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KNOWING WHICH WAY THE WIND BLOWS: WEATHER OBSERVATION, BELIEF AND PRACTICE IN NATIVE OKLAHOMA

A DISSERTATION APPROVED FOR THE
DEPARTMENT OF GEOGRAPHY AND ENVIRONMENTAL SUSTAINABILITY

BY

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For Diane, Adam, Kyle, Drew and Noah

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ABSTRACT

I conducted field interviews and observed and participated in farming and cultural activities to understand how Native American farmers and traditionalists in southwestern Oklahoma conceptualize weather and climate, particularly in local, observational ways, and how the insight they glean from their observations is helping inform renewed efforts to farm, garden, and ranch within a broader framework of agricultural independence and self-determination. Many of the farmers explained that while they consult modern weather and climate forecasts to help guide their farming decisions, they prize their own observations and indicators as providing a local relevance and situational awareness they cannot obtain from other informational sources, and they use the insights gained from them as a key part of an actionable knowledge complex for decision making. My research findings suggest that the observational and performative ritual components of their knowledge are deeply rooted in a belief system that promotes an intimate, reciprocal relationship with the non-human world, and are initially formed through intergenerational transfer as passed down from family members. Their knowledge is culturally situated as "ways of knowing of the ancestors" and is subject to mediation through various social and group influences. The observational and performative aspects of their knowledge are practiced and renewed routinely within agriculture and during times of pandemonium such as an approaching tornado, and adapt and evolve as a matter of that experience, and also adapt and evolve in response to what they perceive as changing conditions due to increased climate variability.

CHAPTER ONE

INTRODUCTION

A STORY

Let me begin with a story. My entry into Indian Country took place on February 11, 2009, a few days after I defended my dissertation proposal. It was one of those Oklahoma winter days that people who are snowed in up north dream of – sunny, blue skies with temperatures that made it pleasant to be outside. This day was made possible by conversation and correspondence I had a couple of weeks earlier with two Oklahoma State University Agricultural Extension agents. They pointed me toward a Kiowa man who was working with Native farmers in southwestern Oklahoma. Within a few minutes of being contacted by one of these agents, this man wrote me two emails:

> "Mr. Peppler, My name is Randall Ware, and I am extension outreach for Langston University to the Native American Indian Farmers and Ranchers. Also, I am a full blood member of the Kiowa Tribe of Oklahoma, am very active culturally and traditionally to my Indian People to help with their farming needs and I am also, a farmer myself. I have a list of 280 Native Farmers we can talk to." [January 29, 2009, 4:07 pm]
>
> "Randy, call me at 10:00AM. I shall be awaiting your call!! A-ho!! (Thank you). Randall" [January 29, 2009, 4:47 pm]

During our January 30th phone call that followed, we set up a meeting to talk about my research project and how we might help each other. Randall seemed even more enthusiastic about the possibilities than I was. We scheduled the meeting for 10 am on February 11 in the gathering room of the Anadarko Community Library.



Figure 1. Anadarko Community Library, February 11, 2009.

I have been to a lot of meetings in my life, but I may have been more nervous about this one than any prior. The 54-mile drive through what is a very pastoral part of Oklahoma went by in a flash. The previous times I had been through Anadarko were nothing more than pit stops during storm chases. Despite years of economic downturn it is easy to see that this was a once thriving place. I arrived a few minutes early and pulled up across the street from the library, gathering my papers, thoughts, and confidence, and went inside. As one walks in the library door, the library is down a short hallway to the left while the meeting room is immediately to the right. I opened the door, and much to my surprise, there were four Kiowa men in the room – Randall Ware, and eventual

collaborators Ricky Horse, Rudy Tartsah Jr., and Garrett Tartsah. I had found a picture of Randall on the Internet so I knew what he looked like. I did not expect the others to be there, but after an initial moment of surprise viewed this as a wonderful opportunity, and it helped me feel like what we were about to embark on was truly important.

The four men immediately made me comfortable around a folding table. Rudy Jr. offered me some of his coffee, which I accepted. Randall introduced himself as a board member of the Kiowa Tribal Conservation District, extension educator to Native farmers and ranchers on behalf of Langston University, and a practicing farmer. Ricky introduced himself as the director of the conservation district and a farmer, while Rudy Jr. and Garrett were introduced by Randall as board members. Rudy Jr. referred to himself as a beginning farmer, while Randall described Garrett as an "experienced farmer." Garrett had been honored as Farmer of the Year in the recent past and was the recipient of the first farm loan through the conservation district program. I felt quite honored that the four of them took time out of their daily schedules to meet with me.

After I told them a little about me, and my project, they each told me more about themselves and what they are doing. Since I did not yet have Institutional Review Board approval for me research (obtained in spring 2009), I only could take notes on this day, but this allowed me the opportunity to get situated working with my eventual collaborators and to gather some background information that I could follow up on during interviews. Randall described how he got his start in agricultural outreach activities in 2004 when Langston University put out a call for an extension agent to work with Native American farmers, ranchers and those interested in conservation. This outreach subsequently helped spawn the idea for the conservation district, and later the

grassroots for profit and non-profit efforts Kiowa Native Farms LLC, Native American Indian Farm & Ranch Cooperative (NAIF&RC), and its successor, Indian Country Agricultural and Resource Development Corporation (ICARD). Much of Randall's effort involves training farmers and extending information about U.S. Department of Agriculture (USDA) programs available to them. Randall had previously worked with the Apache Tribe of Oklahoma's environmental program, giving him experience for these endeavors. He said he has always been involved in environmental activities.

Randall then provided some history for my own education. He described Native peoples as strong in culture and tradition, including strength in spirituality. The knowing of weather for planting was often done through prayer. He described how the Kiowa came from the Yellowstone area and south through the Dakotas – lands he described as "rich in milk and honey." But, he said his people were eventually forced to the barren plains of Kansas and finally Oklahoma. He described his ancestors as smart and productive in their homelands – they lived off buffalo and other animals – but had little experience with what they found on the southern plains. Randall then talked about the resultant demise of diet that these moves caused and the alarming rates of diabetes among Native peoples – Randall said around 80 percent – part being genetic but much being poor diet. He said the work being done to help people start a new livelihood in farming to grow and eat better food would help them lead healthier lives.

Randall described how the USDA and U.S. Department of Interior's Bureau of Indian Affairs (BIA) was supposed to train Native people to farm in order to make their allotted lands productive, but this never happened in a meaningful way. The only people who were trained were those sent off to boarding schools, but they often did not return

home or did other things with their re-education. Randall said USDA extension programs are active in southwestern Oklahoma but key information often is not passed along to Native farmers (resulting in the landmark Keepseagle settlement, described in Chapters Five and Nine). While programs are in place to help people get loans and buy equipment, the bureaucracy and application processes are complex. Extension loan officers, for example, are not as helpful as they could be in guiding people in dealing with banks and other institutions. Equipment often is prioritized to white farmers. Randall closed our opening segment by saying, "We want to farm our own land – we want to teach our grandchildren that there is something here." But, to get onto or go back to the land requires training and money. Some people still have their 160-acre allotments but do not have the training or means to take advantage of them. Others have been working for farmers for years – Randall asked, "Why can't they be farmers, too?" Ricky said the land is the most important thing to Native people – being on it and working with it was a way of life for some, but this had been lost and needs to be reestablished. Garrett said some knowledge has been shared, but that they need to reach out even more to younger people because they "wouldn't know how to do anything."

The farmers then described some activities that are going on locally. Randall talked about efforts to save and mark culturally important seeds as one way to preserve tradition. Garrett described large organic community gardens they intended to plant that spring. He said it was important to be accountable to their people by way of providing for them and doing it in the most natural way possible. Randall stated, "We care about people and hungry families." Rudy Jr. related a story about the quality of processed food – he told of a McDonald's hamburger placed next to one made out of "real meat" and

how the real meat went bad much more quickly than the McDonald's meat due to the sodium and preservatives it contains. He said it is crucial for people to start eating better.

We then talked a little about the people I might interact with. Randall mentioned the "Hobart Kiowa" who grow organic vegetables and the "Carnegie Kiowa" who are wheat farmers, and others who grow herbs organically. Elders also were discussed as people to talk to because of their lifetimes of collected wisdom, and women were mentioned because of their experience as gardeners and in some cases keepers of tradition. Randall called the elders "modern day prayer warriors" that intercede on everyone's behalf. I mentioned that I wanted to talk to a reasonable spectrum of people at different life stages. I asked if they could let me know about meetings and other activities that would help me learn more about what is going on, and they all said yes – I think they viewed me as a potential advocate for them.

The closing of our meeting was a completely unexpected but fascinating and helpful discussion about weather and climate indicators and their use for planting and harvesting (described later in Chapter Six). We talked a little about how their own observational weather and climate knowledge and farming practices might be better united in these efforts. It was at this point I knew my project was viable and was going to be a lot of fun to do. At exactly 11 am the librarian came into the meeting room and shooed us out. We said our goodbyes for the time being, as the four men headed off to have a late breakfast of biscuits and gravy. I sat in my truck for a while before departing Anadarko, thinking about what had just happened. My drive home, including some picture stops, was both euphoric and surreal, knowing that I was about to embark on a new journey.

THIS DISSERTATION

Bob Dylan sang in 1965, "You don't need a weather man to know which way the wind blows" (*Subterranean Homesick Blues*). To "know which way the wind blows" is to understand what is happening around you, to adapt to changing circumstances, and to anticipate the future – it is said to be synonymous with skill and understanding. This is a phrase I found to closely describe the insights and practices of the people with whom I interacted. Building on and extending archival and scholarly research I conducted on Native American weather knowledge (documented in Chapter Three), I address through fieldwork from February 2009 through August 2011 the current form and use of weather and climate knowledge among Native farmers in southwestern Oklahoma. Fieldwork focused on farmers because they are people who work outdoors on the land, and as such need to be keen observers of weather and seasonal climate and their indicators to help ensure their livelihoods. While their existence is contemporary, their daily interactions with the environment may be less mediated than that of most people. It has been written that Native Americans have viewed events taking place in the non-human world as a "blend of physical and spiritual parts...the sun, wind, and clouds were believed to be living entities with a spirit and personality of their own" (Vogel 2001, p. 8). Humans and animals are said to interact with these and other spirit beings, and the actions of individuals or entire tribes sometimes had detrimental impacts on weather and climate. According to Vogel (2001, p. 8), "Punishment for provoking spirits often came in the form of floods, severe storms, or prolonged drought." Minnis and Elisens (2000) suggested that Indigenous science has discovered ecological relationships unknown to

Western science, and that society can benefit from a more sophisticated understanding of Native American knowledge and its production and maintenance.

Archival and secondary sources helped to establish an historical context for the contemporary inquiry, which was conducted with interviews and participant-observation activities. Contemporary inquiry sought to uncover the weather and climate knowledge possessed by Native farmers and how it is constituted (including through intergenerational transfer and its cultural situatedness, and through the observations and activities of inhabiting a place). I investigated how is this knowledge used in their farming, ranching and gardening operations; the extent to which they trust their own weather knowledge in light of other forms of weather information available (such as from television or the Internet); how they work together in farming and social organizations; how they engage in farming practices that might be deemed conservationally responsible based on beliefs on intimate and respectful relations with the non-human world; their notions and observations about changes in climate; and how they are coping with institutions that hinder their abilities to establish independence and sovereignty in their food producing activities.

As a prelude to later chapters, my fieldwork conversations have rekindled memories of weather knowledge and stories once passed down, and have revealed observational signs and performative ritual some still rely upon. Conversations also revealed a vibrant effort within Native Oklahoma to become more self-sufficient and to create healthier and more sustainable lifestyles through agriculture and food production. I found people who, while they are well assimilated into contemporary American society, still hold tightly to culturally important ways of knowing that in some cases has deep

tribal relevance. My research also revealed perceptions of climate change, deeply held feelings about a proper relationship with the non-human world, and strong desires to maintain and pass along these ways of knowing to younger generations. This fieldwork experience was a rewarding privilege, and I hope to convey here the meaningful and reciprocal nature of the relationship I have developed with the people I have met.

This research aims to contribute to scholarship *with* Indigenous peoples by exploring alternative ways of knowing about the non-human world – on-the-ground, rooted-in-place-and-meaning observations of, experiences in, and adaptations to it – and by working with them on environmental issues affecting them in a respectful way. In particular it contributes to such scholarship that has attempted to locate and understand Indigenous weather and climate knowledge within the subfield of ethnoclimatology. This type of research has potential, wherever conducted, to contribute unique, unexpected, and non-intuitive insights into conceptualizing, recognizing, and understanding key elements of the non-human world. This work also intersects with the field of cultural ecology through its description and interpretation of knowledge systems and resultant livelihood practices on the land that contributes to a practical adaptation to environment conditions, and intersects with the field of political ecology by its documentation of the farmers' power struggles to decolonize their livelihoods in agriculture, including their efforts to establish food sovereignty and security and develop their own business ventures, often in the face of continued discrimination. Finally, it contributes to a humanistic geography approach to research in that it, through participant-observation and interviews, provides a method of inquiry to transcend the gulf between 'insider' and 'outsider' status, allowing a collaboration that holds meaning for the researcher and those researched (Jackson 1983).

This dissertation is organized as follows. Chapter Two reviews literatures on Indigenous environmental knowledge and in particular ethnoclimatology, serving as motivations for this study and providing useful conceptual frameworks. Chapter Three establishes historical context for the fieldwork conducted by describing findings from primary and secondary documents on Native American weather and climate knowledge, including particularly that documented from Oklahoma tribes. Chapter Four contains a review of literature on methodological do's and don'ts regarding research conducted with Indigenous peoples, and describes my fieldwork and analysis methods. Chapter Five documents my fieldwork pathway through Indian Country, and provides background on my interview collaborators and describes the participant-observation activities and field observations of real-life situations I experienced. Chapters Six through Nine present my fieldwork findings – Chapter Six describes the local, observational signs and indicators and performative rituals I was told regarding weather and climate and how these are used in farming and during times of pandemonium; Chapter Seven describes observations and perceptions of climate change and variability and how these have necessitated changes in farming and in some cases have rendered their signs less relevant; Chapter Eight provides my collaborators' thoughts on their intimate and reciprocal interactions with the non-human world and how these thoughts influence the importance of knowing about it in intimate ways; and Chapter Nine describes the efforts of agricultural independence, food sovereignty initiatives, and general efforts to do things on their own in the face of discrimination and desires to become more culturally independent, which will be shown to be a form of grassroots self-determination and ties in with desires to perpetuate culturally-important ways of knowing. Chapter Ten then summarizes with a cultural

model of the production, form, maintenance, and use of my collaborators' weather and climate knowledge, discusses the contributions this work makes to an ethnoclimatological line of inquiry in the U.S., and "doing" cultural geography in Indian Country, provides ideas for engaging in meaningful collaborative activities with Native peoples in Oklahoma involving environmental projects and issues (including a discussion of what *to* do and what *not to* do in collaborative projects), discusses possibilities for my future engagement with the Native community, makes suggestions for possible future research areas not fully investigated here, and provides a closing word.

I close this introduction with the prelude to the radio program *Native America Calling – the National Electronic Talking Circle*, broadcast by public radio on December 18, 2008 when I was still forming the topic for this research. Called "The Moon, the Sun and Stars" (Native America Calling – The National Electronic Talking Circle 2008, December 18), the words spoken during this program reiterated the continuing importance and vitality of "traditional knowledge" in modern Native American discourse and the merits of the insights provided by such ways of knowing. The prelude to this program read:

> Native communities have always looked to the skies above when determining the best time for ceremony, planting and harvesting. The close connection to the vastness of the skies is still present in many indigenous communities. From remembering the names given to constellations by our Native ancestors to studying astronomy, Natives are still reading the skies to plot their course and find their futures. What is the significance of the moon, sun and stars in your tribal culture?

The first caller to this program, James from Fort Belknap in Montana, gave witness to this importance as he described observational signs of weather and climate based on the moon, sun and sky. As will be seen in Chapter Three, a representative from his Gros

Ventre tribe had written to Oklahoma Senator Robert S. Kerr nearly 60 years earlier in response to a query about the severity of the upcoming 1950-51 winter, describing some of the same indicators James talked about. One of the program's panelists emphasized that what James said should not be seen as simple, inconsequential observations, but rather as important indicators of changes in climate, insight that has been and is still crucial to consider. It is with these words that I begin.

CHAPTER TWO

INDIGENOUS WAYS OF KNOWING AND ETHNOCLIMATOLOGY – MOTIVATIONAL LITERATURES AND CONCEPTUAL FRAMEWORKS

In this chapter I review two areas of literature – one defining and conceptualizing Indigenous "ways of knowing" in general and another focusing on Indigenous weather and climate knowledge in particular, the latter termed "ethnoclimatology" by the anthropologist Ben Orlove. These serve as background and motivating literatures for my field study.

