerism.

Subtheme Water

Water problems plague many people in this region of Oklahoma due to the Tar Creek superfund site. Heavy rains wash more toxic materials into the water system and drought makes the existing levels more concentrated. It is difficult for residents close to or downstream from the area to access safe water. The Tribes do work together to monitor the water in the creeks to protect their members and assist the EPA to monitor lead and other pollution levels in wells and streams.

> *We have one of the largest Superfund sites in the United States and so we have a very, compared to most tribes in Oklahoma, we have a large Environmental Protection Agency, but their main concern is cleaning up our land. There are chat piles across most of our land and with lead waste... And so that's kind of our main problem right now is we're trying to just deal with that. So there's not much [we can do] we don't have a whole lot of time, people to spend their time on other items or other issues.*
> - Brandon Everett Bandy

There are long-term and residual impacts on the people in this region. The Tribes downstream are proactive and taken responsibility for monitoring streams and river water qualities. Stagnate and low water levels increase conditions that allow blue-green algae to grow. Micco's descriptions are typical:

> *We're on the downstream effects from a Superfund site. With lower water levels our creeks are getting lower. Our river, Elk River, which our ceremonial grounds sit on, at times also is so low that blue-green algae is become a bigger and bigger issue. Those watershed affects, you don't realize the damage. The planet is two-thirds water we're only able to drink 2% of that and we're making that less and less by our pollution. And when you have less rainfall to contribute to the balance of water to drink, you know in your polluting more and more of it with discharge from industry into the watershed. As long as they go out and spray their pesticide, they spread their chicken manure, it rains, it washes it down*

> *into the local ditch, that ditch runs into a Creek or a bigger ditch which runs into a creek that runs into the river and then the lake...*- Micco Emarthla

Another of the many discussions about water was planning for safe water for consumption by increasing populations of people. There was already increased use by the food production industry. Poultry farms in the area in particular use a lot of water for production. Micco addressed concerns about how the waste water was disposed of, calling for industry responsibility for better regulations and water quality standards, or better government standards, regulations, and oversight.

Subtheme Culture

The stress on water negatively impacts the ability of some Native Americans to perform some ceremonies. Half of the participants discussed how changes in the environment were directly affecting their responsibility to their ceremonies and cultural traditions. Chief Wallace mentioned the challenges of appropriating time off work for Tribal members to attend cultural events. She pointed out the difficulties of planning for spring ceremonies that are coming a month earlier than they have been accustomed to. As chief she is responsible to her people and culture to maintain ceremonies as well as possible. One participant discussed how the unseasonable warming was interfering with ceremonial cycles and patterns and his responsibility to pass this knowledge to his children:

> *I'm really active in our tribe and I think a lot about our ceremonies and what I grew up with, and what my kids might not experience because of like the climate changes. It's warm when it shouldn't be and then it being extremely hot. When I was their age it was hard yeah, but it was not like this now and affecting the plants and the seasons for our ceremonies...* - William Tarrant

All participants observed changes with plants, animals, temperature and precipitation patterns and many had their own reflections of how these transformations of their homelands were changing how, when and how often they planned and participated in ceremonies. Some ceremonies were difficult to perform, as certain plants were difficult to find. There was significant discussion from Micco about the relationship and responsibility to protecting "Mother Earth" and preserving culture and land for future generations. He was clear about the kincentric ecological relationship with place Native Peoples have and the important responsibility all Peoples have to protecting the Earth and all life and elements.

Subtheme Government

Political will was discussed as all the participants felt climate change education and information was important to understand by not only their leaders but by the community as well. Many felt the U.S. government was not doing enough action, based on the science and ground truths they were experiencing and observing. There were expectations of government responsibility, but little faith in action. Rebecca's sentiment was typical of the feelings of others:

> *Climate change is real and I really believe that it's man-made and it's made by women as well as men and we've been participating in that effort or in that way. We're all responsible for what's happening, we're all using electricity, we're all turning on the switch, we're all using energy made from coal, we're all part of this and it's the use of fossil fuels. We don't have to do this. We can have a world that can last, that can be beautiful and can be a healthy place. But we're not doing that and we're not put the pressure on corporations, businesses, or our states, or our governments to protect what we need, for regular people needs. They been influenced too much by profits and the power of having people with money approve of what they're doing, but they're not protecting the earth and they're not protecting the future of it. I really believe that as people, we all need to*

> *say that has to stop and we need to do better and we have got to protect what we've got. We cannot depend on the rest of those corporations. We're gonna have to tell them and our governments that we must be protected. We have to do this and we have to do this now.* - Rebecca Jim

Subtheme Science/Academia

Another valuable point on responsibility was in reference to the general public. Many participants agreed that there was not enough understanding of the problem by average people, as there was conflicting information about climate change portrayed in the media. There was a strong feeling that it was the responsibility of science, academia, and the media to share information so people could be informed better to make better choices for themselves.

> *Well, I think the biggest thing is that a lot of people in this area don't know what to believe. They don't know if it's true or not and because the political environment in this country, some people try to say that it's real and some people can say that it's not. And I know from the work that I've done that it is true, and I know from talking to some of the older people that I've talked to that they had seen things and it is happening. So I think if I were trying to say something to all the people in my tribe at once, it would be that you need to wake up and realize that this is true and it is happening, and the to think about this.* – Brandon Everett Bandy

Subtheme Tribal Action

There are those that are attempting to plan and be better situated for extreme events as they are concerned about the recent shift of more frequent extreme weather events impacts. There are multiple Tribes acquiring and building storm shelters to protect their people from harm. They are taking responsibility for themselves and taking steps towards protecting their people and their cultures. It is difficult for the already burdened peoples to fight against more complications than they are already fighting.

Sulphur, OK, July 17, 2013

Nature of Climate Change

The nature of climate change was expressed in a mix of western science and traditional perspectives. Most connected climate change to weather extremes. Tye Baker and Wayne Kellogg's responses were characteristic responses:

> *Climate change means a number of things. A very robust discussion is needed about climate change, it's a very holistic approach with several variables going into the discussion, trying to understand how our climate extremes [and] averages all go in to affecting the people and the region, and their way of life.* - Tye Baker, Choctaw, Tribal Environmental Professional

> *Well climate change can come in the form of droughts or severe weather or just about anything related to the weather.* - Wayne Kellogg, Chickasaw, Environmental Engineer

One of the participants discussed more observational and experiential detail regarding the mechanics of climate change. Not only did he go into details of the weather pattern changes, he discussed seasonal shifts and weather extremes followed by plant and tree mortality or scarcity:

> *Climate change is, what it means to me is that the things that we used to do, we probably can't do anymore. Because I think that weather patterns have changed and that causes us to have to change the schedule [of ceremonies], for example, the Gourd dance. Kiowa Gourd clan ceremonies are in July. A lot of people are becoming stricken by the heat, the intense heat and I think it was last year several people were very ill and had to receive medication or were hospitalized because of the heat, especially the elderly people. The people like my age group that are in their late 60s or 70's are finding it difficult to participate. I know that it is always been hot in the past but they actually had arbors, willow arbors that would remedy direct heat from the sun but now that it's hard to find these growths of Willow. You can't even build arbors to sit under in order to participate in the ceremonial gourd clan event, so those kinds of things. We have several Cottonwoods, in our country house in Carnegie that have died, These large cottonwoods and that's unusual. The weather patterns have changed and they affect ceremonies, affect our way of life. That has*

become a problem. – Gus Palmer, Kiowa, University of Oklahoma, Interim Dean of American Indian Studies