INDIGENOUS WAYS OF KNOWING

The definitions and conceptualizations of Indigenous knowledge are many and varied. The United Nations Educational, Scientific, and Cultural Organization (UNESCO) Local and Indigenous Knowledge Systems (LINKS) Program website (UNESCO LINKS 2003) defines "local and indigenous knowledge" as "the cumulative and complex bodies of knowledge, know-how, practices, and representations that are maintained and developed by peoples with extended histories of interactions with the natural environment. These cognitive systems are part of a complex that also includes language, attachment to place, spirituality and worldview." "Traditional ecological knowledge" or TEK is defined by Berkes (1999, p. 8) as a "cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment." Merculieff (2002) referred to these bodies of knowledge as "ways of knowing." Reviews of Indigenous

knowledge characteristics (e.g., Bonny and Berkes 2008) find that it is local, orally transmitted, adaptive, and possesses a social memory (i.e., preserved in the memory of particular individuals – Mistry 2009), and it is cumulative, long-term, dynamic, experiential, experimental, historical, holistic, and embedded within a particular cultural context (Grenier 1998; Menzies and Butler 2006). According to some (e.g., Berkes 1999; Suzuki and Knudtson 1992; Pierotti and Wildcat 2000; Minnis and Elisens 2000), new or renewed interest in Indigenous ways of knowing should not be just academic – the lessons they provide may have practical significance for the rest of the world in understanding natural phenomena and have the potential to yield unexpected and non-intuitive insights.

It is important to further explore these conceptualizations of Indigenous ways of knowing. According to Berkes (1999, p. 5) "traditional" implies "cultural continuity transmitted in the form of social attitudes, beliefs, principles, and conventions of behavior and practice derived from historical experience. It is cumulative and open to change." Berkes cautioned however that use of "traditional" and "change" may be contradictory, which is why some prefer the term "Indigenous" as being ubiquitous to Native peoples or the term "local" because it is the "least problematical" (p. 8). Antweiler (1998, 2004) suggested that the terms "traditional" and "Indigenous" imply a relation or opposition to Western scientific knowledge that can also imply romanticism, stasis, and aboriginality. He advocated instead the term "local" because "a locally situated form of knowledge and performance [is] found in all societies" (2004, p. 1) – local knowledge consists of factual information and practical skills and capabilities developed in place.

"Local" may indeed be the most descriptive and least problematical term. "Local knowledge" reflects the insights of daily interactions in a place (e.g., Maurial 1999) and exists within and is developed around the specific conditions of a particular geographic area (e.g., Grenier 1998). Ingold and Kurttila (2000, p. 184) defined "local traditional knowledge" as "knowledge as generated in the practices of locality." Turnbull's (1993) philosophical treatment argued that all knowledge is inherently "local" and that "localness" provides a way of comparing different knowledge production systems; if any distinction can be drawn between them, it is because of the local practices that generate the knowledge. Similarly, Nazarea (1999b, p. 19) emphasized the "situated" nature of knowledge and the "constraining as well as liberating effect of this locatedness." Lauer and Aswani (2009) suggested understanding Indigenous knowledge as "situated practices."

Some describe Indigenous knowledge as "Native wisdom" to accentuate the cosmological and holistic aspects of Indigenous knowledge, asserting that "Native wisdom of nature" is holistic, historical, contextual, and sacred, with humans being one with the non-human world and not separated from it (e.g., Suzuki and Knudtson 1992). This term embodies the cosmological beliefs people hold about their role within their surroundings (e.g., Lazrus 2005) that is expressed through oral tradition, rites, and agrarian and health practices (e.g., Maurial 1999).

Indigenous knowledge is undeniable in its cultural situatedness – according to Antweiler (2004, p. 10) it is "best understood as a social product." For example, Rundstrom (1995, p. 46) found human/non-human interactions within an Inuit village to be complexly constructed and intertwined due to the "ubiquity of relatedness." Grenier

(1998) recognized the importance of Indigenous knowledge as being part of a received cultural model.

The next four sections review more deeply Indigenous knowledge from the following constructs or points of view: (1) Indigenous knowledge as sacred, holistic wisdom – a philosophical view that believes it is based on a spiritual, belief-based cosmology for regulating human-environmental relations, and shown to be fundamentally different from but complementary to Western science; (2) Indigenous knowledge as reflecting a place-based, practical adaptation to the environment – studied within the fields of cultural ecology and environmental anthropology – as part of an observationally- and experientially-based livelihood strategy in which observations and experiences help inform or even regulate material-based considerations; (3) Indigenous knowledge as sacred ecology, or ethnoecology, part of a knowledge-practice-belief complex that considers belief systems or "worldview" as a key influence on the insight that supports particular livelihood strategies; and (4) the consideration of Indigenous knowledge as viable and equal input within environmental co-management projects that have as a goal the co-production of new environmental knowledge.

Indigenous Knowledge as Sacred, Holistic Wisdom

In this philosophical perspective, Indigenous knowledge is described as sacred, holistic wisdom that should be preserved and promoted as a key for taking care of the environment and healing our bond with the non-human world as traditional societies and environmental ethics are erased by modern society (e.g., Monroe and Williamson 1987; Suzuki and Knudtson 1992; Lake-Thom 1997). According to Semali and Kinchloe

(1999, p. 15), this wisdom "often gets swept away in favor of Western knowledge epistemologies." Kidwell (2002, p. 97; also Monroe and Williamson 1987) described how Native peoples recognized cycles and patterns in terms of relationships between humans and non-humans (i.e., a concern with events that repeat themselves on a regular basis, such as the growth and harvest of crops, the mating and migration of animals, and the movements of stars and planets). Native wisdom is seen as holistic, historical, and contextual, and considers humans and non-humans as inextricably interconnected. It has contemporary relevance in coping with and adapting to environmental extremes like climate change (e.g., Suzuki and Knudtson 1992; Semali and Kinchloe 1999).

The value of this holistic knowledge of the natural world often is compared to Western scientific reductionism in which learning is obtained by carving up natural phenomena into constituent parts and then putting back together what has been learned (e.g., Suzuki and Knudtson 1992), such as in numerical climate prediction models. Critiques of this construct believe efforts to find a clear demarcation between Indigenous and Western knowledge are futile and counterproductive (e.g., Agrawal 1995, 2009; Aikenhead and Ogawa 2007; Nyong et al. 2007; Watson and Huntington 2008; Berkes 2009; Berkes and Berkes 2009). Such distinctions with scientific knowledge and global environmental discourse have been drawn, however, resulting often in the unfortunate dismissal of what is deemed local, situated, or practical (e.g., Scott 1998; Dove 2006). This is due in part to the perception that the practitioner knows less than the expert and practical knowledge tends to be too anecdotal and represented in forms difficult to reconcile in scientific endeavor – a question of scale I have heard commented on at scientific meetings (e.g., Pálsson 2006). Ingold and Kurttila (200) made a useful

distinction between a what they deemed a custodial modernist traditional knowledge construct that relegates local knowledge as static, cultural, and somehow in opposition to Western science, and a preferred local traditional knowledge construct that recognizes the observations, perceptions, and practices embedded in the everyday lives of people in local, lived relationships (also Huber and Pedersen 1997). Some however (e.g., Lake-Thom 1997) believe that debates over environmental issues help bring to light the differences in these knowledge systems in positive ways.

Specific to Native Americans, this construct emphasizes a close relationship with the natural world that does not attempt to exercise control over it (e.g., Caduto and Bruchac 1988), though some (e.g., Suzuki and Knudtson 1992) caution this way of looking at the world should not be deemed "naively romantic"; rather, it is rooted in observational reality and "sharpened by the daily rigors of uncertain survival" (p. 19) with "…intrinsic value and worth, regardless of its resonances with or 'confirmation' by modern Western scientific values...quite capable of existing on its own merits and adapting itself over time to meet modern needs" (p. 22). Cajete (2001, p. 637) cautions not to valorize or patronize Indigenous knowledge because these "inadvertently can lead to the marginalization of the most profound indigenous epistemologies regarding interaction of human beings and nature." Instead, interactions with Indigenous knowledge must support the collective attempts of Indigenous peoples to restore their traditions while at the same time allowing them to recreate and revitalize themselves in culturally important ways. The acceptance of a spiritual essence connecting Native peoples to the land has had the effect in some cases of essentializing Native people as ecologically "noble" (e.g., Hames 2007).

The importance of place-based wisdom is emphasized – it cannot be separated from the places and events that give it meaning (e.g., Basso 1996; Cajete 2000; Semken and Butler Freeman 2008; and more generally, Tuan 1977). For example, Schnell (2000) and Meadows (2008) described the concept of "homeland" and place in situating Kiowa stories, ideas, and knowledge. Palmer Jr. (2003, p. 107) wrote in particular about the importance of stories in transmitting and defining knowledge, "It seems pretty well established right now that Kiowas tell stories about events, places, and people that hold their interest and become a part of the collective Kiowa consciousness. Kiowas never forget the stories because they are a part of their tribal memory and remind tribal members what it is to be Kiowa." More generally, Preston (2009) refers to this as the epistemic significance of place – particular landscapes and the stories told about them contain moral and religious forces that guide the people living there. As just discussed above, however, the social nature of relations between humans and the non-human world may fit awkwardly within Western science descriptions of the environment and landscape (e.g., Cruikshank 2001).

Native wisdom, termed alternative science by Visvanathan (2006) and Indigenous science by Minnis and Elisens (2000), ultimately is seen as providing a complementary lens through which to observe and understand the world (e.g., Johnson 2000) through its qualitative, holistic, spiritual and adaptive characteristics (e.g., Merculieff 2002). Ignorance of this knowledge could hold "profound consequences for everyone" (Semali and Kinchloe 1999; p. 39).

Indigenous Knowledge as Reflecting a Practical Adaptation to the Environment in a Place

In this perspective, Indigenous or local knowledge is one part of a multi-faceted adaptive strategy to ensure livelihood practices in a place. For those who live on the land (even farmers in southwestern Oklahoma), their long-term relationship with their natural surroundings is grounded in everyday experience. Long-term observations of the behavior of plants and animals have helped those who depend on the land to use it to their advantage and to adapt to changes that come their way (e.g., Nietschmann 1972). Cultural ecologists and anthropologists study the adaptive role of people and their manipulation of resources within an ecosystem; society and nature are seen as interconnected by complex and systematic relationships, with food production being a fundamental area of focus for sustainability (e.g., Butzer 1989; Anderson 2002). The roles of belief, ritual, and cognition are considered as part of these adaptive systems (e.g., Butzer 1989).

The literature on adaptive practices on the land is vast, based on field research in specific locations. Theories and viewpoints include: people living in similar environments, regardless of their location, develop similar subsistence practices and ways of knowing and interacting with the environment (Steward 1955); culture and human behavior are the products of a functional, sustainable, and harmonious relationship with the local environment, including the ecological functions of ritual (Rappaport 1967); adaptive alternatives are chosen by individuals by repeatedly opting for certain activities over others, constructing ways of acting in the environment that others may choose or imitate (Orlove 1980); and adaptations are strategies for survival and to understand them they must viewed on all scales – not only on community scales but also on individual or

group scales – because of the multitude of scale-dependent adaptive options to choose from (Denevan 1983). Adaptive systems have been found to be dynamic as environmental factors change, as technology, know-how, and local knowledge evolve, and as people migrate (e.g., fieldwork by Turner 1999; Batterbury and Forsyth 1999; Stølen 2004; Nesheim et al. 2006). However, some researchers caution that overreliance on materialist terms for describing adaptation may lead to incomplete understanding – for example, complex symbolic relationships people have with their physical surroundings, which may have little to do with making a living, cannot be ignored (e.g., Basso 1996; Johnson Gottesfeld 1994). Smit and Wandel (2006) provide useful examples for studying adaptations to climate change at the community scale.

Indigenous Knowledge as Sacred Ecology

Indigenous knowledge in this perspective actively combines the two above perspectives in a knowledge-practice-belief complex that has been termed "sacred ecology" or "ethnoecology" (e.g., Berkes 1999; Toledo 1992, 2002; Toledo et al. 2002). This complex is said to "explore the connections between the entire repository of symbols, concepts and perceptions on nature, and the set of practical operations through which the material appropriation of nature takes place" (Toledo 2002, pp. 512-513) and "emphasizes the role of cognition in framing behavior…the schemas, scripts, and action plans that orient people in the world and determine the productivity, equity, and sustainability of their practices" (Nazarea 1999a, p. vii). The boundaries between this perspective and the one in the previous section can be rather nebulous, however, as the importance of ritual practice in environmental regulation also was reported by Rappaport

(1967) in work that more closely fits within the cultural ecology perspective.

One approach here (e.g., Toledo 1992, 2002; Toledo et al. 2002) explores the *kosmos* (a sacred, holistic worldview of the land in which the natural and social worlds are linked and each act of appropriation of nature must be negotiated with all other existing things through rituals and acts), the *corpus* (a repertory of local ecological perceptions, observations, and experience that form cognitive systems of how things work) and the *praxis* (a set of practical strategies and actions that people develop and apply as survival mechanisms to guarantee an uninterrupted flow of goods, materials, and energy from the environment). People create an image or representation of their productive surroundings, interpret these surroundings through their local observations of objects, phenomena, and processes in the context of their accumulated, experiential knowledge, and finally use all of this to conduct sustainable livelihood practices.

A similar approach from Berkes (1999) describes a more nuanced four-level framework: the first level consists of local knowledge of animals, plants, soils, and landscape – i.e., ecological processes; the second is a resource management system made up of that local knowledge and an appropriate set of practices, tools, and techniques; the third considers the social institutions, rules, and codes of relationship that provide social restraint and rule enforcement; and the fourth is the worldview that shapes environmental perception and gives meaning to observations of the environment. Berkes (1999, p. 14) states, "Local knowledge may grow; both management systems and institutions may adapt, change, and fall apart and may be renewed. Worldviews shape observations and social institutions but may themselves be affected by changes occurring at the other levels, such as the collapse of management systems." A selection of examples of local

adaptive management as described by this framework is provided by Berkes et al. (2000) and Peloquin and Berkes (2009) – the latter, for example, describes how Cree goose hunters in James Bay use their knowledge of the strength and direction of the wind to refine their harvesting efforts.

Indigenous Knowledge as Viable and Equal Input to Environmental Co-Management Projects and Resultant Co-Production of New Knowledge

This application of Indigenous knowledge as input to environmental management projects has been widely written about in recent years and is made manifest by bringing Indigenous groups to the negotiation table at the start of a project (in theory), and giving them an equal say with representatives from government, academic, and private interests (in theory). The goals of such inclusion are to manage environmental issues in ways that will ensure the cultural survival of Indigenous peoples, prevent environmental degradation, and co-produce new knowledge about the environmental issue going forward. Indigenous ecological knowledge systems, as shown in this section, are increasingly seen to be relevant in negotiating the political entanglements of conservation and ecological restoration projects. Menzies and Butler (2006) describe this new valuation of and opportunity for Indigenous knowledge in environmental management by contrasting local, traditional economies of multiple resource use that require an understanding of how an ecosystem works to the intensive, isolated, single resource use characteristic of industrial extraction.

The application of Indigenous knowledge in co-management frameworks has not been straightforward (e.g., Sillitoe 2010), due in part to fundamental differences in Indigenous and Western knowledge systems, the powerful position of Western science

and society relative to Indigenous knowledge, and the challenges of documenting and presenting Indigenous knowledge in culturally acceptable ways (Peters 2003). Some argue that the very notion of environmental management belongs to a Eurocentric worldview based on the separation and domination of nature (Gibbs 2010). Others worry, for example in relation to the risk of climate change, that Indigenous communities are seen only as vulnerable, helpless victims who need targeted intervention to treat the indicators of vulnerability; this ignores the historical context of the vulnerability and marginalizes whatever local insight has existed to deal with the risk by privileging the knowledge and capacity of experts and agencies (Howitt et al. 2011). Nadasdy (1999) feared that research involving Indigenous knowledge would reduce it to a tool of exploitation by Western science, and renewed interest in it may even threaten its indigeneity (Dove 2006). Indeed, while co-management should be more effective than state management and should empower local peoples, use of Indigenous knowledge in such endeavors may remove its vital context, and the very act of co-management may obscure or reinforce existing power relations (Nadasdy 2005; Ellis 2005). In practice, the application of local knowledge for development should not be restricted to just the extraction of information (Antweiler 1998). As such, the political process of integrating Indigenous knowledge may be more important than the technical problems of integration (Nadasdy 2006).

Minnis and Elisens (2000) suggested that local understanding often is missing or actively neglected in environmental management because it is assumed that Indigenous people are "disarticulated" from their traditional lives and environments due to modernity and the destruction of generational links that sustained cultural heritages and knowledge.

Fowler (2000, pp. 125-126) wrote, in describing biodiversity knowledge in the Great Basin of the western U.S., "If they [resource managers] do not want to adopt co-management plans wholeheartedly, they should at least share the power of decisionmaking in a few cases to make a start. Resource managers and biologists need to learn specifically from Native knowledge and not dismiss it out of hand as uninformed." Even when Indigenous peoples and their knowledge are engaged, not all goes well. Involvement of Aboriginal peoples in Australia in environmental management of lands upon which strong attachments were still held was found to suffer from lack of genuine participation, cultural awareness, agreement-making, and consideration of unique place-based factors, often producing inequitable outcomes that marginalized their interests (Carter 2010; Hill 2011). A project involving agricultural biodiversity in the Peruvian highlands led to the observation that local knowledge itself can become institutionalized in ways that may diverge from actual local knowledge practice (Shepherd 2010).