One of the female participants described climate change in a global context:

When I think about climate change I cannot divorce that from the environmental changes that are happening globally that seem to be. I know there's a big debate about why climate change is happening and there's a debate about whether these things simply happen or our carbon emissions really the cause of it. I'm just plain and simple I've been here on the planet for 64 years and I can say that the last 20 years are exceptionally different in terms of what I see on the planet globally, and personally in my own backyard. - Cathryn Ladoux, Micmac, Educator, Community Member

Two other women expressed a vague understanding of climate change but wanted to learn more:

What does climate change mean to me? I suppose that's a relatively new term. My field is mostly culture and so although we've had to deal with impacts of, I suppose climate or weather on our sites, I guess it's something that were just coming to learn about. – Kim Walden, Chitimacha Tribe of Louisiana, Tribal Historical Preservation Officer

It's very important. A lot of people don't realize how it affects [the environment], and how it affects them. A lot of people think it doesn't affect them, but it does. We have a lot of a lot of changes going on that I think the general public just doesn't even [understand]. They just take everything for granted. You may think that's just how it's supposed to be, but we need to do a lot, we need to do a lot help the environment now. – Sarah Aultman, Kialegee Tribal Town, Tribal Environmental Professional

Most participants had a general understanding of climate change with some having more in-depth understanding than others. All the participants identified climate change with transformations they have experienced and observed.

Impacts

Subtheme Water Concerns

Increased heat and lack of precipitation for extended periods of time has created extreme and exceptional drought conditions. In an area of Oklahoma populated by natural springs and spring fed streams and rivers, surface water is an important resource for the area and its peoples. Some regions had water quantity and quality concerns as stream dried up, lakes became shallow, bacteria numbers increased in water, and blue-green algae blooms occurred.

> *We lived, until a year ago, right on the local lake and for the last four years there, [there has] not been a safe place close to me where I can go [to the lake] because of algae bloom, because the water is receding so badly. And so what can I say more than that, that canoe is in my yard upside down because there's no good place for me to go that safe and that's another concept that I find shocking, that water is not safe. That if I were to get in some of the lakes, if I were to get that water on my hand and actually getting my eyes, or on my face, it could cause me to be sick. That in a nutshell is the most stunning link I have to climate change* – Cathryn Ladoux

During discussions in the focus groups there were several participants who brought up how bad the blue-green algae were for them in their areas. It was pointed out that all the lakes in Oklahoma are man-made and often shallow:

> *I took a little tour to the Chickasaw national recreation area in 2011 and I saw that the streams had quit flowing, and there used to be a lot of swimming holes there that the kids used to swim in and they had hazardous signs posted that kept the public out of the swimming holes because the water was stagnant, not flowing anymore. And they did a little research on the flows on the blue River and in 2011 the flow rate on the blue River drop down to about 1 ft.^{3} per second, which is the lowest flow rate that is ever been since the 1950s.* – Wayne Kellogg

This lack of surface water caused increased use of aquifer sources decreasing the flow of some spring-fed streams. This also is creating concern about drinking water

access and quality. With drawdown of the aquifer many springs quit flowing and well levels dropped. Drought had caused all the participants to voice concerns about drinking water availability, quality and quantity.

> *[People] are mainly concerned with the water quality, the quality of our drinking water and I think because that's the most highly publicized. They get notices in the mail so they automatically think that the whole drinking water is contaminated and that it's not good.* – Sarah Aultman

Concern over the impact on rivers was also discussed especially in focus group, where regional differences were illuminated. The issues of low water followed by extreme rain events followed by drought and extreme temperatures contributed to challenges monitoring and affected wildlife and fish:

> *Our rivers have been extreme, down in the southeast Oklahoma. It will either flood where you can't monitor it to see what's in it, or will be down to where there is nothing in it and you can't find a place to monitor it. It's not really holding a consistent anywhere.* – Unidentified Male

> *Also with the degradation of the waterways you're also going to get lower dissolved oxygen counts. Which affects the wildlife as well and you can see a lower fish count because they are not getting oxygen in the water because of the heat.* – Unidentified Male

Subtheme Heat

Heat was mentioned at all the workshops but the frequency of its mention at this one was higher than at others. Heat was a contributor to water issues, economic issues, invasive species complications, and wildfires.

> *Well we have seen a lot of outbreak of fires that got out-of-control because of such dry conditions. And then we seen an outgrowth of blue-green algae in some of our lakes, which is spurred on by the dry conditions and the high temperatures.* – Wayne Kellogg

Extreme temperatures influenced other aspects of the region. Crops and timber products are a major part of the economy in this area of Oklahoma, and have been

repeatedly unproductive due to drought and heat extremes. Wildfire was a concern since the area grows and harvests trees for economic development, and protecting homes and businesses in the area is important too. The drought and heat stresses trees, weakening them, and invites insects and invasive species into the region, further stressing trees. Once trees become infested or attacked by insects or other problems, tree mortality increases fire danger and affect economic stability:

> *Here, recently [and] over the past few years, they started a large-scale irrigation project because the lands seem to be deprived of water that was always there. So now they're bringing in more water and trying to revitalize the land, but before, it never was needed. Also extreme temperatures are affecting forestry. The dry conditions allow for different types of insects to maybe infiltrate the bark that was previously protected because of the abundance of moisture and the tree's ability to create tar and sap to block the insect infiltration, it's not the case now. And a lot of summers you lose a lot of your forestry crop due to problems like this. So these are things I attribute to climate change, which affects the local economy, affects the sociology and people's jobs so [climate change] definitely affects the tribal people.* – Tye Baker

Timber was not the only economically important issue to the tribes, as infrastructure and development of the land carries its own burden:

> *[With] extreme temperatures you lose mature pine stand of timber. And then a pretty long-term affect you gotta go through, the process of redeveloping the land and replanting. Extreme circumstances, extreme weather, cold and hot. One of the program services we provide is we've got a lot of roads within our tribal boundaries and extreme temperatures degrade our roads and require repair and attention. Also dealing with water a lot of times, extreme temperature can hurt infrastructure and impair water systems. So that that's another thing that we deal with long-term as well, constant maintenance to the systems and the extreme weather I believe attributes to those problems."* – Tye Baker

Subtheme Safety

Extreme weather varies between heat, cold, drought, tornadoes, and hurricanes to name a few. Being prepared for weather related natural disasters and community

resilience to these events is important for survival and protecting community members. Participants discussed how weather patterns were changing and becoming more intense and powerful. The unpredictability of storm paths, power, and movements contribute to property damage and loss of life. Whether the storm is a hurricane or tornado people are concerned for their safety and the places they call home.