Several have provided suggestions to help ensure success when engaging in co-management projects. Rather than making a modernist fetish of Indigenous knowledge, a management framework should be constructed to allow for meaningful dialogue between local practitioners and experts that can lead to a realistic solution – the people directly involved in local resource use probably possess highly valuable insight about it (Pálsson (2006). To be successful in management projects, Indigenous knowledge must be located within its historical and political economic contexts (Butler 2006). Tipa et al. (2009) suggested relationship building, flexibility, and use of multiple methods as ways to best account for Indigenous priorities, agendas and politics. Watson and Huntington (2008) argued, in describing their co-production of knowledge of a Koyukon Athabascan moose

hunt, that each person or group needs to bring their own individual hybridities into the new assemblage of knowledge; researchers and practitioners must be able to navigate across epistemological and practical differences (Huntington et al. 2006). Understanding how local knowledges are constituted by relationships and networks that go beyond the local, how local knowledges are learned and reproduced in time and space, and how the knowledges of local people are still marginalized all need to be taken account of (Smith 2011). For work with Native Americans, Stoffle and Evans (1990) suggested a "cultural triage" that allows for a ranking of the importance of cultural resources that could be impacted by a proposed development. DeWalt (1994) advocated a framework for including differing epistemologies that does not rely on any particular way of knowing but rather takes advantage of the creativity and innovativeness of all involved. Dowsley (2009) proposed a spatially organized, or "community cluster" approach (involving neighboring communities that share a spatially-defined resource such as a wildlife population) to improve co-management institutions; it would use targeted incorporation of Indigenous knowledge as an information source and allow Indigenous people a strengthened role in decision making at the subregional level. And, Pickering Sherman et al. (2010) described an 11-element Indigenous Stewardship Model based on community-based stewardship and ecological restoration in the Pine Ridge Indian Reservation of South Dakota.

Recent successful applications of Indigenous knowledge in co-management and/or co-research have been documented in Alaska and Canada. These include projects studying Inuit sea ice and temperature observations (e.g., Krupnik 2009; Aporta 2011; Weatherhead et al. 2010; Gearheard et al. 2011; Pulsifer et al. 2011); Pacific walruses,

Indigenous hunters, and the effects of climate change (e.g., Krupnik and Ray 2007); and sustainable resource management of fishing and plant harvesting in British Columbia (Menzies 2006).

A recent forum in the *Journal of the Royal Society of New Zealand* (December 2009, 39:4) titled "Cross-Cultural Environmental Research and Management: Challenges and Progress" (forward by Stephenson and Moller 2009) attempted to tie together thoughts on co-management. It included conceptualizations of Indigenous knowledge and its contrasts (or not) to Western science (Berkes 2009; Agrawal 2009; Williams 2009; Dickison 2009; O'B Lyver et al. 2009; Roa et al. 2009); how Indigenous knowledge might be incorporated in effective co-management efforts (Jacobson and Stephens 2009; Robson et al. 2009; Rotarangi and Russell 2009; Uhlmann and Almstadt 2009; Lowe et al. 2009; Allen et al. 2009); possible methodologies to use (Chambers 2009; Maclean and Cullen 2009); and case studies in practice (Crawford 2009; Zurba 2009; Nevins et al. 2009; Thomas 2009; Gaze and Smith 2009; Wehi et al. 2009; Ramstad et al. 2009).

ETHNOCLIMATOLOGY

An area of research on Indigenous ways of knowing is fueled largely over concerns about the impacts on local peoples of climate variability and change, and is sometimes conducted under the umbrella of sustainable development. It seeks to understand how people know, recognize, and anticipate day-to-day weather and seasonal climate conditions in support of their livelihood efforts. Ben Orlove coined this field of study "ethnoclimatology" (Orlove et al. 2002).

Orlove et al.'s (2002) research on the seasonal rainfall forecasting techniques of potato farmers in the Andes Mountains of Peru and Bolivia showed how the degree of obscuration of the stars in the Pleiades, as observed by the farmers in June, foretells either a dependable rainy season (bright and numerous stars) or an erratic one (dim and sparse stars), leading to different planting strategies. The farmers know they must plant within the tight constraints imposed on them by elevation and climate – potatoes will not produce strong shoots if soil moisture remains low and will be damaged if the ground freezes – they must plant right at the beginning of the rainy season. The researchers found that the farmers are not "fatalistically resigned" to accept climate variability as a reality but instead seek information useful for dealing with it to help ensure their adaptive survival. Orlove and colleagues suggested that Indigenous and modern systems of weather and climate knowledge could become complementary, as these farmers might benefit from consideration of scientifically-known atmospheric attributes of El Niño (a key climatic factor in the region) while scientific forecasters might benefit from awareness of local phenomena observed by the farmers and from better recognition of how the timing and form of their forecasts might affect their use and acceptance by the farmers in relation to planting cycles.

Pennesi's work with the rain prophets of Ceará in northeast Brazil studied the integration of Indigenous ways of knowing about climate with scientific climate forecasts produced by Brazil's climate prediction service, FUNCEME – Agency for Meteorology and Water Resources (Pennesi 2007a, b; Orlove and Tosteson 1999). In Ceará, the rain prophets make traditional predictions of what is called the six-month *inverno* (January-June "winter") and its impact on agriculture. The prophets are typically older farmers

that make predictions based on observations of insects, animals, birds, plants, winds, stars, clouds, and other natural phenomena. They are known within their communities as knowledgeable, experienced, and credible forecasters. FUNCEME, which began as a weather modification (cloud seeding) program in the early 1970s, provides official seasonal climate forecasts for Ceará's February-May rainy season; these forecasts, which have received international recognition for their accuracy, are used in government policy planning and drought mitigation efforts. For the farmers, ideas about what rain prediction is and expectations about its accuracy are linked to agricultural practices and religious beliefs. Due to limited resources and incomes, they usually cannot adjust their planting strategies based on the official forecasts, limiting the forecasts' value. The forecasts often are seen as irrelevant because a commonly held belief is that it is a person's duty to plant as a way of life, having faith in God that their efforts somehow will be rewarded. To not plant is a sign of a loss of faith and of laziness. Forecasts by the prophets emphasize optimism even if they believe the coming growing season will be short – they will advise that with hard work and intelligence a crop can be harvested, and farmers feel it is more important for the prophets to give them hope than it is for them to be accurate. FUNCEME's probabilistic forecasts are not what farmers need in terms of content and timing, as the farmers need information on when, how much, and where it will rain, and FUNCEME takes no responsibility for decisions made by the use of its forecasts, which leads to low opinion of the forecasts despite their technical accuracy.

The timeliness of this topic is evidenced by United Nations' attention to Indigenous peoples and climate change and at least four different special issues of peer-reviewed journals devoted to the topic of Indigenous knowledge and climate change. As

part of the UNESCO LINKS Program, The United Nations Framework Convention on Climate Change (UNFCCC), for example, has compiled case studies of Indigenous knowledge of weather and climate on a web portal under the searchable headings "Adaptation" and "Local Coping Strategies" to "facilitate the transfer of long-standing coping strategies/mechanisms, knowledge and experience from communities that have had to adapt to specific hazards or climate conditions to communities that may just be starting to experience such conditions, as a result of climate change," with a focus on subsistence farmers and their concerns (UNFCCC 2011). It includes examples of indigenous forecasting listed under headings such as "drought/aridity", "erratic rainfall", "tropical cyclones", and "extreme cold", documenting local insight in Kenya, India, and the western Himalayas. A related compendium was made of case studies on climate change, adaptations and Indigenous peoples (United Nations University-Institute of Advanced Studies Traditional Knowledge Initiative 2009).

A special issue of the journal *Climatic Change* (May 2010, 100:2) titled "Indigenous Peoples' Knowledge of Climate and Weather" gathered peer-reviewed studies of some of the knowledge systems compiled by UNFCCC and others, each containing at least one Indigenous author, to build the case for the integration of Indigenous knowledge and observations within collective responses to climate change (Green and Raygorodetsky 2010). In this issue, Orlove et al. (2010) found that farmers of rain-fed agriculture in southern Uganda have developed a knowledge system that includes longstanding familiarity with the seasonal patterns of precipitation and temperature, a set of local traditional climate indicators, observation of meteorological events, and information about the progress of the seasons elsewhere in the region.

Previous, related work by some of these authors in Burkina Faso – Roncoli et al. 2002, 2003; Ingram et al. 2002 – investigated official seasonal forecasts of rain with respect to the traditional weather knowledge of farmers; it was found that the considerable knowledge of these farmers, built on long-term observations various phenomena and indicators in the environmental and the spiritual world, help shape their understanding of climate phenomena and their understanding of official climate information. Also in the special issue, Gearheard et al. (2010) discovered that Inuit observations of wind at Clyde River, Nunavut, Canada, help them understand sea ice, ocean, and weather conditions that enable or constrain hunting, travel, or other important activities. Speranza et al. (2010) found that agro-pastoralists in the Makueni District of Kenya possess and rely upon indicators of rainfall variability as part of a basic knowledge frame within which they interpret and use meteorological forecasts, although only a few were found to adapt their practices to the forecasts partly due to high rainfall variability in the region and lack of resources. Lefale (2010; and 2003) documented how Samoans have kept a unique seasonal calendar based on monitoring changes in plants and animal behavior, which are used as key indicators to forecast changes in weather and climate; communal and family social activities like hunting, fishing and feasting are driven by the seasonal calendar. Their knowledge includes cloud formation, conditions conducive to the formation and onset of severe weather systems, and seasonal changes in climate, all of which helps them anticipate, plan and adapt to extreme weather and climate events. Scientists in the region believe these calendars will be useful for understanding past climates and for verifying the results of climate model simulations. And, Green et al. (2010) found that Aboriginal and Torres Strait Islanders in remote areas of northern Australia, who still rely upon and

are closely connected to their natural environment, have developed over millennia a sophisticated appreciation of their local ecosystems and the climatic patterns as recorded in their oral history. This knowledge is passed down through generations and documented in seasonal weather calendars, and is used to direct hunting, fishing and planting as well as to inform many seasonally dependent cultural events. Another Aboriginal seasonal calendar for the Kakadu region of Australia had been referenced in Harding (1998). Interesting, scientists in that part of the world are recognizing the importance of these observations as a vital source of environmental insight where few historic records exist (e.g., Squires 2007, May 10).

Three other special journal issues that focused on Indigenous peoples and climate change and are of relevance here. "Traditional Peoples and Climate Change" in *Global Environmental Change* (May 2009, 19:2) contains a collection having an ethnoecological focus (Salick and Ross 2009). Of particular interest in it is Turner and Clifton's (2009) study of the effects of climate change on Indigenous lifeways in British Columbia, including their local knowledge relating to weather (observations of animal and plant behavior and taboos against picking certain plants or harvesting certain animals at particular times) and how climate change is impacting their use of this knowledge. A special issue of *Polar Research* (April 2009, 28:1) titled "Climate Change Impacts, Adaptation and Vulnerability in the Arctic" provided insights on the risks and opportunities posed by climate change in the circumpolar region and advice on how to conduct effective climate change research with Arctic communities (Ford and Furgal 2009). Previous work within the region that this issue built upon (e.g., Riedlinger 1999; Cruikshank 2001; Henshaw 2003; Nichols et al. 2004; Ford et al. 2006a, b) sought to

better understand Indigenous knowledge (including knowledge of clouds, stars, wind, sea ice and currents, and animal behavior) that is embedded within broad cultural contexts for the purpose of creating more culturally-informed climate change policy and better understanding of climate change vulnerability and adaptability. And most recently, a special issue of the journal *The Canadian Geographer* (Spring 2011, 55:1) titled "Geographies of Inuit Sea Ice Use" described Inuit observations and use of sea ice under the premise that much is to be learned from Inuit understandings of it (Aporta et al. 2011). This issue built upon the work of Krupnik (2009, 2011) and others that sought to uncover Indigenous ways of knowing about culturally important environmental phenomena in the Arctic. The recent work of McNeeley and Shulski (2011) in the interior of Alaska looked at vulnerability to changing seasonality there by considering side-by-side Indigenous observations and understanding of climate with instrument-collected data.

It can be seen from the work presented in this section that research involving Indigenous weather and climate knowledge is and should remain of wide interest as long as climate variability and change remain an important societal issue, and that there is room within this field to conduct this work in other Indigenous settings, like Oklahoma.

TAKE-AWAY POINTS OF THIS REVIEW FOR MY STUDY

The literature review in this chapter on the various conceptualizations and past applications of Indigenous knowledge, including ethnoclimatology, establishes (1) a foundation upon which to guide and inform the analysis of my data by providing framework with which to model the production, form, maintenance and use of my

collaborators' weather and climate knowledge – intersections of this review to the present study; and (2) a basis against which to compare how my field work contributes to and diverges from what has been done before. While most of the conceptualizations described in this chapter have been constructed or theorized through research performed in highly vulnerable subsistence societies across the world, they should have applicability for studying the Indigenous knowledge possessed by Native peoples in Oklahoma.

Intersections – Foundation of a Framework to Model My Collaborators' Weather and Climate Knowledge

The sources and characteristics of Indigenous environmental knowledge revealed in this review chapter, composing and describing a cumulative body of knowledge, practice, and belief regarding the human/non-human interaction, provide a framework with which to model (see Chapter Ten) my collaborators' ways of knowing about weather and climate, and how they use these ways of knowing in their agricultural pursuits. Here, I assemble what I reviewed above into key pieces of a framework that will inform my model, and as such illuminates the intersections of that review with my analyses in later chapters.

One component of the knowledge framework culled from this review is the intergenerational, received source of Indigenous knowledge – transmission occurs as it is passed down through generations (e.g., Suzuki and Knudtson 1992; Grenier 1998; Berkes 1999; Mistry 2000). Intergenerational knowledge possesses a social memory through preservation of insights generated in the past by family or community members (Mistry 2009). It has culturally situated and community-valued characteristics (e.g., Antweiler 1998, 2004; Merculieff 2002), embedded within particular cultural contexts (Cruikshank

2001; Henshaw 2003; Ford et al. 2006a, b; Menzies and Butler 2006) that often are part of a received cultural model of understanding of how the immediate world works (Grenier 1998).

A second component is the local, regenerative source of Indigenous knowledge – the regular observation of and interaction with the local environment that produces a cognitive system of factual knowledge (e.g., UNESCO LINKS 2003; UNFCCC 2011; Antweiler 1998, 2004; Berkes 1999; Maurial 1999; Orlove et al. 2002; Roncoli et al. 2002; Pennesi 2007a; Orlove et al. 2010; Speranza et al. 2010; Lefale 2010). This knowledge is developed around specific conditions in a particular place (e.g., Steward 1955; Grenier 1998) and is generated and regenerated through the long-term observations and practices of inhabiting a place (Nietschmann 1972; Huber and Petersen 1997; Ingold and Kurttila 2000). It has a situated localness (Nazarea 1999b) that is formed in part through situated practices (Lauer and Aswani 2009). It produces a local relevance – a situational awareness and intuition – resulting in a place based wisdom that holds meaning that cannot be separated from the place (e.g., Basso 1996; Cajete 2000; Semken and Butler Freeman 2008; Preston 2009).

A third component is the influence of social mediation on Indigenous knowledge – (all) knowledge is best understood as a product of a constellation of social interactions (e.g., Antweiler 1998, 2004). Knowledge that is culturally and locally situated often is characterized by the ubiquitousness of the relatedness among humans and between the human and non-human worlds (Rundstrom 1995); the social nature of relations between humans and their surroundings is key to understanding the place- culturally-based contexts of Indigenous knowledge (e.g., Cruikshank 2001).

A fourth component is the dynamically evolving characteristics of Indigenous knowledge – it is cumulative, experiential, experimental, regenerative, and ultimately adaptive (e.g., Turnbull 1993; Huber and Petersen 1997; Grenier 1998; Berkes 1999; Ingold and Kurttila 2000; Menzies and Butler 2006; Lauer and Aswani 2009). This evolution is part of a practical adaptation to the environment (e.g., Orlove 1980; Butzer 1989; Anderson 2002) that adjusts dynamically as conditions change (e.g., Turner 1999; Batterbury and Forsyth 1999).

And, a fifth component of this knowledge is its embeddedness within a belief system – a belief system that encourages intimacy with the non-human world, culminating in a knowledge or wisdom that is characteristically described as holistic, historical, contextual, and sacred, with humans and non-humans inextricably linked (e.g., Caduto and Bruchac 1988; Suzuki and Knudtson 1992; Merculieff 1992; Lake-Thom 1997; Maurial 1999; Semali and Kinchloe 1999; Menzies and Butler 2006), and is described as ritualistic (e.g., Rappaport 1967). Specific to Native Americans, it is claimed that this close relationship means humans should not attempt to exercise control over "nature" (Caduto and Bruchac 1988) but rather should engage in a reciprocal relationship of give and take. Some refer to this melding of belief system and practical environmental engagement as "sacred ecology" (e.g., Toledo 1992; Berkes 1999).

As will be seen in Chapters Six, Seven, and Eight, the knowledge revealed by my collaborators displays characteristics of these components and fits within the conceptual framework of Indigenous knowledge described and categorized in this chapter. It will be analyzed along the lines of the framework above in Chapter Ten.

How My Field Work Contributes to and Diverges from the Literature

Based on the above review, my work contributes to the tradition of studies that have looked at the formation, maintenance, and use of Indigenous knowledge, albeit here in a First World setting, and particularly those within the smaller field specifically studying Indigenous weather and climate knowledge (ethnoclimatology). My study appears to be the first to consider in depth the weather and climate knowledge amongst Native peoples in the continental United States *and* how it is used for land based activities, and as such goes beyond the simple documentation of such knowledge, or the studies that attempt to compare and contrast local and scientific ways of knowing and/or attempt to augment scientific knowing with local knowledge. Much of the research involving weather and climate knowledge and its applications to land-based activities reviewed here has occurred in subsistence communities in the Arctic, Canada, Australia, Africa, and South America. Although the people I worked with are not engaging in subsistence activities, they are in most cases basing their livelihood activities (many fledgling) on manipulation of the land, and weather and climate knowledge is part of their toolbox of insight used to do that. Thus, there should be parallels between my work and these previous studies with respect to how farmers form and use their knowledge.