> *It seems like storm patterns have changed, they become more numerous. When I was a child we always had a cellar, an underground shelter, a storm shelter, and people don't readily think about that anymore. There's an occurrence: there's more storms, maybe it's just because recently in the community where I live now there's been an increase of tornadic activity so that in the past 10 years there's been at least four major tornadoes in the area. One of the strongest recorded storms occurred in two areas a few years apart. So that more and more people are thinking they need storm shelters. I'm going to have to have one myself. My wife and I live alone in our house last year when we were hit by an F1 or F2 tornado and we had considerable damage. It took about $20,000 to repair the roof and to remove things and change everything around in our house. So we were affected by it.* – Gus Palmer

There were some participants from the Louisiana coastal region of the SC-CSC region. They discussed storm intensities and shoreline erosion but mentioned being unprepared as a tribe for climate projections implied by the CSCs. Kim Walden mentioned the inability to address the changes immediately and conceded to reactionary practices as she mentions:

> *I think the biggest concern to the Chitimacha people is closely related weather-wise to hurricane damage, and because we have seen such shoreline erosion and subsidence coastally, and we are coastal people, that those protections, the buffer that we used to have, is getting less and less. And so the concern would be that that storm surge and hurricanes will be more impactful to our reservation lands. Our growing concern is that we will have an inadequate protection from hurricanes because of coastal erosion and shoreline loss that used to be that buffer. You know recently we've had one hurricane just miss us, then one go east of us but we know that another Hurricane Andrew, that was pretty devastating for us, will be coming, we don't know when. So I guess that, we're more reactive. I guess this is why it puts me in a position to talk about climate*

change. We will deal with it when it gets there, there's not much that we can do as a community to change those things. - Kim Walden

Of the unique issues discussed a couple participants spoke about was how extreme weather events, including drought and rain, were creating difficulties with graves and burial sites. The drought was causing lake levels to drop to levels that exposed earlier burial sites and looters could locate and plunder them. If it wasn't drought exposing them it was flood, erosion was. These problems are expected to increase as weather extremes continue:

> *Working in historic preservation department, as the water levels drop, we see more burials and archaeological sites being exposed. Because of that, sometimes we see more looting.* - Ryan Spring, Choctaw, Historical Preservation Officer

> *But that's the biggest thing is those burials getting exposed and having to do a lot more repatriations. Of course looting is an everyday thing we find as a historical preservation department, but definitely see the increase because a lot of archaeological sites are under the water. In Oklahoma of course most of the lakes are man-made so when you flood these Lakes, you flood sites and as the water levels go down, erosion or just the flooding and those sites are starting to come back and people can have access to.* - Unidentified Male

Adaptations and Mitigations

Most tribes did not have plans for adaptation to climate change. Most were addressing some of the short-term impacts on a one-by-one, reactionary basis:

> *No, we are not really, not that I know. I mean we are open to it. The idea is great and studying it and what does it mean... I guess in the back of our minds we know that we'll have to deal with it in the future. So I think this is an opportunity to bring [climate change information] to the forefront so that we can become more proactive and use this information for planning purposes rather than being reactive.* – Kim Walden

With there being such differences in preparedness for and understanding of climate change, there were many discussions relating to what they were already doing,

what they thought could be done, and what they wanted to do to educate and prepare the communities they are part of. One of the interesting things was frequent conversation about emergency management and disaster preparedness. There were several people that addressed extreme violent weather events like tornadoes, as well as long-term events like drought. The thought was that tribes should be planning for the worst-case scenarios and address perceptions of risk:

> *I think the long-term effect is that these weather patterns may become more intense and we may have to plan for these kinds of things. You find more people thinking about we need public shelters, or we need personal shelters. We think about our neighbors and we're all afraid for each other. So we're looking at weather patterns, the long-term effects there I think. And it's hard at this point to make any kinds of predictions right away, but I think we're thinking more along those lines. When I was a kid when I was growing up there was always a shelter there. I don't think we thought about these things because everybody has shelters. We ran into the shelter, storm sellers and stayed overnight, all night and that was just a matter of practice, and wouldn't think so much. But nowadays it seems like, maybe it's because we have increased technology, we know more about storms and maybe that's why were more aware of these patterns of change. They just seem to be more numerous and I think that's going to change how we think...* - Gus Palmer

> *I think it's important for tribes to [define drought] not just with the state or the federal definition of drought, but to develop their own. I know that we thought about that a little bit in our drought planning. I think it's important for tribes to set their own markers and then make that declaration as saying, our nation is deciding this is a drought now. We're not just relying on external sources, but here's how it impacts us and maybe have those indicator set earlier so you can be proactive about it and maybe implement some conservation practices or other things. To have that plan in place so when you see those early indicators you can say here's how we now educate our people and get them on board and already have your plan in place.* - Unidentified Female

Including emergency managers into planning and was frequently brought up in dialogues. Discussions included the value of having Tribal planners include input from various tribal departments to create a better-developed plan that emphasized long-term strategies:

Working with your [Tribal] emergency management team and the planning takes into account a lot of other things besides just the disasters. – Unidentified Female

Much of the value of this thought process revolved around protecting lives through better conservation measures as well protecting assets and resources. Many of the ideas for change were specific to storm shelters and "long-term sustainability of water resources" for multiple tribes covering differing areas:

Shelters I think storm shelters are important. I think there should be public facilities to help people in their neighborhoods whether they live in rural communities or in urban areas, or cities. Within city limits there should be facilities. Public school buildings are now considering for a new school building, for construction to offer a shelter storm shelters because of the situation in Moore where we lost I think more than a dozen schoolchildren because they didn't have anywhere to escape, to escape from that huge tornado that hit them. - Gus Palmer

... thinking about climate change is almost a positive thing as we had to reach out and we partnered with our sister tribe the Chickasaw nation and where developing a water plan and this focuses on long-term sustainability of water resources in the Choctaw and Chickasaw nations. Climate change has partly expanded our thinking to how we plan for the future and how we can become more efficient and better stewards of water in our region here in Oklahoma. So climate change has brought about a different way of thinking and we definitely have been trying be adaptive and conserve water and pass the message along to everyone in the Choctaw nations so that hopefully we can sustain this resource and continue to grow in the community as well as in the tribe and help everyone in the region. - Tye Baker

Well part of our water planning efforts is to come up with ways to deal with drought conditions you know there's you can do artificial aquifer recharge and try to take the water stream storm event and replenish the water in the aquifer during a storm events to have a bill that your water supply for drought conditions. We're also looking at doing a study on the recycle and reuse wastewater, which typically is just discharge to the stream and then flows down to the Red River and out to the gulf. - Wayne Kellogg

...whenever an opportunity arises I let people know about my particular attempts at sustainability i.e. through gardening, through what I'm going to eat and how I'm going to dispose of my food so. And I notice that tribal members basically, you cannot live in a small community like I live in with

limited water supplies with surrounding farmers allowing run off into our streams, and you know you get a drink of water some days it smells…hmm is water supposed to smell. So, it's like it's all around us so, we can't not speak about it, but we may not be really thinking that we're speaking about climate change. – Cathryn Ladoux