My motivations for doing this research diverge from many of those documented within ethnoclimatology. While I am seeking to identify weather and climate knowledge locally produced and learn how it is used, like the others, I am not seeking to directly compare it to scientific ways of knowing, though I did query my collaborators about the types of "official" weather information they look at. As indicated above, often times research by others has sought ways to meld local and scientific ways of knowing to

augment the adaptability of local people, given the perception that those involved in subsistence agriculture are unusually affected by climate change and variability and by inference are vulnerable, helpless victims that need the intervention of scientists, governments, and nongovernmental organizations in the name of "development" in order to survive (e.g., UNESCO LINKS 2003; UNFCCC 2011). Research by others also has sought to determine why scientific ways of knowing are not accepted or properly interpreted by local peoples in the hopes that they can be recast in ways that make them more understandable and usable (e.g., Pennesi's 2007b work with the rain prophets of Brazil and the government climate service; the climate service could never really figure out how to provide and situate its forecasts in ways that the people who listened to the rain prophets could find useful either agriculturally or culturally). And, research by others has sought to "verify" local ways of knowing against scientifically research natural processes (e.g., Orlove et al.'s 2002 comparison of the star observations of the Andean potato farmers to the different states of El Niño), perhaps to make them more acceptable as complimentary insight. Interestingly, the research of others has uncovered that the local peoples are doing just fine (e.g., the Andean potato farmers) and are able to adapt to the vagaries of climate variability in sustainable ways, and it is the scientists and governments who end up learning as much or more about local weather and climate knowledge and the resultant sustainable local practices as the local people might have learned from use of the official forecasts (Lefale's 2010 Samoan calendars).

Based on the background provided by this review – what has been discovered about Indigenous knowledge in other parts of the world – I entered into my field research under the premise that the people I would talk to indeed would "know which way the

wind blows" in their particular, local situations, and that any official weather and climate information they consulted would simply augment their own insights and wisdom. [I did not anticipate the level of use of their own knowledge, however, as will be shown in Chapter Six.] I do indicate what my collaborators told me about how they value (or not) their knowledge over that from other sources and how these various ways of knowing come together to form an actionable knowledge base (modeled in Chapter Ten). As Orlove et al. (2002) and others here have suggested, "traditional" and modern systems of knowing about weather and climate may end up providing complimentary insight going forward in addressing issues such as climate change diagnosis and resultant adaptations. I made no efforts to teach my collaborators to use official weather and climate information or related technologies (e.g., the work of Gearheard et al. 2010 and others in the Arctic); rather, I desired to find, as Berkes (1999), Suzuki and Knudtson (1992), and Pierotti and Wildcat (2000) suggested, unexpected and non-intuitive insights about how the world works, knowledge that I believe should be of broad interest beyond the local community. As suggested by Cajete (2001), I will take care not to present my collaborators' knowledge in ways or in settings that may marginalize it or strip it of its local and cultural context. Through compiling of their knowledge here, one goal of this research will be to support my collaborators' collective attempts to help restore the weather and climate portion of their cultural knowledge base and by inference any traditions relating to it, thereby helping them recreate and revitalize themselves in culturally important ways (e.g., Cajete 2001). As will be seen later, conversations with my collaborators elicited a new appreciation of and pride in their own weather and

climate knowledge and interest in how it might be better used as a viable and valuable piece of their decision making.

Hence, I believe my work can initiate a type of ethnoclimatological research in Native land-based agrarian livelihood economies (though not necessarily subsistence) that take place within a First World setting that privileges the goals and needs of the local people as much or more than the needs of the scientific community in "mining" such knowledge. The knowledge I have been provided by my collaborators has the opportunity to further inform thinking and action regarding local climate change adaptation and mitigation and may help prevent actions that often end up being destructive. At the very least, this knowledge should provide a sort of ground truth or reality check within environmental development projects that the review above documented on the use of Indigenous knowledge in co-management projects – any such development efforts involving ethnoclimatology should have as a primary motivator the co-production of new knowledge going forward.

CHAPTER THREE

"I HAVE A HIGH REGARD FOR THE OLD INDIAN WAYS OF DETERMINING SUCH THINGS" – ESTABLISHING HISTORICAL CONTEXT WITH ARCHIVAL RESEARCH

To establish context and possible directions for my fieldwork, I performed background archival and academic literature research to locate primary and secondary sources on Native American weather knowledge. According to Wilson (1998), a complete assessment of some aspect of Native Americans requires not only research in libraries and archives but also communication with the people in question, as lack of one or the other may provide an incomplete glimpse into the worldview of Native people. Davis (2009) stressed the importance of looking back in order to move forward within an historical political ecology context (e.g., Offen 2004) regarding environmental management, an idea that applies here. Moore (2010) defined historical research in geography as that based on the traces left by former lives, with the archive the place or space that stores, presents and orders materials of historic interest and social significance. The researcher uses these traces and materials to explore and attempt to reconstruct the past. The limitations of the archive and other sources available may limit inquiry, however, since the items that survived may have been the result of social or political processes.

The focus in this chapter is on two sets of archival documents since these, based on my inquiry, have not been analyzed before with respect to Native American knowledge of weather and climate. The first is the papers of U.S. Senator Robert S. Kerr and of Malvina Stephenson contained in the Carl Albert Center Congressional Archives at the University of Oklahoma. The second is the transcribed interviews from 1967-1972

of Native elders that are housed in the Doris Duke Collection of the Western History Collections at the University of Oklahoma. At the end of this chapter I also summarize Native American weather and climate knowledge findings from secondary and other anecdotal sources relevant to Oklahoma tribes.

THE LETTERS OF SENATOR ROBERT S. KERR AND THE INDIAN WINTER FORECASTS

In September 1950, U.S. Senator Robert S. Kerr (D-Oklahoma) wrote to Indian leaders across the United States in order to "make some determination with regard to whether or not we are going to have an early winter and whether or not we may expect a hard winter." Even though he had access to U.S. Weather Bureau predictions and other scientific data, Kerr and his Administrative Assistant, Ben Dwight, a member of the Choctaw Nation and its onetime Principal Chief, wrote that they "would like to know what some of the Indians in the various sections of the nation think about our coming winter probabilities." Kerr and Dwight indicated they had a "high regard for the old Indian ways of determining such things – because they are practical and have always been able to make some very accurate predictions." From 33 letters sent in 1950 (including nine to tribes in Oklahoma) three responses are known to have been received; a follow-up letter writing campaign in October 1951 was more fruitful, producing eight known responses. One of the 1950 letters written by Dwight on Kerr's behalf was to the Roly Canard, Principal Chief of the Muscogee (Creek) Nation in Oklahoma. Canard's response, sent six days later, related "two old time sayings" from his people, namely "when lots of spider webs are in the air and on lots of trees such as we now see, means we will have a hard, cold winter. Also when the corn shuck is thick and heavy, as it is

here in Oklahoma, it is a sign of a hard and cold winter." Canard also said there are probably other indicators and would try to "get more information from my friends." His response was used by Kerr as the basis for his 1951 letter-writing campaign, which also included a query about the existence of "weather prophets."

This particular background research takes an in-depth look at the weather knowledge provided to the Senator, sought at a time when the U.S. Weather Bureau had already established itself as the nation's primary source of weather information and predictions. More on this work, including the lives of Senator Kerr and Ben Dwight and their possible motivations in seeking the forecasts, is more fully described in Peppler (2010).

Kerr's Letters and Personal Communication

A web-accessible inventory of the contents of the Robert S. Kerr Collection at the University of Oklahoma's Carl Albert Center Congressional Archives provides a gateway to the information contained (Robert S. Kerr Collection n.d.). While the inventory does not allow one to see the collection's papers, it does briefly describe what is in each box and folder within the collection. The "Box and Folder Inventory" of the "Departmental Series" of the Kerr Collection includes a variety of information about the Senator and holds the 1950 letters and responses, specifically in Box 8, Folder 40 under the title, "Interior: Indian Affairs, Weather Predictions (1950). Indians' weather predictions for the upcoming winter." More searching within the Center's archives revealed the responses to Kerr's follow-up 1951 letter writing campaign, but these are held in its Malvina Stephenson Collection (Malvina Stephenson Collection n.d.). Stephenson was a

Tulsa World political reporter who became Kerr's press secretary in 1951. The "Box and Folder Inventory" of her collection, specifically Box 2, Folder 40, is titled, "Indian Weather Forecasting, 1951. Topics include Indians of North America Folklore." It contains the 1951 responses but sadly does not contain Kerr's 1951 letters to Indian leaders, and these have not been discovered. The 1951 responses are more numerous and contain richer content than those from 1950. Personal communication with an expert on Kerr's Senate career, Anne Hodges Morgan, who authored the definitive research on his Senate career (Morgan 1977), and Kerr's surviving son, William G. (Bill) Kerr, provided invaluable background information, anecdotes, and analysis on the Senator that helped answer why he may have been interested in the Indian weather forecasts (see Peppler 2010). Interestingly, neither knew of the archived letters or responses, and as such each became interested in helping me piece together my query.

The Indian Winter Forecasts

Tribal Responses

Of the 33 letters sent by Kerr and Dwight in September 1950 (nine to tribes within Oklahoma and 24 outside), three responses are known to have been received. One came from Roly Canard of the Creek Nation, as described earlier. Based on the 1951 responses (described below), it appears Kerr used Canard's 1950 response as the basis for his missing 1951 letters. Another 1950 response came from the All Pueblo Council in Casa Blanca, New Mexico. It indicated that "most all of them ["the Indians in this area"] felt this would be a hard winter just how hard they did not expressed, but, all of them felt that it will be a cold winter, more snow than usual." Two Pueblo informants consulted

for the response indicated "there had been some sort of unusual disturbance in the skies this year, assuming 'cloud seedings'." Another said, "Whenever there was any amount of drought then hard winter followed." The third 1950 response, from the Crow Agency in Lodge Grass, Montana, was informed by 70-year-old Sidney Blackhair. He had learned to forecast from his father, a "famed Crow Chieftain." Mr. Blackhair predicted a mild winter for southeastern Montana and northern Wyoming, based on observations such as the occurrence of an early mid-September snowfall; frequent rains during the fall; ants not having gone into the ground yet; snakes still being out; and an absence of frogs. This response was delayed because of the hesitancy of Mr. Blackhair "to make his prediction concerning the nature of the coming winter as early as September." He advised the response writer, Joe Medicine Crow, "…He would be in a better position to make his prediction in the latter part of October." Crow continued his response by indicating that "the opposite of these indications would of course mean a severe winter" and that "these signs of nature, I might add, have been observed by the Indians of this region from time immemorial and are well founded and could be relied upon." He concluded by saying, "Indians of other regions have also developed means of forecasting both the weather and the climate for their particular locality."

It is not known how many letters Kerr sent in October 1951 or their contents, but eight responses are known to have been received, six of which are described below (two were not informative). The Minnesota Chippewa Tribe in Cass Lake indicated "we are looking forward, with dismay, to a long and hard winter." Signs for "forecasting the outlook for the coming winter" included "if the muskrat or beaver build an unusually high and large house, the winter will be severe." Other signs of a hard winter included

"if the fur of wild animals is unusually heavy; if the bark of the tree is thicker, and if the squaw-corn [field corn] is heavily covered with shell." The response writer indicated (on October 23) "we have had a little snow already, in some places as much as 6 inches, but we are looking forward to our Indian Summer which should soon make its appearance."

The Pima-Maricopa Indian Community Council in Scottsdale, Arizona, related that the *Arizona Republic* had recently published a report indicating a "brilliantly colored Gila Monster" had been found wandering in a residential area by two 4-year olds. As written in this response, "a Maricopa Indian girl from the Salt River Reservation" who served as an informant indicated that this sighting "portends a long and very cold winter." Also in Arizona, the Navajo Tribal Council in Window Rock reported on a number of observational signs. In late summer, small animals gather and store leaves, grain, and plants if they sense an early frost, and horses and other fur-bearing animals usually change from light to heavy fur. Small insects such as ants "have a way of preparing the ground for coming rains or hard winters." The writer noted the "disappearance of bees, rabbits, birds and eagles which would mean they are having a famine. They have probably gone to better country – only last summer I saw an eagle which to me would be a sign for better weather conditions." He noted, writing on November 16, "well sheltered ground green plants coming up like in the early spring" due to some rain "late after the frost." In sum he indicated "an easy winter, little snow, mostly rain," but wanted to visit with Senator Kerr in Washington after the beginning of the New Year "to discuss more with [him] this subject."

The Potawatomi Indians of Indiana and Michigan returned a detailed response. The response reported "Some of the old timers came up with some extremely odd

statements in forecasting weather for the months ahead." One of them predicted a "short and hard winter, with heavy snowfall" for southwestern Michigan. This informant's reasoning included observations of average temperatures throughout the spring, summer and early fall, and that occasional rainy spells had offset "the torrid heat spells that we some time have." Another of the old timers, "one of our ardent outdoor Indians" that was a trapper reported, "muskrat houses are small and not over thirty inches in height and there are more of them this 'early' fall." This meant that "the 'rats will be moving about more and won't have to be worrying about too many tight ice freezes." He called for a "short and hard winter, the big freeze to come in February and last until the middle of March." This informant added that fox squirrels were not storing nuts and corn in the late fall, meaning "the snow won't last too long and that the squirrels will be more active in search for food. Maybe!" A third old timer lamented "all water over the dam nowadays, since the atomic tests, I believe the chemicals have interfered with the air and clouds, the clouds I use to see are no longer in the skies, it must be the atomic experiments have bothered them, because I just can't give you a good prediction." But he did think there would be a "hard cold snap from middle January to the 1st of April" because the leaves on most of the hardwood trees remained on the limbs late into the fall. The Potawatomi consensus was a "hard and short winter, maybe." The response writer noted on November 7 in closing that "outside it is snowing something terrible, there is now about 8 to 12 inches of snow. I believe I'll talk with the old trapper."

Two long hand-written responses from 1951 also contained much information; these were received from the Oneida Indians of Wisconsin and the Gros Ventre Indians of the Fort Belknap Reservation in Hays, Montana. The Oneida indicated four ways "of

telling what the future weather is in store for us" and that they had brought these ways of forecasting with them from New York to Green Bay in 1823. The person who wrote the response had been working with the University of Wisconsin to preserve "Oneida Indian folklore." The first way "is when the wild geese are flying back south at high altitude means a hard winter. This fall the geese are headed back south at low altitude, so we expect a mild winter as well as fall." The second way regarded rabbits or cottontails – if they are "fat in fall we can expect mild winter, if not then it means cold winter." The third way was "when we get the first snow fall, the rabbits feed on Brushwood, if rabbits eat brushwood next to snow, then we will not get much snow during the winter, but if the rabbits eat Brushwood at the height of a rabbit in a standing position, then it means a lot of snow." And the fourth was "when Oneidas butcher a pig, usually in the fall, they examine the spleen of a pig [and] if found [to] be thick, then look out for hard winter, and lots of snow." The response writer agreed with Roly Canard's Creek Nation assessment on the thickness of corn shuck being a good indicator. He also said he had spoken to an Oneida woman the week before writing the response, and she indicated a mild winter "because the New Moon was more to the South than North." He went on that "some Oneida can forecast dry or wet season by the position of the New Moon in the spring of the year" and when there is "lengthy thunder in the North during fall months or in a northerly direction from Oneida, Wis." it is a sign of a mild winter. Overall a mild winter was predicted.

At the Fort Belknap Reservation, the Gros Ventre had observed that wild geese "in their flight to the south this year flew very 'low' and they tell us that this coming winter will be a severe and hard one." Other signs of a "hard winter" included a

"beautiful fall with lots of berries"; "in the old days the buffalo didn't migrate very far south because it had plenty of feed and forage that would be under the deepest snows and of the fact that they were very adept at pawing through toughest crusted snow"; and "when the prairie dogs which abound up in this country 'raise' the entrance to their 'burrows' it also means a long and hard winter." The Gros Ventre had other signs portending changes in winter weather. These included the appearance of the Northern Lights "when they dance and quiver and pierce the skies with beams of light" and "when the sun comes up with 'sun dogs' on one side or both sides of it and when the 'dogs' seem to be on fire means severe cold and intensely so if the 'dogs' stay with the sun till it goes down." A sign of a cold snap is "when coyotes howl most mournfully." A circle around the moon "tells us that a storm is brewing" (a visible ring around the moon is caused by an increase in atmospheric moisture content, often followed by rain or snow – an old adage is "ring around the moon, rain by noon"). Other signs of a coming winter storm include "when horses play with each other and stampede around" and "when our cattle come home from the range." But "when stock horses and cattle [head] for the high ridges even during a storm in winter it means that by the next morning the storm will be over." The writer of this response indicated, "These methods of forecasting weather by the Indians up here are most surprisingly accurate" and described a "famous Indian weather prophet" named Faces Backwards for whom "it is claimed that his forecasting never misses." He closed with some editorial commentary when thanking the Senator for "your interest in Indian life and lore." He said "there is much – very much – that the Whiteman fails to appreciate because he doesn't study…the 'Indian's way' that would

contribute greatly to the progress and advancement of the Whiteman's civilization." The writer intended to consult with his 83-year-old uncle to find out more about forecasting.