Subtheme Food Security

Food and agriculture were discussed, not connected to farming and ranching but rather to protecting individual foods and gardening in the event of disaster and water scarcity. This is the first workshop where participants discussed disasters in ways that caused them concern over access to food and water to survive:

When I consider the drought, I need to make my diet fit into the fact that I want to eat plants that aren't going to require as much water. So I'm talking about a dietary change. I've already made that dietary change. I'm impacted in that way and how much water I can use and more importantly the weather-related disasters and a lack of water. All of that I find very frightening so it's like, how am I going to make sure my family, my husband and I are going to survive if suddenly more of Oklahoma City is taken away by a storm and everybody's trying to find a place to live, and where do we get water and where do we get food? Then I'm more likely to be able to feed my family if I'm buying locally, if my diet is according to what will grow locally. I've taken it a step further and because of some of the national political climate, I've taken it a step further and have identified within the 15 miles of my house that I can access, should the infrastructure go altogether, should the water department shut down or the water dry up, should I no longer be able to access gas and not to go to the supermarket. Where will I get my food? How will I make sure that my family and friends are fed and well cared for with very little resources. And that's probably my prime motivator for coming here is to see what scientists want. For me, the folks that have access to that lovely cloud of global resources, and how do they say I might help my family and friends stay alive." – Cathryn Ladoux

Subtheme Information Dissemination/Collaboration

There was a discussion amongst participants during a focus group about climate tools. A couple of men suggested that the climate information be made more available

to landowners, farmers, and the general public regarding how climate change could mean more extreme events and what those events could look like. There were requests for more information and materials to educate the community so there is better understanding of the jobs the TEP's perform, while creating opportunities for communication with the community about the subject of climate change and variability. There is a need for peace of mind in the community that researchers and Tribal representatives are working together to achieve. There was interest in more collaboratively developed community outreach. Better communication and collaborations between Native nations, local, state, federal governments and academic institutions was advocated:

> *What I would recommend, if I can make a recommendation, is that there become more intertribal activity so that tribes can work together. For example the Chickasaw nation, the Choctaw nation, the Kiowa, Comanche and all of the affiliated tribes in western and eastern Oklahoma, as well as those in regional areas, should become more organized in terms of climate change. They should work closely with the research groups, with the University's offering facilities and meeting places where we can all get together and plan how we can work out plan and strategize for weather change, for climate change. I think it's going to affect our food sources.* - Gus Palmer

> *Yeah they need to become aware of it because it does affect them. A lot of them think that it doesn't, but yet they do need to create more awareness, and just to learn all they can about it so they can relate that to their population or their tribal members, or even the whole community as a whole.* - Sarah Aultman

Tribal participants agreed that things are changing in their environment physically and socially at a rate many cannot adequately deal with. The changes affect their cultures, homelands, and ways of living. There is interest in outside help, but also in maintaining self-respect and being seen as equals politically and as humans. They are

deeply concerned with the future of their communities and the longevity of their resources:

> *So weather patterns are changing, tribal groups are changing, all the things are changing, natural patterns, natural events in our world and so we can't possibly help ourselves. We need the assistance of other people who might have better ideas, a better plan and resources to help meet the needs of these communities* -Gus Palmer

Responsibilities

There was no outright accusation as to who was at fault, but there were significant discussions about who was responsible for addressing climate change and on what levels. Participants were clear in their understanding that they were not alone in the problem or in the solutions. There was understanding by all participants that the main levels of responsibility for fixing the problems or adapting to problems were on those who held power. The most common discussion of responsibility and accountability was at a collective level, such as a community.

Subtheme Community/Youth Empowerment

One topic participants discussed was education of youth and community on climate impacts, extremes, long-term potentials, projections, responses, and adaptations. There was a sense of responsibility to helping prepare their youth for the future, and a sense of responsibility for caring for their community and environment. The other issues of education related to community. This included farmers and leaders, as they were the ones most responsible for the land and the community on some levels. Leaders were tasked with making long-term decisions for the entire Tribe and on national and possibly international levels.

Subtheme Tribal Responsibility

Tribal leaders are responsible for outreach to other Tribes, institutions, municipalities, and for Nation-to-Nation agreements and planning. There are increased expectations of responsibility for leaders to advocate for conservation and sustainability actions. Native American participants found it very important to protect what the Tribe knew to be sacred and protect and perpetuate the cultures:

> *Climate change has partly expanded our thinking to how we plan for the future and how we can become more efficient and better stewards of water in our region here in Oklahoma. So climate change has brought about a different way of thinking and we definitely have been trying be adaptive and conserve water and pass the message along to everyone in the Choctaw nations so that hopefully we can sustain this resource and continue to grow in the community as well as in the tribe and help everyone in the region.* - Tye Baker

> *I think that it's good to recognize the tribes have different concerns then maybe the general public. In regard to climate change and weather and the impact, not to minimize other people's concerns at all, but there are those cultural ties and those ties to the land, and in our case for thousands of years we were not removed. And even the people that were removed you now have different concerns and they are possibly more emotional because of the cultural ties and cultural practices and continuity of practice that [was] taken away. So I think that being cognizant of those concerns is good and also in our case, we're really not having those discussions about climate change and so therefore we are not maybe as proactive as we should be, or could be. So getting us to look at, maybe in our case, sea level rise or coastal erosion, you know? What are we looking at down the road and to begin having this conversation so were less reactive and more proactive.* - Kim Walden

> *It's gonna take an organization and a dialogue to take care of that situation but it's just the beginning of other places where there are land sites there are places that indigenous people use for to collect material or resources to conduct ceremonies. These are important actions, important tribal practices and that becomes endangered just like the languages are becoming endangered. And so people want to rally, people need to rally in order to save these places I think that there sacred places there are sacred places that are necessary for people to conduct their lives* - Gus Palmer

Subtheme Individual Responsibility

Participants pointed to levels of personal responsibility. Learning about climate change and adaptations and understanding as much as possible and then sharing the information to educate others was seen as a personal responsibility. Also, investigating how to be personally responsible for your contribution to the problem of climate change through the use of fossil fuel was seen as important. Changing the habits of everyday people and finding measures of producing more and consuming less also was seen as important. Growing a garden or buying local products from farmers was seen as a great strategy:

> *What I'm looking at today in coming to the conference is not only my personal experience with climate change and specifically drought, but looking at avenues where I might help to educate people in my community on climate changes and the drought...I really do have a personal prejudice that top-down is how we got here, and it's time to go bottom up...*- Cathryn Ladoux

Participants expressed concern about how they could find safe water and food in a disaster. Not only a weather related crisis but in any crisis where competition becomes pressing. Finding ways to protect oneself in a crisis was an important topic for a few participants. All participants accepted some personal responsibility for how they lived and could contribute to changes in their own life to adapt to climate change. There was doubt and concern about those with the most power not acknowledging the problem or the solutions.

Subtheme Governmental Responsibility

Governmental responsibility was related to global and national responsibilities to protect our entire planet and nation. This perspective was based on federal protections for critical resources like water. Many felt it was important for the city, state and federal government to implement better codes and regulations for building improvements in areas where extreme weather events are more likely. It was also important that these same city, state, and federal agencies advocate safe shelters for communities to protect themselves in, as part of community development. All participants felt it was an important responsibility for the government to recognize climate was changing and that humans are contributing to the changes, and take actions to address the problem responsibly:

> *If I had to say something about climate change to large groups of people I think as a society, especially in the United States, we've become very good at utilizing technology. We've become very complacent and comfortable in our climate-controlled homes. Being part of the tribe I also understand that throughout the years we've learned to take what nature's given us and kind of roll with the punches, and understand that things are consistent year-to-year. As they may seem in your climate controlled car, but there are extremes and we do need to have a longer memory and understand how our generations before us and think about how our generations after us, can deal with what we've left them and how the climate changes and how we got to that...* – Tye Baker

> *Well you know as far as natural resources the natural resources in the state are shared by everyone and we all need to take a hard long look at how we're using those natural resources and manage those things in a sustainable manner.* -Wayne Kellogg

The overall sense of this workshop was that the participants could not wait or depend on outside help or assistance because they felt it would not come. They all felt a level of personal responsibility for the problem and a larger responsibility to come up with solutions and adaptations, especially in areas of conservation and gardening.

Chapter 5: Analysis and Summary

To better visualize and summarize the content of the voices provided in Chapter 4, I have placed keys points into two tables. The first is a collection of the most often discussed impacts participants relate to their understanding of climate changes in their regions (Table 1). Many impacts are shared such as surface water problems, temperature extremes, food security, and cultural changes. There were a few patterns that varied between workshops in that all of the Oklahoma tribes discussed phenological shifts but the New Mexico meeting didn't discuss them. That is not to say there are not shifts in phenology in New Mexico but it was not a pressing issues brought up at the workshop. Another difference was plants and insects were discussed in Oklahoma workshops but again not in New Mexico. This is a result of differences in location and landscapes, and priorities raised in discussion.

Table 1- Impacts

Impacts	Stillwater	Ft. Cobb	Albuquerque	Wyandotte	Sulphur
Surface water	X	X	X	X	X
Aquifer Issues		X	X		X
Flooding/Extreme rain events		X	X	X	
Temperature Extremes	X	X	X	X	X
Food/Ag	X	X	X	X	X
Culture	X	X	X	X	X
Phenology Changes	X	X		X	X
Tornadoes	X	X		X	X
Drought	X	X	X		X
Wildfire		X	X		
Insects Shift		X			X
Plants Shift	X	X		X	X
Animal Shifts	X	X	X	X	
Hurricanes					X

Table 2 - Results

Sulphur	Wyandotte	Albuquerque	Ft. Cobb	Stillwater	
*Weather extremes *Seasonal shifts *Phenology changes *Temperature extremes *Precipitation changes	*Weather extremes *Temperature extremes *Seasonal shifts *Phenology shifts	* Drought *Temperature increase *Phenology shifts *Weather pattern change *Culture change	*Weather extremes *Weather pattern changes *Precipitation changes *Temperature increase	*Weather extremes *Seasonal shifts *Phenology shifts *Ambiguous science	Perspective of Climate change
*Drought *Heat increase *Water quality/quantity *Aquifer drawdown *Invasive –species *Emergency/disaster	*Season instability *Plant animal changes *Extreme weather *Invasive *Extreme temperatures	*Water security/scarcity *Drought *Aquifer/well drawdown *Wildfire *Invasive –plants, insects *Warmer drier winters *Hotter drier summers	*Water /food Security/scarcity *Extreme weather *Extreme temperature *Phenology shifts *Health/Safety *Wildfire	*Hydrological changes *Food and water securities *Extreme weather *Phenological shifts *Cultural impacts	Impacts attributed climate change
*Planning/Mgt *Education *Research collaborations *Emergency/mgt *Gardening/food	*Management *Building *Planning *Emergency/disaster planning *Research *Collaborations	*Farming & foods *Water use *Planning/Mgt *Education *Collaborations- *Research	*Planning/Mgt *Alternative energy *Farming *Collaborations *Education	*Education *Farming Agriculture *Collaboration between Tribes *Scientific tools for decision making and planning	Adaptation Mitigations to climate change
*Power holders *Government *Humans *Community *Individual	*Humans *Science *Government *Academia *Community	*Community *Culture *Food *Education *Individual *Science *Government	*Gas & Oil *Government *Science *Trust *Individual *Community *Educate youth	*Gas & Oil industry *Government/policies *Science *Agricultural practices *Community/Shared *Trust/Relationships	Responsibility to correcting mitigating climate change

The second and more complex table illustrates the basic questions asked with overall responses summarized from each workshop (Table 2). The first row across represents the definitions and perspectives participants gave relating to climate change. The common answers at the workshops were seasonal shifts, phenological shifts, extreme weather, precipitation changes and temperature increases. There were a couple of standout responses: one in Albuquerque of cultural changes and one in Stillwater where climate change was referred to as an ambiguous science.

The second row reflects impacts of participant-understood climate changes. When discussing impacts of climate change at the workshops, the major issues were phenological shifts of plant and animals, extreme weather events, water and food security, water quality and quantity, invasive species and increased heat. Sulphur, Albuquerque, and Fort Cobb all discussed issues of their aquifer waters. There were concerns of pollution, quantity, quality, and competition over aquifer waters. Wyandotte, Fort Cobb, and Stillwater workshops were the only three that discussed extreme and violent weather events such as tornado activity, flooding, and winter storm events.

Another interesting point was food security. Fort Cobb, Stillwater, and Albuquerque each discussed how impacts on their traditional foods, gardens, and other agriculture were understood to be a result of climate change. Along with these issues, participants expressed concern about being able to manage their food and farming systems from challenges associated with seasonal shifts: spring coming earlier, longer summers, and later falls. All of these things as well as warmer winters made food plants

grow differently. Another challenge to their native plants and animal species were invasive insects, plants, and animals.

When discussing adaptation and mitigation very few of the tribes had plans or were currently implementing adaptive measures. That said, participants at the Sulfur, Albuquerque, Fort Cobb, and Stillwater workshops were all making plans for farming and food production adaptation measures. Food security and food sovereignty were extremely important to participants at these workshops. The other major issues were water use and management with an interest in further research to better understand aquifers.

Planning and management was another area of adaptation that participants discussed as either working on or working towards. Adaptation plans that included community development, energy sovereignty, and resource management were other areas of importance that people expressed. Not all of the tribal participants that attended acknowledged their tribal community being prepared, but all voiced concerns on the different levels of preparedness across Native nations.

At every workshop participants discussed research collaborations and education. All the participants discussed wanting to work with scientific institutions and government agencies to better understand the environmental transformations and climactic drivers in their region. One of the challenges mentioned was mistrust Native nations had of science and government because of years of failed interactions and negative results. There is a level of collaboration between the Native nations but the participants agreed there needs to be better collaboration, and increased partnerships between them and outsider institutions to better grapple with and adapt to climate

change projections and variability. These partnerships need to be mutually beneficial and Native nations must receive respect as sovereign nations and afforded self-determination in decision-making. Native participants wanted to self-represent as well as contribute to policies relating to them.