Comparison to Measured Climatology?

It is tempting to determine how the tribal predictions compared to measured climatology, which was the main query I received from meteorologists after giving a presentation on this topic in 2009. Some researchers have used climate information to validate such predictions or have related the predictions to known physical processes. For example, Orlove et al. (2000, 2002) determined that the star observations of Andean potato farmers described in Chapter Two can be explained by the stage of El Niño and its cirrus cloud-producing capabilities. Table 1 contains one possible comparison for the winter predictions using seasonal snowfall amounts and average temperatures obtained from National Weather Service Forecast Offices located nearest to the tribal entities that responded to Senator Kerr. Pulling two examples from it, the Gros Ventre prediction of a "severe and hard winter" in 1951-52 compared well to meteorological observations, while the prediction of a "mild winter" by the Crow Agency in 1950-51 did not.

Table 1. Summary of Indian winter weather predictions.

Tribe	Location	Winter Forecast	Climatology
1950-51			
Creek Nation	Okmulgee, OK	Hard, cold winter	At Tulsa, 51st snowiest (Sep.-May) out of 109 years; 46th coldest (Dec.-Feb. average temperature) out of 104 years
All Pueblo Council	Casa Blanca, NM	Hard winter, more snow than usual	At Albuquerque, 49th snowiest (Dec.-Feb.) out of 115 years; 15th warmest (same) out of 115 years
Crow Agency	Lodge Grass, MT	Mild winter	At Billings, 11th snowiest (Jul.-Jun.) out of 74 years; 3rd coldest (same) out of 74 years
1951-52			
Minnesota Chippewa Tribe	Cass Lake, MN	Long and hard winter	At Duluth, 40th snowiest (Jul.-Jun.) out of 62 years, at International Falls, 40th snowiest (same) out of 85 years; at Duluth 29th coldest (Oct.-Apr.) out of 111 years, at International Falls 31st coldest (same) out of 112 years
Pima-Maricopa Indian Community Council	Scottsdale, AZ	Long and very cold winter	At Phoenix, precipitation (Nov.-Apr.) below average with trace snowfall in February and March; temperatures (same) slightly below average
Navajo Tribal Council	Window Rock, AZ	Easy winter, little snow, mostly rain	At Flagstaff, 31st snowiest (Dec. 21-Mar. 20) out of 111 years; 17th coldest (same) out of 111 years
Potawatomi Indians of Indiana & Michigan	Cassopolis, MI	Short and hard winter, maybe	At South Bend, 20th snowiest (Sep.-May) out of 68 years (87% of this snow occurred during

			Nov.-Jan.); Nov. 1951 is the coldest November in the last 115 years and second snowiest but Dec.-Jan. was only 65th coldest
Oneida Indians of Wisconsin	Green Bay, WI	Mild winter	At Green Bay, 40th snowiest (Dec.-Feb.) out of 123 years; 57th coldest (same) out of 123 years
Gros Ventre Indians of Fort Belknap Reservation, Montana	Hays, MT	Severe and hard winter	At Glasgow, 3rd snowiest (Jul.-Jun.) out of 106 years; 16th coldest (Dec.-Feb.) out of 106 years

Indigenous Knowledge as Independent Insight

Comparing the Indian winter predictions to scientifically measured seasonal snowfall amounts and average temperatures may be problematic since Western science and Indigenous knowledge systems emanate from different orientations to and historical paths through the world, possibly causing the knowledge used in such comparisons to be inadvertently decontextualized or deemed lacking (explored briefly below). There is no one way in which such a comparison might be performed, as well. Such a verification also may be culturally insensitive. Berkes (1999) argued, for example, that Indigenous observations need not be legitimized by means established within other knowledge-producing worldviews. Agrawal (1995) suggests it the "ultimate irony" of Indigenous knowledge research that those on the one hand who valorize indigenous knowledge also set out to validate it by means of scientific scrutiny before accepting its utility or giving it credibility. Larger discussions have debated the ramifications of melding or reconciling Indigenous epistemologies and Western technologies (e.g., Geographic Information

Systems do not capture the complex relatedness of human/non-human interactions with respect to the environment, but rather construct it – Rundstrom 1995, p. 47; see also Global Positioning Systems – comments section following Aporta and Higgs 2005).

The people who provided Senator Kerr with their predictions likely had their own conceptualizations of what a hard or easy winter was, which may differ from meteorological averages, or what Kerr was interested in. It is suspected, based on some of the response letters, that they may have related stories about the timing and intensity of particular snow and thaw events and how these may have played out relative to, for example, growing the following spring. Perhaps a very cold early winter that killed insect pests would have been considered a good winter for later crop growth. Or, maybe a winter with a lot of snow at opportune times would have been considered advantageous for capturing moisture for spring crops (a weather proverb is "a year of snow, crops will grow").

To help contextualize the Gros Ventre forecast provided to Senator Kerr as an example, beyond the observational indicators described in their response letter, during even the earliest years of reservation life (late 1800s through early 1900s) pipe bundle rituals were held that included control of the weather. Spring rites conducted by Sitting High (a keeper of the pipe) included a sweat lodge ceremony and offerings to the pipe; as the keeper of the pipe he had various powers in weather control and in protecting people from illness and danger (Fowler 1987, p. 55). In 1904 he and other older men sang all night to stop rains from ruining a Fourth of July gathering; the weather later cleared up (Fowler 1987, p. 75). As late as the early 1980s, the pipe ceremony was used to pray to "Thunderbird" for good weather for celebrations (Fowler 1987, p. 172). The importance

of the pipe in Gros Ventre cultural construction is further described by Gone (2000), including how it provided its keepers with supernatural abilities to fulfill their role as intermediaries with the One Above, including the Thunder Being. In the Gros Ventre response to Sen. Kerr, we saw that a famous weather prophet (Faces Backwards) was said to never miss on his forecasts. This example provides but one small glimpse into a Native intimacy with the non-human world and resulting epistemological framework regarding a natural phenomenon (weather) and the direct spiritual engagement the people felt with it as an active participant in it, making comparison with scientifically-collected data of the same phenomenon difficult.

A Postscript

Well after I performed and wrote up this research I learned that Joe Medicine Crow, the person who wrote the Crow Agency response from Lodge Grass, Montana, was still alive. This surprising revelation (the Kerr letters and responses are 60 years old) came serendipitously through me being on a Delta Airlines flight to Seattle in January 2011 and happening to read the January edition of *Sky Magazine* (Sky Magazine 2011, January). It contains a feature section on the state of Montana, and within it a "Q+A: Dr. Joseph Medicine Crow." He was 98 years old at that writing, and is described as the Crow tribal historian and oldest living tribal member. He received the 2009 Presidential Medal of Freedom from President Obama for "contributions to the preservation of the culture and history of the First Americans are matched only by his importance as a role model to young Native Americans across the country" (Thackeray 2009, July 30). In *Sky Magazine* Joe Medicine Crow is quoted as saying with respect to places and events in

Crow Country, “Come out and join me; I’ll take you around!” (p. 125). My efforts to contact him through various avenues, however, have failed.

DORIS DUKE COLLECTION OF AMERICAN INDIAN ORAL HISTORY

The Doris Duke Collection of American Indian Oral History, part of the University of Oklahoma’s Western History Collections, contains digitized typescripts of hundreds of interviews with Native Oklahomans conducted during 1967 to 1972 (Western History Collections n.d.); these typescripts are said to encompass the history and cultures of the state’s tribes. Included are accounts of ceremonies, customs, social conditions, philosophies, and standards of living, and members of each tribe in Oklahoma were interviewed. The typescripts are organized by tribe and are searchable. Using weather-related keywords like “weather”, “rain”, “snow”, “drought”, “thunder”, and “lightning”, I was able to locate passages that revealed the observational knowledge and stories of weather and seasonal climate of people born in the late 19th century or early 20th century. Relevant entries are related below and provide historical context on weather knowledge held specifically by Oklahoma tribal members. This likely represents the first effort to comprehensively distill Native weather and climate insight from this archive.

Cherokee

Phillip Osage, a Cherokee man born in 1899 and living in the Peggs/Iron Post area of Cherokee County (T-539-2; Cherokee: “See wild geese flying south – predicts weather by signs”; second part, p. 3), related in 1969 how the flight patterns of geese and other signs were used to predict “the kind of weather to come.” As summarized by his

interviewer, “He remarks that the Indians can predict the kind of winter to come according to the time that geese fly south. Also, many other signs are observed and heeded by Indians as pertain to weather, planting, harvesting, and personal guides. Some of these include the many functions of tree leaves, secrets revealed by corn shucks, activity of wild life, the cry of the owl, the chirp of crickets, etc.”

Cheyenne and Arapaho

In entry T-200-1 (Cheyenne: “Finer characteristics of the Cheyennes”, p. 16), Sam Dicke (born in 1902 and interviewed in 1968 in the El Reno/Watonga/Thomas area) said, “The Indian was first of all a hunter, not a warrior. As history books tell. As the history book stated. For upon his ability in this direction, depended his living and early training, and games were all designed to teach him skill in hunting.” This account continued, “All old Cheyennes seems to know everything, names of stars in heaven and in the milky way. They could tell what the weather was to be in advance even in one year ahead. By the study of the nature. The seasons, plants, the actions of birds, the animal life.” The Cheyenne, Arapaho and Kiowa tribes also held rain and snow dances near the towns of Geary and Apache (T-651-2; Kiowa: “Father’s Day Dance for Leonard Cozad given by his family, June 19, 1971”).

For the Arapaho, the moon was important for scheduling the Sun Dance (T-221; Arapaho: “End of the Sun Dance and the forty-nine that follows”, p. 24). Jess Rowlodge, a leader among the Arapaho from the Darlington area of Canadian County, described that to have the Sun Dance the moon had to be “right” (interviewer comment in brackets): “[How are they able to calculate when the moon is going to be right?] They know that

pretty well – the old folks know that pretty well. Yeah, they know when it's going to rain and they know, say, a week or two ahead of time what the weather's going to be. I don't know how they know, but they're pretty good judge on the calendar. That's a mystery to me."

Chickasaw or Choctaw

In "Learning from Indians" (T-102-1; Chickasaw or Choctaw), Mrs. E. F. Kelley, non-Native but whose father Jim Dixon was a friend to and neighbor of Indians just north of the Red River, related in 1967 about how "they" knew the country: "They knew every foot of it; they knew the weather; they knew when a storm was coming up; that's where my father learned. He learned to read the stars, and the seasons, and when to plant the things, and when to hunt for game…" A follow-on passage (T-102-5, p. 6) relates how her father used such information to plant potatoes: "(Father) always had an instinct and he always plant potatoes on the 17th of March, unless it'd come a big freeze or something what way. But otherwise, he'd always plant those potatoes. I don't know exactly how to explain it, but anyway, that was the time to plant potatoes. That's all I know."

Creek

Two interviews documented how the Creek people related a wintertime moon ring to bad weather (T-591-2 and T-593). In T-591-2 (Creek: "Indians knew the signs of the moon", p. 3-4), Ethel McIntosh (born in 1896 and interviewed in 1970 in Eufaula) said, "Indians knew how to do things and knew signs of most everything. Me and Lizzie

was talking about it yesterday. In winter time if there is a ring around the moon, we'd have real bad weather."

And in, T-593, (Creek: "Indian weather signs", p. 23) Martha Tiger (born in 1889 and lived in the Weleetka/Wetumka/Eufaula area) was interviewed in 1970. Her interviewer asked, "Do you know of a Indian signs, something like – I'll tell you for one. If you see a moon with a ring around it there's so many stars inside of it in the wintertime and that's going to be that much bad weather day. Do you know of very many signs that Indians used to go by, you know." She replied, "Well, mostly all went by signs. But I never did notice. Daddy used to say in the summertime, he said, 'The moon got a story in it and it's going to rain in one day.' And it always did. Then a circle around it they said it's going to turn bad. Or it's going to have bad weather somewhere. That's all I ever heard about that."

Kiowa

Jenny and Cecil Horse (T-328-2; Kiowa: "Weather Forecasts were done by Sun, Moon and Cloud Conditions"; interviewed in 1968 in the Alden/Carnegie area, pp.12-13) described how weather forecasts were made by observation of the sun, moon, and stars, and how cloud conditions affected their appearance. Cecil related, "Here's the moon. That moon's got a circle. If you notice that sometime you go out and there's a circle around the moon. Then there's another circle and another circle. It gets bigger and each one of them circles around that moon means hot weather, cold weather or wind. But that's true." About the sun, he said, "There's a sun here. And they have a sun dog here on both sides. If you notice sometime the weather, it gets kind of damp or something, you

look up there and the sun will be a color – all colors. On the north side and the south side – and they call those sun dogs. And that means something. If they closest to the sun, well, that means that the weather will have to make a change." He also remarked about the stars: "Now they have no calendars. They had no calendars at that time but they always studied the stars for their weather. Now my father [Hunting Horse], he knows. Oh, he knows it all. He knows just what's up there." More was said about sky condition: "Now if the sun comes out – the sun comes out in the evening and if it's red, when that sun come out and it's red, tomorrow's a bad weather. If the sun – I mean when the sun goes down and the clouds are bad red he said, 'Watch out. Watch your children. Don't let them go far away from the, camp because we're going to have bad weather.'"

Ponca

The Ponca describe the story of "Spongehide and His Little Brother" (M45; Ponca: pp. 64-66), provided to the Duke Collection by the White Eagle Community Association, a Ponca Tribe group that documented oral history materials in northern Oklahoma around the time of the Duke Collection interviews. Here, Adam Le Clair described how "Spongehide fixed everything. He made an old stump, he made the weather cloudy, he made it sprinkle here and there."

The Ponca also had the Rainmaker clan (T-597; Ponca: "Clans", p. 13) – Albert Makescry, who lived on a reservation most of his life, spoke in 1969 about the custom of putting food or water at the head of a coffin: "That's the clan they call Rainmaker. Whenever they put water in, it really rains they say, the way it does. I know it does. I

know that. I don't know how it happens, but it rains so they don't put water there at the grave."

OKLAHOMA ACCOUNTS FROM SECONDARY AND OTHER SOURCES

Various historical and contemporary accounts of Native culture and activities, sometimes written by people who spent an extensive amount of time with a tribe, have described weather and climate knowledge, including rainmakers and storm splitters. These accounts are restricted here to and organized by Oklahoma tribes.

Apache

The 2009 Oklahoma motor vehicle license plate depicts the Sacred Rain Arrow sculpture. This sculpture was created in 1988 by Allan Houser and appeared for a number of years in Tulsa's Gilcrease Museum (The Museum of the Americas), and was displayed in the first-floor Potomac Rotunda of the Smithsonian National Museum of the American Indian in Washington, D.C. The sculpture depicts the legend of a young Apache warrior who was summoned in times of drought to shoot a sacred arrow to the heavens. This arrow carried his people's prayers for rain to the spirit world.

Caddo

Swanton (1942 and 1946, pp. 232-233) portrayed a Caddo forecasting ceremony held in the winter, providing two slightly different accounts. This ceremony involved a mass meeting of the people in which they celebrated the dry meat of hunted animals from

throughout the year and the brewing of tea, culminating in the "wise old men" deliberating and making known their predictions for the upcoming growing season.

Cherokee

Rainmakers were described to have practiced among the Cherokee. Butler (1937-1938, p. 464) portrayed "old time Indian rain makers" stating, "Up to 1914, the rain makers were still active. A large crowd gathered from far and near for the ceremonies, which were held on a (river) bank." Bierhorst's (1983, p. 97) account of spells, prayers and songs of American Indians includes a Cherokee prayer on how to frighten a storm.

A more contemporary account comes from October 2006, when Eddie Glenn, a columnist for the *Tahlequah (OK) Daily Press*, wrote about weather forecasts for the upcoming winter of 2006-07 (Glenn 2006, October 24). The article was distributed nationally by Associated Press, and while criticizing the U.S. Department of Commerce National Weather Service and causing somewhat of a ruckus in Western scientific circles (personal communication with local weather forecasters), it described weather signs as told by Pat Moss, a local man identified in the article. Correspondence with the Mr. Glenn indicated Moss is considered to be something of a "medicine man" in northeastern Oklahoma and may have learned his weather prediction methods from Cherokee elders. Moss used various indicators to tell about the upcoming winter, including importantly the shape of a cut-open persimmon seed. The seed's appearance as a spoon, knife, or fork means different types of winter weather can be expected; that is, a spoon is indicative of a lot of snow, a knife is indicative of excessive cold, and a fork is indicative of a milder winter with less snow. The newspaper article describes other indicators of weather to

come, such as the striping on a woolly bear caterpillar, foretelling a hard winter if it has a thick black stripe.

Cheyenne and Arapaho

Maddux (2010) related how the Cheyenne and Arapaho told the first settlers of Woodward in 1893 that tornadoes would not track along the North Canadian River. This was said to lead to a false sense of security amongst white settlers in the years leading up to the 1947 Woodward tornado, although given the dismissal of most Native knowledge during those times, this seems surprising.