The biggest surprise for me in the research was the outcome of a code that I placed upon the interviews referring to responsibility. I had not asked any specific question that would place blame or reference responsibility to any entity, person, or group and yet many of my richest narratives emerged in the context of identifying the factors and forces responsible. These responses varied from who was responsible for these environmental transformations referenced as climate changes on a macro-scale worldwide, to individual and local responsibilities.

Every single participant at every single workshop held national and global leaders, policymakers, regulatory and oversight enforcers, along with those materially responsible for contributing to climate change, responsible for and accountable to clean up and mitigate factors related to environmental degradation that they associate causally resulted from climate change. Humans, in general, are also considered responsible for correcting and mitigating climate change. Participants discussed everything from population, consumerism, consumption, and waste individual, and collective human groups have on influencing environmental degradations, climate variability and change.

Community responsibility was another interesting area because it was mentioned that educating the youth using tradition and culture to protect their homelands is a collective responsibility. So it is community a cultural obligation to mitigate or address climate change locally within their regions. This collective

responsibility encompassed adjoining non-native communities to partner with Native nations to address climate change issues and adaptations regionally across boundaries.

Science and scientists were also held to a high standard. Science was seen as having access to resources, tools and information related to regional climate changes. Most participants agreed that science and researchers held an obligation to understand the changes happening that were rapidly affecting people and place. Participants suggested that science and research academies and educational institutions all held obligations and responsibilities to contribute to a solution to the problem, as many people felt these institutions were contributors to the problem, as well as having the best opportunity and support to find answers and solutions to pressing issues. Educating the youth was both a public responsibility as well as communal responsibility of the Native nations. It is clear that education of the people was a valuable criteria for adaptation and survival.

A couple of final interesting stand-alone components of the overall study were the issues of trust and the gas and oil industry. The issue of trust was a double-edged sword because historically relationships between government and Native nations only benefited the government. The relationship between Native nations and science has a similar story of negative results for the tribe and benefits to science through the extraction of information. Yet, participants had a serious discussion regarding rebuilding trust between the Native nations, these governmental agencies, and research institutions for the benefit of everyone. There was cautious optimism that relationships could be rebuilt and that they could forge new ones.

Participants at the Fort Cobb and Stillwater workshops placed responsibility squarely on the gas and oil industry. It seems their long-term relationships with the gas and oil industry in Oklahoma color their opinion of the long and short-term effects oil and gas has on the people, land, and climate. The strained relationships with gas, oil, and other extractive industries and federal government contracts and leases imposed on Native lands and Peoples puts into perspective the long-standing influences on some resource rich regions as well as how Native Peoples reciprocate.

Although the study was not exhaustive it does connect effectively to the literature dealing with indigenous relationships with government and oil industries, as well as reflecting similar challenges other U.S. Native Americans are facing with respect to climate changes and variability in other regions. Future follow up studies will be necessary to better understand the diverse and complex issues Native American Peoples are dealing with.

Climate Change is Real to Native Nations

As the workshops showed, climate change and how it relates to water, food, plants, animals, and seasons ultimately affects the ceremonial responsibilities participants feel towards their communities, cultures, and places. The impact of climate change on Native American communities is not only physical but also spiritual and with a sense of place. Climate change is not only a noun but also can be an adjective and on occasion, even a verb. Climate changes are expressed as a descriptive action and interactions between all things in place and therefore climate change is an active description of the processes, interactions, and impacts directly connected to how they

were affected and struggling to survive culturally, spiritually, and physically. Climate change was not a far away abstract idea, but rather immediate and pressing experiences.

The five workshops revealed much about the climate concerns held by Native Peoples in the south central U.S. Cultural impacts to community were described by participants as the inability to perform and complete some seasonally specific ceremonies, decline in the health or availability of traditional wild and domesticated food plants, and an increase in extreme weather events that are impacting the health and safety of people. These workshops revealed the importance of self-representation and relationships of trust and distrust that link to larger aspects of the modern Native American experience.

The major question for this thesis revolved around identifying if and how tribes were identifying climate change and experiencing its effects and impacts. The responses from participants confirm that not only are then identifying climate change, they are currently experiencing its impacts. Every participant understood what climate change is, though different perspectives about how climate change is defined exist (e.g., through science-based research or holistic environmental observations).

Impacts and Adaptations

Though there were similarities in what the different tribes wanted to pursue in terms of adaption, the reality is that there exists large differences in the ability of tribes to adapt and in the availability of discretionary financial resources. This impacts all aspects of the adaptation process, including the ability to hire grant writers or environmental professionals. This economic disparity results in further marginalization

of less economically secure tribes. In reality, only a few well-off tribes are able to actively adapt to climate change. Still, the answers and data collected at the five workshops reveal important avenues that can be taken by tribes, including their own perspectives of what those need to be.

Overall, participants wanted to see the scientific, geographical and statistical tools combined with oral traditions and Indigenous knowledge, while acknowledging the limitations of both. This inspired discussion of oral tradition and the passing down of stories of historical extreme weather events and their effects on adaptive capacities in the past, present, and future in the region

The belief that the past holds information on how to prepare for the future is one of the traditional methods of adaptation that is anchored in place. The "traditional" method of adaption is one that is still seen as valid and useful, particularly when combined with more modern tools. Sharing techniques and information collected during extreme events of weather and climatic shifts through oral tradition is part of TEK, as participants felt traditional knowledge remains extremely valuable for the protection and perpetuation of tribal culture and survival.

Self-Representation at the Workshops

The participants viewed the workshops as being valuable in that they created a space within which Native voices and experiences could be heard along side those of scientists and other officials. Participants felt that the workshops not only fostered education, but also for intertribal collaboration, as Native American nations speaking to each other about their own adaption strategies was seen as paramount to successful

adaption. In the end, self-representation and self-determination in the adaption process and in policy formation were expected and demanded by workshop participants as being essential to the development of successful mediation strategies and their implementation.

Reciprocal Relationships: Patterns of Trust and Distrust

Five-hundred years of broken agreements and promises has led to an expectation of exploitation from government, academic, and private sectors. Responses from participants revealed ongoing conflicts between Native nations and gas and oil industries that have continued the historical pattern of marginalization of Native interests. Gas and oil industries are blamed by the Native nations as being the cause of environmental degradation that has impacted their ability to adapt to climate change. The lack of oversight and regulation from the government in the protection of Native lands and peoples is the main catalyst fueling continued distrust of and blame for current and past human-induced climate changes.

The fundamental importance placed on the responsibility to protect their homes and communities connects directly to the cultural and spiritual ties tribes have to place. Generational and historic observations of environmental change coupled with current environmental degradation from anthropogenic means have produced evidence to the tribes that climate change is occurring and that they generally are unable to keep pace with the rate of climate change as perceived.