Chickasaw

Cushman (1899) portrayed Chickasaw rainmakers in Mississippi (Debo's 1962 abridged volume, p. 405): "As among all North American Indians, as far as I have been able to ascertain, so too had the Chickasaws those privileged personages, the rain maker, medicine man, and the prophet or seer." Cushman described their roles: "The first, in seasons of protracted drouth, was invoked to exert his mysterious power to bring about an abundant shower; the second to interpret dreams and charm away spells, and the third to life the veil from the dim and mystic future." Of weather prediction in general, Cushman added (p. 434; repeated by Cole 1938, p. 74), "The North American Indian was nearly as certain in predicting the weather as a barometer, and his knowledge of the characteristics of the wild animals of his ancient forests would be a prize indeed to the naturalist."

Richard Green, Chickasaw Nation tribal historian, led me to James Adair's (1775) *The History of American Indians* (Holland Braund 2005, edited volume) for what he

referred to as "tribal rainmakers" when the Chickasaw were in the southeastern U.S. (personal communication, March 19, 2007). Adair spent time among the Chickasaw, Cherokee, Choctaw, and other tribes in the southeastern U.S. as a trader, diplomat, friend, and chronicler of events. His impression that rain makers blamed drought and flood on various breaches of social and ceremonial laws was written about by others and is a recurring theme in how Native peoples believe their own behavior has an effect on occurrences in nature. About Chickasaw rainmakers, Adair wrote (beginning on p. 132):

> When the ground is parched, their rain-makers, (as they are commonly termed) are to mediate for the beloved red people, with the bountiful holy Spirit of fire. But their old cunning prophets are not fond of entering on this religious duty, and avoid it as long as they possibly can, till the murmurs of the people force them to the sacred attempt, for the security of their own lives. If he fails, the prophet is shot dead, because they are so credulous of this divine power conveyed by the holy Spirit of fire, that they reckon him an enemy to the state, by averting the general good, and bringing desolating famine upon the beloved people. But in general, he is so discerning in the state laws of nature, and skillful in priestcraft, that he always seeks for rain, either at the full, or change of the moon; unless the birds, either by instinct, or the temperature of their bodies, should direct him otherwise.

On how the prophets blamed drought on poor behavior, Adair continued:

> However, if in a dry season, the clouds, by the veering of the winds, pass wide of their fields – while they are inveighing bitterly against him, some in speech, and others in their hearts, he soon changes their well-known notes – he assumes a displeased countenance and carriage, and attacks them with bitter reproaches, for their vicious conduct in the marriage-state, and for their notorious pollutions, by going to the women in their religious retirements, and for multifarious crimes that never could enter into his head to suspect them of perpetrating, but that the divinity his holy things were endued with, had now suffered a great decay, although he had fasted, purified himself, and on every other account, had lived an innocent life, according to the old beloved speech: "*Loak Ishtohoollo* will never be kind to bad people."

Choctaw

Cushman (1899) also depicted rainmakers among the Choctaw people in Mississippi; these writings also are posted on the Choctaw Nation website ("Myths and Legends – Choctaw Tribal Rainmakers…fact or fiction?"). From pp. 201-203 of Debo's 1962 abridged volume, Cushman portrayed the rainmaker as such:

> In the matter of rain, the Choctaw Rainmaker truly swayed the scepter of authority in that line of art, undisputed, and was regarded with reverential awe by his people. In all cases of protracted drouth, which was quite frequent at an early day in their ancient domains, the *hut-tak um-ba ik-bi*, (man rain maker) was regarded as the personage in whom alone was vested the power to create rain; therefore to him they went with their offerings and supplications.

Cushman added, however, "But all such delusions vanished before the teachings of the missionaries."

Tingle's (2003) book of Choctaw stories relates in "Brothers" (pp. 83-98) how Joseph split a tornado in half by flinging a hatchet to the ground, causing the tornado's two split parts to miss the town's church.

Comanche

Deloria (2006, pp. 135-148) provides a detailed section on the abilities of medicine men to change and control the weather, and in particular to produce rain. The ability to produce rain was manifested through song and dance given to the spiritual elder in a vision or dream. Several examples are given, including the humorous example of a Comanche medicine man Big Bear, who sprinkled drops of water four times at the sun with the outside tail feather of a black eagle. He was said to have overdone it, though, as

a large cloud grew, producing heavy rain and wind that blew down his tipi near Cache, Oklahoma. His wife scolded him for not asking for a softer rain.

Creek

Stanley (1846, p. 7) said of the Creek people in the southeastern U.S., "They adhere tenaciously to all their ancient customs, with a superstitious awe and veneration, having among them their rain makers, medicine or mystery men, in the potency of whose mysteries, they are firm believers."

Delaware

Tantaquidgeon (1977, pp. 89-90), a Connecticut Mohegan considered kin of the Delaware in Oklahoma, described various observed "weather lore" that foretold weather. These include the behavior of wildlife (tree frogs, quail, geese, chickens, hogs, cats), insects (locusts, spider webs), plants (corn husk, thickness of spring and summer foliage, dandelions), and characteristics of the sky (redness, fog, cloud affects on sunlight, sun shining on snow), wind (speed, direction, rising of smoke), clouds (type, characteristics, sun dogs, circles around the moon, haze concealing the moon), and pond ice.

Hale's edited volumes (1984a, b) on the oral traditions of the Western Delaware of Oklahoma contain stories about the North Wind and the Sun and their argument over who was strongest and would thus control the weather (1984a, pp. 55-57); the boy who made it rain after his community ran out of water to grow corn (1984b, p. 14); and preventing tornadoes by putting an axe toward the high wind to break up the cloud or burning cedar to keep the wind from coming (1984b, p. 29). The second volume (1984b)

also contains a short dictionary of Delaware terms, including those for clouds, fog, rain, storm, thundercloud, weather, and snow, and emphasizes the significance of the turtle and its metaphor for the earth.

Bierhorst's (1995) compilation of the mythology of the Lenape (Unami and Munsee Delaware, the former of which includes people of Oklahoma) includes abstracts of many stories relating to weather, including the origin of humans from thunder [abstract 32]; the origin of winter [34]; the rainmaker Hingee-kee-shu [53]; the origin of the rain-making charm [64]; the story of Cyclone [75]; the story of the Seven Stars (or the origin of the Pleiades) [80]; the girl who joined the Thunders [86]; the story of Indian Summer [124]; the boy who hoped for rain (Thunder's helper) [139]; and the man who visited the Thunders [164].

Kiowa

Momaday has written about the importance of stories in supporting and confirming perceptions of the world (forward to Caduto and Bruchac 1988; p. xvii). Momaday's (1969, p. 48) recollections of his Kiowa upbringing include the story of the "Storm Spirit" (also referred to by Palmer Jr. 2003, p. 106):

> The Kiowa language is hard to understand, but, you know, the storm spirit understands it. This is how it was: Long ago the Kiowas decided to make a horse; they decided to make it out of clay, and so they began to shape the clay with their hands. Well, the horse began to be. But it was a terrible, terrible thing. It began to writhe, slowly at first, then faster and faster until there was a great commotion everywhere. The wind grew up and carried everything away; great trees were uprooted, and even the buffalo were thrown up into the sky. The Kiowas were afraid of that awful thing, and they went running about, talking to it. And at last it was calm. Even now, when they see the storm clouds gathering, the Kiowas know what it is: that a strange wild animal roams on the sky. It has the head of a horse and the tail of a great fish. Lightning comes from its mouth, and the tail, whipping

> and thrashing on the air, makes the high, hot wind of the tornado. But they speak to it, saying "Pass over me." They are not afraid of *Man-ka-ih*, for it understands their language.

Several of my collaborators told me about praying to the tornado to make it pass over or split.

A similar Kiowa account is provided by Maddux (2010):

> Native Americans, who occupied the land long before white settlement, were the first to try and understand violent weather patterns that were capable of causing destruction of their villages and the death of their people. According to Wilbur Sturtevant Nye, Indians believed that the cataclysmic whirlwind had a demoniac origin. An old Kiowa once told him of a day when a great black cloud rushed toward him. In its midst, a hundred feet or more above the earth, was a group of struggling black objects. Suddenly the whirlwind veered and roared past him. In the cloud the Indian saw that the tumbling objects were buffalo.

Greene (2001, 2009) described the works of Silver Horn (*Haungooah*), a Kiowa who recorded events and time in pictorial calendars, including some references to important weather events (Greene 2009). The year 1905 was the "Great Cyclone Summer" coinciding with the Snyder, Oklahoma, tornado of May 10 – more than 100 people lost their lives in this tornado, still considered one of the deadliest on record in the U.S. (2009, pp. 154-55). The image drawn represents Red Horse, the supernatural storm maker who has the upper body of the horse and a long sinuous tail "like a snake" – it whips around the tail "to stir up tornadoes" (2009, pp. 154-55), much resembling Momaday's Storm Spirit. The 1905-06 "Red Horse Winter" represents a tornado that hit Mountain View, Oklahoma, on November 4. That storm was described at the time as "second only to the great Snyder disaster last spring" (pp. 154-56). Calendars for 1911-12 ("Overtaken by a Storm Winter") and 1912 ("Many Storms Summer") represent other key weather events. The winter of 1911-12 is depicted by four men lying face down,

pelted with precipitation (pp. 164-65); a similar depiction of boys lying face down after freezing to death is shown for the winter of 1890-91 ("Boys Frozen Winter"). The calendar for the summer of 1912 is particularly relevant as it depicted several winged horses, signifying how Red Horse visited Kiowa territory repeatedly that spring and summer (pp. 164-65). A small tornado was depicted as Red Horse shaking his ears, while a large one was shown as many horses running. A small tipi is shown in this pictograph, belonging to Charlie Buffalo, Silver Horn's brother, with many people gathering around it. It was said that people would gather around "Grandpa Buffalo" during a storm "as he had the power to make it pass safely by" (p. 165). Personal communication with Greene (June 16, 2009) revealed that she did not find other such depictions of weather shamans like Charlie Buffalo in the calendars. Other pictographs with particular weather references include "Windbreak Winter" (1847-48), "Ice Rising Winter" (1848-49), "Dusty Summer" (1851), "Showery Summer" (1853), "Horse Ate Ashes Winter" (deep snow, 1862-63), "Ragweed Summer" (1864), "Plant Growing Summer" (1870), "Woman Killed by Lightning Summer" (1884), "Peyote Man Died Summer" (a medicine man said the white people would be swept from the earth by a strong wind, 1888), "Rainy Summer" (1907), and "Struck by Lightning Summer" (1928).

Seminole and Shawnee

Lyon's (1998) encyclopedia of Native American Shamanism includes entries for weather shamans. Of them, he states (p. 384), "Many shamans have the ability to control rain, wind, fog, and other elements associated with the weather." Of shamans documented in Oklahoma-related tribes were Seminole shamans who made rainmaking

devices (pp. 384-385) and a Shawnee shaman who secured rain or cool weather for his people (p. 385).

Wichita

Curtis (1930, pp. 74-80) describes in great detail the rain ceremony of the Wichita that involved a hunter given the power to bring rain after successfully bringing meat to the "water monster." The hunter is told: "Everything that you told me was truthful. You asked my help and I gave it to you. You asked for rain. It is not hard for me to bring rain, because I know all about making it. Now, I am going to give you that power, and when you undertake to do as I have done, I shall know it. If you follow my instructions carefully, it will rain."

RELEVANCE OF HISTORICAL CONTEXT TO THE FIELD STUDY

The knowledge described in this chapter, as provided by tribal representatives around the country to Senator Kerr and his aide Ben Dwight in the early 1950s, as culled from the Doris Duke Collection in the late 1960s and early 1970s from Oklahoma tribal elders, and gathered from other secondary sources, serves as valuable historical and comparative context for what my collaborators told me (described in Chapter Six) and allows us to draw links to the past. The information from Kerr and Duke Collections was provided by people who were approximately the same age as the grandparents and great-grandparents of my collaborators (and for the elders I talked to, perhaps parents). As will be shown in Chapter Six, my collaborators received basic observational and performative insights as children and young people through intergenerational transfer

from these elders, and many of those I spoke to have since carried on the traditions of observing and using them. Many of the insights provided in these archives and others sources are similar to what was told to me during fieldwork and appear to be common as general knowledge across tribal boundaries as well as through generations, though the exact details can vary. As such, this knowledge from the past, as shown through the progression of time from the early 1950s through the early 1970s and then to today, provides valuable context to what is known today and attests to the power of intergenerational transfer, and infers the value of this transfer within Native society. Although I have not been able to verify this, it is possible that some of my collaborators may be related to the people interviewed for the Duke Collection. The information revealed in the secondary sources documented here is particularly revealing of the performative aspects of Indigenous knowledge (e.g., rainmaking and storm splitting) that will be shown in Chapter Six to live on today. Where possible, knowledge described in this chapter is linked to the knowledge expressed by my collaborators in Chapter Six.

As a result of the intergenerational transfer of this knowledge, it possesses a cultural situatedness or value for Native peoples that will be explored in Chapter Ten. To the people from the past and to those I spoke to, it is Native insight. My collaborator Randall later describes how, in his discussions with tribal members from other places across the country, "All the tribes had the same kind of beliefs and teachings." The Gros Ventre informant who responded to Senator Kerr in 1951 lectured that "there is much – very much – that the Whiteman fails to appreciate because he doesn't study…the 'Indian's way' that would contribute greatly to the progress and advancement of the Whiteman's civilization." The value of this knowledge to Native peoples then lies in part

to a desire to remember and maintain the ways of their ancestors – as Mistry (2009) described earlier, it maintains a "social memory." Although many of the observational indicators described in this chapter, and the insights created from them, resemble the locally-produced knowledge of any land users, Native peoples both in the past and today seem to have taken ownership of these as somehow unique and special to their cultures due to their transfer from relatives and to conceptualizations of intimacy and reciprocity with the non-human world that will be explored in later chapters.

CHAPTER FOUR

A CONVERSATIONAL EXPERIENCE – RESEARCH *WITH* INDIGENOUS PEOPLES: FIELDWORK AND ANALYSIS METHODOLOGIES

Davis (2008, p. 51), in reflecting upon years of fieldwork with Indigenous people, called it "…an adventure, a voyage into the unknown. How will the local Indigenous people receive me? What will I say I am doing? What will I say is my purpose? How will I introduce myself?" These were the feelings, questions, and doubts I had as I set up my fieldwork plan. Davis encouraged those embarking on such endeavors that well-planned fieldwork thoughtfully conducted and recorded in detail will stand the test of time. Nakamura (2010) suggested that researchers approach Indigenous communities from a learning perspective, as this encourages open-mindedness and sensitivity, and should be prepared and willing to refine their research questions and to continue their literature searches after their fieldwork is completed. These strategies help limit misinterpretation and exploitation of Indigenous knowledges and peoples.

Raj Pandya said, "Yogi Berra is reported to have said a whole lot of things, including 'You can observe a lot just by watching'…I'd suggest, instead: 'You can hear (learn) a lot by just listening.'" (Pandya 2011, January 19). This chapter first reviews what has been written about methodological do's and don'ts involving research with Indigenous peoples, then describes my data collection and analysis methods.

RESEARCH *WITH* INDIGENGOUS PEOPLES

Many Native Americans are not satisfied with the manner in which outside researchers have depicted them in scholarly writings (e.g., Mihesuah 1998). They do not

consider themselves "objects of study" nor, as Institutional Review Boards (including the University of Oklahoma's) refer to them, "human subjects" (I am using the term "collaborators" throughout this work). Viable works on Native history and culture should include Native versions of events and not just history or culture interpreted by others. The Cherokee Nation of Oklahoma has taken steps to monitor research conducted on its tribal members because of "volumes of incorrect and repetitious history" (Mihesuah 1998, p. 11). Archival research needs to be supplemented by communication with the people in question (Wilson 1998). A common problem is not with what is included, but with what is not included – often, archival scholarship is good, but "the search usually ends there" (Mihesuah 1998, p. 4).

Scholars "can find Indian voices – if they bother to look" (Mihesuah 1998, p. 5) although the use of oral accounts is not easy because there is no one "Indian voice" – even members of the same tribe or family may have different interpretations of the same stories or events. Fair (2007) found this to be the case when researching the social networks and knowledge systems of the Caddo and Delaware in western Oklahoma. Informants also have been known to "pull the leg" of researchers, and not every aspect of Indigenous knowledge may be held sacrosanct by all community members (George 1999). However, despite such obstacles, Mihesuah (2005) wrote that it is racist to purposely omit using Native voices. Non-Indian scholars who have attempted to produce American Indian history without listening to the stories generally limit their forms of evidence and analysis to written accounts, professed theories, and devised methodologies (Fixico 1998). Wilson (1998) suggested understanding oral tradition is the key, and for scholars to think that they can sift through written sources to sufficiently understand the

Indian perspective is "presumptuous and erroneous." Instead, acquaintances should be slowly and deeply developed and those involved in the research should be given the opportunity to comment on the work while it is being written. Frey (2004) suggested understanding oral tradition from the perspective of the Indian storyteller – to see "from the inside looking out."