Looking Forward

Despite the history of distrust and current legal and cultural animosity between Native nations and other societal entities, participants overall indicated a desire to be engaged in future discussion and planning with those same societal entities in order to be and remain part of the solution. Participants perceive that Native voices are now being included and even welcomed into these discussions, including in these workshops. Geographers particularly have played an important part in this process of recognition and inclusion. This includes the closing the gap between Indigenous knowledge systems and academic theory and scientific methodologies. The increasing number of Indigenous geographers has been instrumental in this change and for the implementation of innovative methods and methodologies. A co-production of knowledge is becoming more acceptable to all parties and has the potential to result in effective and successful adaption and knowledge building.

Overall, the findings from my research on Native adaptations to climate change not only dovetail with those documented in the literature from other regions, but also expand upon them by inclusion of the U.S. south central region. The desire for self-representation in the adaptation policy formation process as expressed by the participants echoes past literature (e.g., Louis, 2007; Maldonado *et al.,* 2013; Whyte, 2013) and reinforces the importance of inclusion and transparency. The hope is that the current more inclusive cultural climate in the U.S. will allow for greater collaboration and equal representation of ideas between Native Peoples and mainstream thought. Though historic injustices are fresh in cultural memory, currently there is hope that through collaboration and changing ideologies, culturally appropriate adaptation

strategies for native homelands to address climate change can be accomplished. Much like the differing perspectives on how to plan for the ceremonial bread dance dates, Native Nations dealing with impacts of climate change are balancing modern and traditional needs and perspectives, and they continue celebrating and adapting every year with the hope that solutions will be created.

Chapter 6: Lessons Learned

Many lessons were learned in the process of completing this thesis. Immediately after starting we realized the magnitude of what we were attempting to do in a small time scale and with limited resources. The goal of attempting to open a dialogue with the 63 federally recognized tribes across so many landscapes and distances was unrealistic. In all, participants from 33 tribes were involved in this research and because of their many views and thoughts, many lessons were learned. There were 4 major lessons learned from this research and these should be used to better plan future collaborative efforts that will hopefully lead to better adaption and preparedness for indigenous communities.

First, when planning collaborative work with tribes, maintaining focus on research methods and goals is key. Enough time needs to be provided to contact, build relationships with and to familiarize oneself with the tribal members and governments. Relationship and trust building is invaluable in working with tribal government, but this takes time. Planning for this aspect of the work process will increase the likelihood of successful collaboration.

Second, understanding the cultural characteristics of native peoples and communities is a huge part of creating a successful research endeavor. Employing cultural competency in order to facilitate mutually beneficial and successful collaborations is necessary. The many native nations each have their own histories, languages and religious beliefs and cannot be treated as the same entity. Understanding this and using this when entering into collaborations or discussion with native

communities will offer innovative ideas and solutions to mutually shared concerns, such as climate changes.

Third, in light of the historical relationships between native communities and federal agencies, outreach activities and programs need to be approached with respect and humility. The SC-CSC, which is funded by the DOI, was perhaps not the best agency to do outreach to Native Nations, especially when asking for information related to 'cultural resources.' I believe Native nations want to collaborate with scientists but have many reservations and mistrust from years of negative results. So going forward I would suggest starting smaller, slower and with fewer expectations. Nurture relationships with the Native nations. Give back to them more than is taken away.

Fourth, another valuable lesson is respecting Native nation's sovereignties. These Peoples are not another segment of the American demographic but sovereign nations and should be treated as such. To come in without consideration and acknowledgement of this will limit the usefulness or even likelihood of collaboration. Agency authority means little to nothing to the Native Peoples and attempting to speak on their behalf or make decisions pertaining to them without approval or insight is disrespectful. Scientific and government actors must engage in nation-to-nation collaborations to effectively negotiate climate adaptation plans and policies. Policies should include Native leaders and TEP in regional and landscape-scale planning discussions for reciprocal exchanges of information and co-production of new ideas.

Many other lessons were, of course, gleaned from my research but time constraints force some points to be explored in future works and publications. Going forward, the hope is to use these lessons to better craft and create collaborative efforts to

aid Indigenous communities in their struggles to adapt to and mitigate climate changes in ways that are socially, culturally, spatially, and fiscally appropriate. There is hope that researchers going forward will have a better understanding of the issues impacting the Native nations in this region as the needs to grapple with the challenges are immediate and pressing. Native Peoples are still sovereign nations that make their own decision regarding their Peoples and culture. There must be continued effort to support their needs, choices, opinions, insights, self-determination and sovereignty, especially in the light of projected climactic changes.

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APPENDIX A: Workshop Attendees and Participants List

STILLWATER, OK



Dan Cornelius- Oneida Tribe of Indians of Wisconsin
ETPBR LCC and Indian Agricultural Council Iowa



Phillip Cravatt, Chickasaw
Environmental Services Director



Yvette Wiley, Muscogee (Creek)
Environmental Specialist (and Watershed Management/Wetland grad student at OSU)

Judy Ausmus, Environmental Specialist - Not pictured



Casey Camp, Ponca Tribe of Indians of OK
Tribal Elder

Tonya Walker, Thlopthlocco Tribal Town - Not pictured
Thlopthlocco Business Committee Advisor

Kelly Kersey, Pawnee Nation – Not pictured
Environmental Conservation and Safety (DECS) Ranger

Monty Matlock, Pawnee Nation - Not pictured
Environmental Conservation and Safety (DECS) Director

Steven Bond, Chickasaw Nation, - Not pictured
Tribal citizen and environmental professional



Daniel Wind, Sac and Fox Nation of Oklahoma
Office of Environmental Services, Air Quality Specialist

FORT COBB, OK



Steve Barse, Kiowa Indian Tribe of Oklahoma
Tribal citizen and medical consultant



Curtis Munoz, Kiowa Indian Tribe of Oklahoma
Environmental Services Director



Maya Torralba, Kiowa Indian Tribe of Oklahoma
Tribal citizen and educator

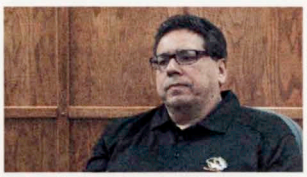


Randall Ware, Kiowa Indian Tribe of Oklahoma
Tribal citizen and farmer

Barney Meeks, Kiowa Indian Tribe of Oklahoma- Not pictured
Tribal citizen and farmer



Dorla Tartsah, Kiowa Indian Tribe of Oklahoma
Tribal Environmental Program Administrative Assistant (nurse)



Mark Palmer, Kiowa Indian Tribe of Oklahoma
University of Missouri Geography faculty



Rupert Nowlin, Cheyenne-Arapaho Tribes of Oklahoma
Tribal citizen, rancher, and adjunct faculty at SWOSU

Kim Goodbear, Cheyenne-Arapaho Tribes of Oklahoma
Planning and Development Program, Tech Writer - Not pictured

Loretta Partridge, Wichita and Affiliated Tribes
Tribal citizen - Not pictured

Donna Shepherd, Wichita and Affiliated Tribes
Tribal citizen - Not pictured



Leslie Standing, Wichita and Affiliated Tribes
Tribal citizen (former administrator)