Concerns about loss of intellectual property and cultural appropriation by researchers have become more frequent (e.g., Berson 2010). Pualani Louis (2007, p. 130) stated, "The doors previously open for doing research on an Indigenous community in the name of science are closing." In September 2007, the United Nations adopted the *Declaration on the Rights of Indigenous Peoples* (United Nations 2008) that includes language regarding the Indigenous right to maintain, control, protect and develop traditional knowledge (Article 31, p. 11). The *ex situ* archival of Indigenous knowledge (e.g., Agrawal 1995), often carried out in development projects (see the previous discussion of the UNFCCC) and well intentioned, can recolonize and decontextualize Indigenous knowledge by severing it from the cultural connections that give it meaning (e.g., Semali and Kinchloe 1999). Menzies and Butler (2006) cautioned to researchers that Indigenous expression of traditional ecological knowledge might be part of a movement toward political sovereignty and greater control over natural resources. They may be reluctant to have their knowledge recorded and taken away, and as such they may not reveal the most important aspects of it. They also may not provide information about things they personally feel they do not have the right to discuss. All of these can result in incomplete or erroneous research findings even when native voices are included. Chickasaw historian Richard Green (personal communication, March 19, 2007)

cautioned that I might have trouble eliciting information on rainmaking, for example, information that is still held privileged by tribal people general. Green told me "If anyone responds to my note about you I will contact you" (he never did). Researchers may encounter gatekeepers such as Green who provide or limit access and filter information (e.g., Campbell et al. 2006).

Pualani Louis (2007) promoted an Indigenous research methodology that differs from Western methodologies in four ways: (1) the methodology must be accepting and advocating of the Indigenous knowledge systems uncovered; (2) it must position the Indigenous community members and the researcher within the research (by making them collaborators, in effect); (3) it must give regard to the needs of the community when devising the research agenda (that is, research should not be conducted simply because someone received a funding grant); and (4) it must share the written results of the research directly with the community (and even allow the Indigenous collaborators to see and comment on a final draft). Research that is approved should be carried out respectfully and ethically – it must include involvement of the Indigenous people and it must provide adequate benefits both for the Indigenous people and the researcher. Regarding point (3), Mihesuah (1998, p. 4) added that researchers should not impose themselves on Native peoples: "Sensitive researchers know that if tribes are not willing to aid them they should abandon the project." And, point (4) – the researcher giving results back to the Native community – is crucial. Mihesuah (1998) related how the Institutional Review Board at her university (Northern Arizona University) asks researchers up front why they chose their projects and if the findings will benefit the tribes or the authors.

Confidentiality and anonymity often are demanded by Institutional Review Boards and promised by researchers to protect sensitive research informant information from being misused, unless informants sign away such rights through informed consent. Confidentiality can be protected by encoding material or data, for example. Anonymity can be protected by using pseudonyms to refer to research participants or by identifying them only as part of a group. According to Svalastog and Eriksson (2010) this practice is so prevalent among researchers that it is treated as automatic and a standard requirement for approval by Institutional Review Boards. However, they point out that this can lead to misrepresentation and intellectual theft when doing research with Indigenous peoples. They instead advocate the use of names so that the source and owner of the knowledge is properly acknowledged. In all but one case, my research collaborators agreed to let me use their names, and I have. Some have even gone so far as to allow Native research participants to "speak for themselves" (e.g., Fair 2007), which I also do. Watson and Huntington (2008) did this by using an autobiographical method to narrate their respective portions within the co-production of knowledge of a Koyukon Athabascan moose hunt to, among other things, reflect conversations they had in the context of the hunt. Watson, a researcher, and Huntington, a hunter, shared a "single epistemic space" to co-produce a narrative that respected the entirety of the knowledge. Still researchers must be careful to balance the potential benefits of the research – such as advances in practical or theoretical knowledge and increased understanding of those researched – against the possible costs to those being researched – such as affronts to dignity, embarrassment, loss of trust, and loss of self-determination (Nachmias and Nachmias 1981, Chapter 13).

Finally, from the point of view of research with Indigenous peoples within the field of geography, Herman (2008, p. 75) proposed that to peer into the Indigenous worldview, an "Indigenous geography" is important for "looking to (or, looking *through*) societies in which other value systems and integrated worldviews are still operational," affording a more passionate study of the natural world that values the meanings of activities and occurrences. Johnson and Murton (2007) similarly suggested that the absence of modern Native voices in discourse on nature perpetuates the colonial rupture between culture and nature and has led to the "disenchantment" (placelessness) of Western thought on nature. A critique of Indigeneity in geography in general and the importance of efforts to "re-imagine" and decolonize it can be found in Shaw et al. (2006). Johnson et al. (2007) advocated the decolonization of the interaction with Indigenous peoples during research as a primary goal of an "anti-colonial" line of inquiry in geography. Smith (1999, p. 39) explained that, from the Indigenous perspective, the act of decolonizing research is about "centering our concerns and worldviews and coming to know and understand theory and research from our own perspectives and for our own purposes."

As I performed my field research, I tried to keep all of these things in mind.

DATA COLLECTION METHODS

Interviews

I conducted semi-structured interviews as my main method of data collection (e.g., Spradley 1979; Bernard 2006). My Institutional Review Board-approved interview guide (Appendix A) includes a number of topical areas, including background

information about the collaborators and their heritage, their weather knowledge and how they form and use it, their views on human/non-human relationship and the importance of their own observational and experiential knowledge in a modern world, how they farm, ranch or garden, how they network (the social and farming institutions they are involved in), and whether they have observed climate change and their views on the climate change debate. My conversations lasted anywhere from 30 to 100 minutes. They were recorded with a digital recording device and I transcribed them. I also took extensive notes during interviews about various contextual and observational points beyond what was recorded and typed these as field notes once I arrived home from an interview. While the interview guide appears rigid, it often was loosely followed, as I let the collaborator guide the discussion's flow; when people wanted to talk, I let them. "Chewing the fat" before, during, after interviews sometimes elicited more interesting information than my scripted questions and allowed for unanticipated insights and issues to surface, such as the point of "doing things ourselves" (e.g., Crane et al. 2010). My first interviewee, Garrett Tartsah, talked for over 10 minutes before I ever asked a question or was able to have him sign the informed consent form (Appendix B); fortunately my recorder was on. During this time he told me about how he knew there would be a dry spell because the beavers were building dams on his property. The Institutional Review Board-approved research protocol is shown in Appendix C. I tried to make the interview experience as comfortable as possible while still eliciting the information I needed to answer the questions. In the more public locations, we sat off in the corner and I allowed the collaborator to keep his or her back to the patrons if desired. I also let the collaborators pick the time and place for our interviews.

Six interviews were conducted at Temptations Restaurant, located inside the America's Best Value Inn & Suites Motel on the east edge of Anadarko (described as the best restaurant in town by my collaborators); two each were held at the Anadarko Community Library, Redstone Baptist Church in rural western Caddo County (which dates back to Oklahoma statehood), and Langston University-Oklahoma City Campus; and one each was held at the Caddo County Fairgrounds, the National Hall of Fame for Famous American Indians, and Indian City Lanes bowling alley, all of which are in Anadarko. One informal interview (more of a conversation) with someone who wished not to be identified was conducted at an undisclosed location. I was "stood-up" three times early on. All 15 formal interviewees signed the aforementioned informed consent form that allows me to use their names, which I desired in order to allow them to speak in their own words and tell their own stories, and to allow them to receive proper credit for their insights and views. Thirteen of these interviews were recorded and transcribed, while two were captured through note taking. Contextual and background information for each of these 15 collaborators is contained in Chapter Five.

Participant Observation and Field Observations of Real-Life Situations

A second field data collection method consisted of participant-observation activities and experiences of various types, including field observations of real-life situations at meetings, conferences, and other gatherings. Jackson (1983) helped define the notion of participant-observation research for application by social geographers. At the time he deemed it has having potential as a "new" type of humanistic geography that provides a method of inquiry to "transcend the epistemological gulf between 'insider' and

'outsider' status" (p. 43), allowing a researcher a way of obtaining his or her data in ways that have meaning for the respondents (Vidich 1955). The researcher can assume the roles of "participant as observer" and "observer as participant" (e.g., Gold 1958), roles I assumed.

These experiences totaled 18 (described in Chapter Five), including: my first meeting with the four farmers in Anadarko to discuss the possibility of my research (1); Langston University Annual Small Farmers Conferences (3); Apache Tribal Environmental Camps (3); Anadarko museum visits/meetings (3); Mvskoke Food Sovereignty Initiative Symposia (2); Anadarko Conservation Meeting (1); Oklahoma Tribal Conservation Advisory Council Workshop (1); Langston University Beginning Farmers Program Meeting (1); International Summit on Indigenous Environmental Philosophy 2010 (1); 79th Annual Indian Exposition and Fair's Native American Vegetable Contest (1); and the Keepseagle Settlement meeting (1). I most often acted as "participant as observer" but also acted as "observer as participant" in some, and in all I engaged in conversation that served as additional material beyond what I heard in interviews. These activities allowed me to establish a presence, meet other people, and become closer to the Native farming and environmental communities. They also allowed me observe what is going on in both Indian Country and within the Native farming community in order to develop context around which to understand what the collaborators were telling me. In almost all cases these experiences were positive. Data collection in these cases consisted of extensive field notes taken during and after each event, which I typed once I returned home, and include both the impressions made on me during the events and the reflections I made after the fact.

Sampling and Representation

My field data collection was a non-random sample of opportunity obtained through initial contact suggested by two Oklahoma State University extension agents and enhanced through the resulting connections made to people like Randall Ware and Maya Torralba and who they suggested, and ultimately populated by the people who agreed to spend some time with me. Formally, this is known as the snowball method of eliciting further informants and contacts from people with whom I have already interacted, including those I might run across unexpectedly by virtue of being in the right place (such as my interview with Bob Beckwith). I ultimately talked to people covering a broad spectrum of ages, ranging from the early 20s to the upper 70s, including four women, and to some who would consider themselves more as traditionalists than agriculturalists. There was no attempt made to obtain representative samples through a comprehensive survey,.

As such, this was not an immersion study, and I do not propose that my findings are generalizable or definitive. Rather, they are highly suggestive, representing the rich responses of the people I talked to and how, for example, they conceptualize weather and climate and how it factors into their daily lives (e.g., Crane et al. 2010). As described above, I tried to "look through" (Herman 2008) and "understand, from the inside" (Berque 2010) the people I have interacted with, from their point of view and their own discourses (Crane et al. 2010). In other words, I desired to understand the knowledge of the farmers, what makes them tick, and how they are trying to make their way in the world, and this was accomplished. With the people I talked to, I would like to believe that "we all produced this narrative" (Watson and Huntington (2008, p. 277). I

transcribed interviews myself rather than hiring someone to perform this task. I wanted to be able to capture not only the words people said but also what is between them (Underwood 2009, September 21) – to "hear between the words." The notes I took during interviews and my memory of the listening sessions with the collaborators – their body language, facial expressions, tone of voice, etc. – helped me to do this. Johnson (2008) suggests this freeing oneself from the typical convention of the "disembodied objective researcher" helps recognize and identify each person's positionality so that you can indeed speak from an integrated place, allowing all voices and ideas to be heard. This path provides space not only for the many perspectives and voices of those involved in the research through, for example, heavy use of direct quotation (e.g., Crane et al. 2010), but also the perspective of the researcher.

Bias

Although Randall Ware was my primary portal into Indian Country, I was careful to branch out from his sphere of influence. He is well respected among the tribes and farmers and as such is an invaluable confidant, but it was important for my fieldwork to not be completely associated with him or his work, especially with respect to local perceptions of me if something changed to affect his reputation. Affiliating one's work with an established leader or a particular group can have the affect of alienating one from other collectives of people. Fair's dissertation (2007) described how she met resistance to some groups in Indian Country once she associated with others. At times, dissenting viewpoints were expressed by my collaborators (particularly with regard to reliance on local observational indicators, specific farming techniques such as no-till wheat farming

and their environmental friendliness, and some of the activities falling under the category of agricultural independence) and are captured appropriately. So, in a limited sense, I was able to see different sides of the farming story. My last several interviews (beginning with collaborator Maya Torralba) helped me break out on my own, which had been enhanced by over a year's worth of visibility in the community, and provided diversity amongst those I spoke to (e.g., not all are involved in the efforts of agricultural independence). I also learned about or showed up at some of the gatherings on my own. For example, I learned of the Veggie Contest on the Internet and invited myself to it, even though I found out later that Langston and Randall had organized it. Once I invited myself, I was asked to judge. I know in retrospect that I should not have been allowed to attend the Indigenous Environmental Philosophy Summit, but I was allowed in. I sat off to the side and minded my own business, but several people came over to welcome and talk to me.

My early interview no-shows may have been the result of reticence to speak to me (a non-Native person) at all. Even those with whom I spoke to at times seemed to be hesitant to provide me with the full details of their knowledge. Self-reporting, as a way for people to provide information, also can result in a person's over-reporting their levels of knowledge or competency (Pearce et al. 2011), which may have occurred a couple of times as well. In the end, though, people were extremely kind to me and are interested in my work, which I intend to share with them.

ANALYSIS METHODS

The framework for my themes was determined *a priori* through the development of the topical categories in my interview guide (Appendix A), so the analysis described here was used to flesh out or drill down inside my interview transcripts to identify common or recurring sub-themes, often at more than one level, and allow for the correct placement of key quotations supporting them in Chapters Six through Ten. This *a priori* pre-research or theory-driven approach differs somewhat from strictly data-driven approaches such as grounded theory, in which data are analyzed without application of pre-conceived hypotheses or notions about what to expect. However, how I developed sub-themes, and further sub-themes below them, was strictly data driven.

I coded, or applied labels to, each quotation in the interview transcripts (e.g., Patton 2002; LaDue et al. 2010) to allow the organizing and sorting ideas into common or emerging strains of thought (thematic analysis, Boyatzis 1998; Rowles 1978). This is a task that several popular software packages can perform, recently described within the geography literature by Kwan and Ding (2008). However, I did this on my own. For example, I coded each quotation with the collaborator's name and with a theme or sub-theme. For what became Chapter Six on the collaborators' weather knowledge, I used the sub-themes "animal", "plant", "meteorological", "celestial", and "performative ritual" to denote the different types of weather knowledge I heard. I then sub-coded these sub-themes. For example, under the sub-themed "animal" I sub-coded "beavers", "cattle and horses", "squirrels", "deer", "ants", "turtles" "birds", "fish", and "buffalo". I performed a similar exercise for the field notes I took during participant-observation encounters in order to include this information into the thematic analysis as well – these notes

contained my personal impressions as well. All of this allowed me to systematically sort and position the data I collected, and guide the process of letting the collaborators speak in their own words. Discussion and analysis that follow the collaborators' thoughts are mine, but to be authentic these represent all involved in the research relationship; these are not necessarily applicable to others, though they may be suggestive (Rowles 1978). Fair (2007, p. 36) said, "This is the story of what I heard and saw, what I was told and learned, what knowledge I accumulated up to this point and how I made sense of it all."

The only attempt made here at a quantitative analysis was by running the compendium of direct quotations from my transcripts through the online word analysis program Wordle (Wordle 2009). This program produces a "word cloud" that allows a visual representation of keyword prominence, which displays a measure and inference of the importance of each. The graphical representation of this analysis is shown in Chapter Ten.

CHAPTER FIVE

MY FIELDWORK PATHWAY – MAKING CONNECTIONS, THE COLLABORATORS, AND PARTICIPANT-OBSERVATION ACTIVITIES

MAKING CONNECTIONS

How does one get started in this sort of fieldwork? I knew I wanted to talk to people who spend a good deal of time outdoors and who need to observe the weather and be aware of it for their activities. I settled on agriculturalists after I described what I wanted to do to local Oklahoma State University Agricultural Extension Agent, Albert Sutherland. He gave me the names of several county agricultural extension agents in Indian Country – those parts of Oklahoma in which tribal populations remain abundant and relatively strong. Crane et al. (2010) also consulted with agricultural extension agents in Georgia in order to help identify farming informants. I wrote to these agents, and the agent in Caddo County, David Nowlin, where Anadarko is located, quickly replied to my query. He said he knew of a fellow that works with Native farmers that might be able to help me. He copied this person in his response to me. Within 13 minutes I heard from this person, Randall Ware, who enthusiastically offered his support and organized the initial February 11, 2009 meeting (see Chapter One).

Other correspondence with extension agents on January 30 and February 2, respectively, involved Rick Clovis, the Creek Nation 4-H Educator, and Doug Maxey, the Okmulgee Agricultural Educator – each suggested I contact Vicky Karhu, the then executive director of the Mvskoke Food Sovereignty Initiative in Okmulgee (MFSI). She wrote back to me, indicating the MFSI would be "glad to speak with me" and would "help out any way that we can." She suggested I speak with Ben Yahola, a co-director of

the MFSI who interacts with the community's more traditional members. Although he did not respond to me, I was able to meet with both at the 2009 Langston University Small Farmers Conference.

Given the success in getting connected with Randall and his grassroots organizations, I decided not to work directly through specific tribes. It turns out that most of the southwestern Oklahoma tribes (Kiowa, Comanche, Apache, Wichita, Caddo Delaware) are involved in some way or another with the Langston and grassroots activities, so I knew I would be able to talk to people from those tribes. As described earlier, I worked with Randall and collaborator Maya Torralba in particular to line up interviews and to attend and participate in various agriculture and community meetings, activities, and functions, such as small farmer meetings and workshops, conservation meetings, food sovereignty symposia, and environmental camps for children to learn not only about weather knowledge but also what was going on in farming and to better know the people and the communities.