Josh Woosypitti, Wichita and Affiliated Tribes
Tribal citizen - Not pictured

Vanessa Vance, Wichita and Affiliated Tribes
Tribal citizen - Not pictured


Milton Sovo, Comanche Tribe of Oklahoma
Tribal citizen and farmer

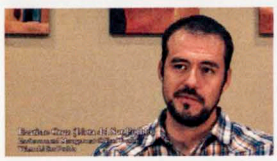

Richard Torralba, Comanche Tribe of Oklahoma
Tribal citizen and educator

Darren Ahshapanek, Fort Sill Apache
Environmental Program - Not pictured

Willard Tillman, Seminole Freedman
Oklahoma Black Historical Research Project - Not pictured

ALBURQUQURE, NM

Joseph Mark Chavarria: Pueblo of Santa Clara
Environmental Director - Not pictured


Evaristo Cruz: Ysleta del Sur Pueblo of Texas
Director of Environmental Management


Robert Gomez: Pueblo of Taos
Environmental Office Program Manager – No Image

Cordell TeCube: Jicarilla Apache Tribe
Environmental Director of Environmental Protection Office - Not pictured



Ann Marie Chischilly: Diné (Navajo)
Executive Director of Institute of Tribal Environmental Professionals (Northern Arizona University)

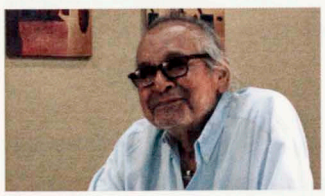


Laura Harjo: Muscogee (Creek)--Oklahoma
Assistant Professor of Planning at University of New Mexico



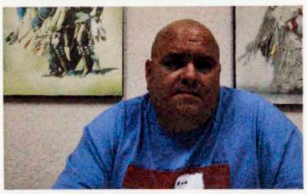
Roger Fragua: Jemez Pueblo
President Cota Holdings, LLC

Bryn Fragua: Jemez Pueblo
Haskell Indian Nations University student - Not pictured



Sam English: Turtle Mountain Band of Chippewa Indians
Artist and activist

WYANDOTTE, OK



Micco Emarthla, Seneca-Cayuga Tribe of Oklahoma

Environmental Management Department, Water Quality Technician

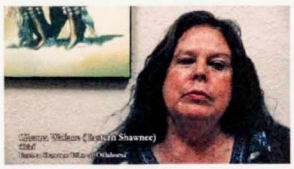


William Tarrant, Seneca-Cayuga Tribe of Oklahoma
Environmental Management Department, Water Quality Technician

Kathleen Welch, Wyandotte Nation
Environmental Department Assistant - Not pictured

Christen Lee, Wyandotte Nation
Environmental Department Director - Not pictured

Rosanna Sheppard, Shawnee Tribe
Environment and Natural Resources Department, Director - Not pictured



Glenna Wallace, Chief , Eastern Shawnee Tribe of Oklahoma

Debbie Dotson, Eastern Shawnee Tribe of Oklahoma
Tribal Environmental Protection Agency & Land Management Department, Water Quality- Not pictured

Kristi Laughlin, Eastern Shawnee Tribe of Oklahoma
Tribal Environmental Protection Agency and Land Management Department- Not pictured

Steve Daugherty, Eastern Shawnee Tribe of Oklahoma
Cultural Preservation Dept. - Not pictured



Rebecca Jim, Cherokee Nation
L.E.A.D. Agency Director and farmer



Brandon Everett Bandy, Quapaw Tribe of Oklahoma
Tribal employee and citizen

SULPHUR, OK



Tye Baker, Choctaw Nation of Oklahoma
Tribal Environmental Professional

Ryan Spring, Choctaw Nation of Oklahoma
Historic Preservation Dept. - Not pictured

Larry Masters, Choctaw Nation of Oklahoma
Tribal Environmental Professional - Not pictured

Gary Johnson, Choctaw Nation of Oklahoma
Tribal Environmental Professional - Not pictured

Ryan Spring, Choctaw Nation of Oklahoma
GIS specialist - Not pictured

Sara Jane Smallwood, Choctaw Nation of Oklahoma
Legislative Coordinator - Not pictured



Sarah Aultman, Kialegee Tribal Town
Tribal Environmental Professional

Thomas Herrod, Kialegee Tribal Town
Tribal Environmental Professional - Not pictured



Kim Walden, Chitmacha Tribe (LA)

Tribal Historic Preservation Officer

Cynthia Highfield, Chickasaw Nation
Tribal Environmental Professional - Not pictured



Wayne Kellog, Chickasaw Nation
Environmental Engineer

Linda Robins, Chickasaw Nation
Environmental Services Director - Not pictured

Brent Shields, Chickasaw Nation
Tribal Environmental Professional - Not pictured

Ambrie Johnson, Chickasaw Nation
Tribal Environmental Professional - Not pictured



Cathryn Ladoux, Tsalagi/Mi' kmaq
Tribal community member and educator

Jason Prince, Wichita and Affiliated Tribes
Tribal Environmental Professional - Not pictured

Craig Watkins, Wichita and Affiliated Tribes
Tribal Environmental Professional - Not pictured

Citizen Potawatomi Nation - Asked not to be identified

RESEARCH TEAM AND CONTRIBUTORS

Laurel Smith
Filo Gómez – Mixe
Renee McPherson
Addison Nichols
Randy Peppler
Mark Morris – Cherokee
Rebecca Sheehan
Paulette Blanchard – Absentee Shawnee
Jeff Palmer - Kiowa
Emma Kuster (Fagan)
April Taylor - Chickasaw
Kim Winton
Jackie Vadjunec

APPENDIX B: IRB Approval Document

The UNIVERSITY of OKLAHOMA

Institutional Review Board for the Protection of Human Subjects

Approval of Initial Submission – Expedited Review – AP01

Date: May 31, 2013

IRB#: 3173

Principal Investigator: Paulette L Blanchard, BA

Approval Date: 05/31/2013

Expiration Date: 04/30/2014

Study Title: How's the weather? Visualizing pluricultural conversations about climate

Expedited Category: 6 & 7

Collection/Use of PHI: No

On behalf of the Institutional Review Board (IRB), I have reviewed and granted expedited approval of the above-referenced research study. To view the documents approved for this submission, open this study from the *My Studies* option, go to *Submission History*, go to *Completed Submissions* tab and then click the *Details* icon.

As principal investigator of this research study, you are responsible to:

- Conduct the research study in a manner consistent with the requirements of the IRB and federal regulations 45 CFR 46.
- Obtain informed consent and research privacy authorization using the currently approved, stamped forms and retain all original, signed forms, if applicable.
- Request approval from the IRB prior to implementing any/all modifications.
- Promptly report to the IRB any harm experienced by a participant that is both unanticipated and related per IRB policy.
- Maintain accurate and complete study records for evaluation by the HRPP Quality Improvement Program and, if applicable, inspection by regulatory agencies and/or the study sponsor.
- Promptly submit continuing review documents to the IRB upon notification approximately 60 days prior to the expiration date indicated above.
- Submit a final closure report at the completion of the project.

If you have questions about this notification or using iRIS, contact the IRB @ 405-325-8110 or irb@ou.edu.

Cordially,

[redacted]

Vice Chair, Institutional Review Board