While I was not able to devote the time (nor had the resources) to embed myself in the community for an extended period of time, I was able through targeted visits to develop a "closeness" to the community such that those I have spoken to now greet me as an old friend, engage me in conversation, and introduce me to others. I often run into someone at Anadarko's apparent convenience store of choice, a Valero Gas Mart. I did not get so close so as to be directly invited to cultural activities such as tribal pow-wows or dances, but I did attend some events that included them. These include singing, drum, prayers, and ceremony at the International Summit on Indigenous Environmental Philosophy in April 2010, War Dances with drum and song that were part of the Jacobson

House theatrical performance of the story of the Kiowa Five in May 2011, and the drum and song that accompany the Kiowa and Pawnee Snake Dance and the Southern Plains Fancy War Dance as demonstrated at the Smithsonian National Museum of the American Indian in September 2011.

I have been able to develop with my collaborators a reciprocal relationship of helping each other achieve our goals. While the collaborators shared their knowledge with me, helped me spread the word about what I was doing, suggested people for me to talk to, and embraced me, I have participated in events that gave back to the community, such as the tribal environmental camps for children and the vegetable judging contest. The advice and assistance provided both before and during field research, and ultimately the intellectual insight shared by my collaborators and others, have been invaluable. My experiences in Indian Country in the end were a rewarding privilege.

THE COLLABORATORS

To better situate and contextualize what my collaborators told me as presented in later chapters, I provide here descriptive information about each of them as obtained during interviews, field notes, informal conversations, and other leads I have followed. The collaborators (not including the one who wished not to be identified) are presented in the order I formally spoke with them.

Garrett Tartsah

Garrett Tartsah and I met at Temptations Restaurant on the morning of July 21, 2009. Randall was there to help kick things off and sat with us for a while, but I already

knew him from the February 11, 2009 introductory meeting. Randall has referred to Garrett as "Mr. Haney" from the 1960s television program "Green Acres" because he seems to know everything about farming – Randall said, "I don't know how he knows things." Garrett is Kiowa and he and his family resides in Caddo and Kiowa County area. He said, "I grew up five miles west of here (Anadarko) but I've always been a country boy. That's where I would prefer to be." He has a high school education. He started working with farmers as a child and has been very helpful to the younger farmers in building fences, repairing dams, carpentry, and diesel mechanics. Randall refers to him as a teacher. He is a full-time farmer and owns horses, and has been doing so for more than 15 years. His family has been involved in agriculture of some sort since the 1920s, particularly raising horses. His brother Rudy Jr. helps him farm approximately 500 acres, leased from his brother and sisters, and when I spoke to him his fields were planted in no-till wheat, alfalfa, and hay for grazing. He is very involved in the Kiowa Tribal Conservation District and the grassroots organization Kiowa Native Farms LLC. He said "they are coming together and growing together day by day."



Figure 2. Temptations Restaurant sign, July 2009.

Milton Sovo

I met with Milton immediately following my interview with Garrett Tartsah, also at Temptations Restaurant. He gave me his business card, which shows a picture of a horse. Milton is Comanche and lives in the Elgin area. He has a Bachelors degree from Cameron University in agronomy, animal science and soil science. He has had a lifelong interest in weather because as a child a tornado hit the Walters area where he grew up on a farm. He explained, "My weather knowledge is self-taught – like say from the time I went through that experience, and I began to find books and find other articles about weather." He went on, "And then my dad always taught me to look at the signs, the

animals, the insects, and the clouds and different elements that tell you kind of what the weather's going to be, or how it's going to react, or whether we're going to have a hard winter, or whether it's going to be a dry year, you know, things like that." His grandfather and father were farmers, and while growing up his family mainly raised corn and feed grains, plus alfalfa, wheat, and peanuts. He has worked for the Caddo Nation as its transportation director and also has worked as a natural resources and land manger with the tribes for the Bureau of Indian Affairs. He directly farms 130 acres, but his overall operation exceeds 900 acres, with most of the land leased out. He mostly produces feed for his animals. He said, "We're not in it for money – my wife calls it 'Gentleman Farming'." Milton has land on the Canadian River, south of Anadarko along the Little Washita River, in northeast Comanche County around Sterling, and then east of Walters just above the Waurika Lake near where he grew up. He had to sell his cattle during a recent dry spell but still has a few horses. He farms with his brothers and sisters, and was growing no-till wheat in rotation with alfalfa and grass. He also is involved with Kiowa Farms LLC and likes to share his knowledge with younger farmers.

Rudy Tartsah, Jr.

I spoke with Rudy Jr. on August 19, 2009 at Temptations Restaurant. He was honored by Langston University in May of that year as its Farmer of the Year. He graduated from Riverside Indian School and attended college at Southwestern Oklahoma State University, Haskell Indian Nations University, Bacone College, and Cameron University. He studied journalism, physical education and sports medicine. He said when he was growing up he wanted to become a meteorologist but ended up being a

journalist. He also is an associate pastor in the United Methodist Church and was to become a pastor in 2009; his father also was a pastor. Rudy Jr. is Kiowa and has spent much of his life in Oklahoma, but also lived in Alberta, Canada. Five generations of his family have lived in Oklahoma, so he even though he has spent time in other places, he feels a strong attachment to this place. His grandfather Charles was a farmer. He considers himself a "side job hobby" farmer and rancher and had been involved in agriculture for only about a year when I spoke to him; he also works for Horse Construction and has his church activities. He was attempting to start a radio station with programs on Native news, traditions, and sporting events. He also was going to run for president of the American Indian Expo that is held each summer at the Caddo County Fairgrounds. He is very involved in the Kiowa Tribal Conservation District and Kiowa Native Farms LLC. His brother Garrett helps him with farming, as do Randall and Ricky. He said, "Anything we can help each other with." They will cut each other's hay, help with their cattle, or water their horses. He greatly values Randall's connections in the farming community. He shares his knowledge with friends in "pickup truck conversations" that include discussions about the weather, but since he is relatively new to agriculture he is mostly soaking up information from others. He farms about 130 acres in two places, most of which he leases, near Carnegie and just west of Anadarko, and intended to expand to lease an additional 380 acres in January 2010. At the time of our conversation he was rotating no-till wheat with alfalfa, and was hoping to get about 30 bushels per acre. He also has about 50 head of cattle and two horses.

Ricky Horse

Ricky is an extremely affable man with whom I have interacted numerous times in addition to the introductory meeting in February 2009 and our interview session on September 2, 2009 at Temptations Restaurant. I have run into him at random places like the Valero Gas Mart in Anadarko. Randall once said, "Call him by his Indian name – Little Beaver" (which produced laughs). Ricky is Kiowa and was born in Mears, and attended high school in Carnegie. He has taken some classes at a vocational college. His roots are in the Wichita Mountains though he now lives in Caddo County. At least five generations of his family have lived in the area. Ricky is both a farmer and rancher, and has been involved in it most of his life in some way via his father and grandfather. He does this only part time, however, as he also owns Horse Construction. The inner circle of Randall, Garrett, and Rudy Jr. help him with his farming efforts. He farms and owns 148 acres that are mostly in hay and alfalfa, with some no-till wheat. At the time of our conversation he was the chairman of the Kiowa Tribal Conservation District and is involved in Kiowa Native Farms LLC and the Oklahoma Tribal Conservation Advisory Committee (OTCAC). He said he wishes there were more people trying to get Native young people into farming and ranching. He likes to have early morning coffee conversations about farming and weather with his friends, and does so several times a week.

Randall Ware

I interviewed Randall on September 2, 2009 immediately following my interview with Ricky, also at Temptations Restaurant. Randall is Kiowa and attended college,

studying wildlife, forestry and conservation. He lives in Fort Cobb and his family has lived in the area since removal, or as he put it, "the head hunter days" (laughs ensued). As such he feels a strong attachment to the area and the people who live in it, which motivates his outreach activities. He formally has been a farmer and rancher for five years but has been involved in agriculture in some way all of his life, saying, "I've always labored in farming." His said his grandfather, Aut-Daugh, was the first farmer in the Kiowa tribe, and his grandmother raised chickens and sold eggs around Carnegie – she was well-known for her eggs. Randall plants and harvests 240 acres of no-till wheat and raises seven head of Black Angus cattle. He was in the process of acquiring another 50 head when we spoke, and apparently is the only Ware now farming or ranching on a large scale. He spends most of his time organizing the activities of the southwestern Oklahoma farmers, as the extension outreach specialist for Langston University's Small Farmers Program, president of Kiowa Native Farms, LLC, and organizer of the Indian Country Agricultural and Resource Development Corporation. These activities mainly serve seven tribes in southwest Oklahoma (Kiowa, Comanche, Apache, Wichita, Caddo, Delaware, and Fort Sill Apache), with some activities also reaching to the Cheyenne and Arapaho. He teaches Langston's Beginning Farmers Program in southwestern Oklahoma, and extends information on various USDA programs. Randall is on the board of the Kiowa Tribal Conservation District and is involved in the Intertribal Agricultural Council, the Native Conservation Advisory Council, Native Women and Youth in Agriculture, and Heifer International. Randall was appointed in 2011 to sit on the USDA Strategic Action Team Advisory Board, formed as a result of the Keepseagle settlement (see next section), to assist and advise on ways USDA programs can better serve minority

farmers and ranchers. All in all, Randall is the Pied Piper amongst this community for making farming and ranching available to as many people as possible. Randall said he and the other farmers "debate a lot" on the weather, such as whether it will rain or not.

Alan Dee Kaulaity

I met with Alan on November 4, 2009, in the Anadarko Community Library after a conservation meeting there on growing castor beans as a biofuel. Alan is Kiowa and is a bit younger than most of the people I talked to, and has an extremely close bond with the land. He attended one year of college at the University of Central Oklahoma. He is from the Anadarko area, but has traveled the country extensively as a journeyman construction worker because of lack of work in the area. This included construction work on tall skyscrapers. He sent money home to his family (he "sacrificed his life" on their behalf) although he lamented he was never paid enough, but invested some of it so he could start his own construction business. He believes based on his experiences that he can teach people "how to work." He said he has traded out leases with his relatives by building fences and cleaning out the land, taking care of animals, and tending to vegetable gardens, all of which has allowed him to amass over 1,000 acres to farm. Alan believes that more than four or five generations of his family have lived in the area, and remarked that his last name means "man with many wives" (laughs ensued). He said that his great grandmother was captured by the Kiowas before the tribe was removed to Oklahoma – she had a mixed blood line, resulting in his grandmother having blonde hair and blue eyes – the only Kiowa with these characteristics. This means that every couple of generations there is a child born with lighter hair and blue eyes, including his daughter.

His grandfather had a profound affect on his life when he was young, walking him through the countryside. This has allowed Alan to learn not only the land but also the vegetation and animals on it, key to his view that, "I could survive off the land." He said this knowledge acquisition growing up has made it easier to farm now. Alan raises cattle mostly and grows hay for them, and grows some no-till wheat (he said he plows only about 10 percent of his land), and has been doing so for close to ten years. His one grandfather was a gardener until he was nearly 100 years old – his grandparents raised vegetables and fruits – but Alan is the first in his family to raise cattle. He is trying to make ranching and farming a full-time endeavor in order to get out of the construction business. He blamed recent floods on adversely affecting both his farming and construction operations – construction projects and fences were washed away, and crops and animals were lost. He does not use fertilizers or pesticides because he cannot afford them and instead survives by "bumming seeds" from his neighbors and sells or trades out cattle as needed, and watches the seasons to limit pests and weeds. He allows his cattle to graze on natural buffalo grass. His children and friends are his main sources of farming help – "whoever's available." He felt he was "going it alone" but was getting more involved in Randall's support activities, and during my time in Indian Country has become more involved based on participation in the Langston Small Farmers Conferences. He won one of its Farmers of the Year awards in 2010.

Larry Snake

I had first met Larry and signed him up for an interview during the April 8, 2010, Beginning Farmers Program workshop in Anadarko. My attempts to contact him after

that failed, but at the Langston Small Farmers Conference on May 27, 2010, he sat next to me during a break and said, "Sorry I didn't respond to your e-mail, things have been crazy. Want to talk now?" So, we talked on and off through the break, lunch, and another break, and as such I was unable to record our conversation. Larry is a member of the Delaware Tribe of Western Oklahoma. He has a high school education and "grew up in the city" but now lives in the Anadarko area. Larry is not a farmer but his grandparents were, and said that unlike the Kiowa, the Delaware were farmers. His family has been in Oklahoma since the 1850s when the cavalry brought the Delaware north from Texas into what he called "The W-C-D" (Wichita-Caddo-Delaware portion of southwestern Oklahoma). He said this spans only four generations of his family because his great grandmother lived to be 113 (1855-1968) and his grandmother lived to be 104 (1896-1999). Larry's grandparents were beef ranchers but also raised vegetables for food and for sale, such as potatoes, corn, and cucumbers. When Larry was young he visited their farm in the Anadarko area during summer vacations and would help pick corn or hoe the gardens, which he said was hot and difficult work for a city boy. At the time of the interview Larry was attempting to join up with Kiowa Native Farms LLC and was continuing his participation as a student in the Langston Beginning Farmers Program.

Sandy Wade-Penn

Sandy and I met in the Langston University-OKC building on June 2, 2010. She is the program manager for the Langston's Small Farmer Outreach Training and Technical Assistance Project and helps oversee Randall's activities. She has a Bachelors degree in organizational leadership from Southern Nazarene University and a Masters

degree with Honors in business management, also from there. She is Muscogee (Creek) on her father's side and of unknown heritage on her mother's side, although they were part Native American and came from Mississippi. At least four generations of her family have lived in Oklahoma, back to her great-great grandparents. She grew up in Boley, Oklahoma, and was raised by her maternal grandmother, whom Sandy described as a "strong woman." Sandy lives near Meridian in Logan County and helps her husband farm their land and tend their garden. Her husband has farmed and ranched for over 30 years and does it now mainly to sustain the family farm. They own 160 acres and lease another 80. Her husband raises forages such as oats, bluestem and rye for cattle, and raises some wheat. She and her husband tend a garden that includes tomatoes, peppers, green beans, lima beans, okra, greens, lettuce, carrots and squash. Sandy is a member of and sometime adviser in the Oklahoma Land Owners and Tenants Association, the Logan County Livestock Association, and the Oklahoma Farmers and Ranchers Association. She carries journals and shares her knowledge of farming with others. In her capacity with Langston she provides information on government incentives and funding programs, and coordinates training – she is basically in the business of helping. She has a saying on her office wall that says, "It takes a long time to grow a good friend". Sandy works with Randall on an almost daily basis, mostly over the phone and at meetings. She conducts field audits of his work to make sure things are going smoothly and makes farm visits to see how people are faring with their training and assistance.

Maya Torralba

Maya met with me at the Redstone Baptist Church on June 15, 2010, accompanied by her young daughter. It is a calm and peaceful place. The church is on her great-grandmother's allotted land. Our conversation was held next to the garden that Maya and the girls in the Anadarko Community Esteem Program, which she founded, planted. Maya is the second youngest person I interviewed. She is enrolled Kiowa (her mother's side) but also is Comanche and Wichita. Maya has become a confidant to me for questions I have about tradition and culture, and she suggested some of the people I subsequently interviewed. She lives in Anadarko but grew up mostly on the Zuni, Hopi and Navajo reservations, and graduated from high school in Flagstaff, Arizona. Elements of her family have been in southwestern Oklahoma since before allotment when the area was still reservation land. She attended classes at the University of Oklahoma and was a fellowship holder at the University of Science and Arts of Oklahoma (USAO) in Chickasha. Her work with the girls focuses on self-esteem issues and culture, and participation in community based activities to help rebuild the town of Anadarko. Maya also is a member of the Kiowa Tribe Teen Suicide Prevention Task Force and the ROOTS Youth Coalition. She is active at the Jacobson House at the University of Oklahoma and sometimes performs there. She ran for Oklahoma State House in District 56 in November 2010, but was defeated. With respect to environmental issues, she is involved in the Oklahoma Sustainability Network. She helps garden, but mostly is a mother, community activist, volunteer, and traditionalist, and as such has a vested interest in issues of social justice and the future of Indian Country. As we departed, later

collaborator Dixon pulled up on his tractor, so Maya introduced us and he gave me his business card.



Figure 3. Anadarko Community Esteem Program garden, June 2010.

Bob Beckwith

I interviewed Bob on August 5, 2010, immediately following the Veggie Contest at the 79th Annual Indian Expo at the Caddo County Fairgrounds – this was an interview of opportunity and as such was not recorded. Bob was one of the contest participants. At one point during the contest he introduced himself because I was wearing my "Explore…Geography" t-shirt – it turns out he also is a geographer, having obtained a Bachelors degree in Geography from the University of Kansas. Bob entered watermelon

and cantaloupe and won second and first place, respectively. Bob is a quiet, unassuming man, and is of Chehalis (western Washington) and Chickasaw heritage, growing up near Ada. He has lived in many places, including California, and has been back in Oklahoma for three years. He is a soil conservationist for the Bureau of Indian Affairs, working for the tribes in southwestern Oklahoma. He said he "works for the farmers." For the BIA he is involved in land management, including teaching farmers and ranchers how to avoid soil erosion. He also makes sure their fences are up and mended. He is especially interested in using Geographic Information Systems to help farmers, but said some of the people he has encountered regard it as "witchcraft." Bob is a gardener in his spare time and helps a few of the elders and his uncles with cattle ranching. This particular summer he grew watermelon, cantaloupe, tomatoes, squash, zucchini, peppers, and kohlrabi. He said he likes to plant the seeds of the things he has eaten and likes. This includes his watermelon and cantaloupe – he lets their seeds germinate at the place where they have been eaten and then moves them to the garden. His garden is large – about 60 by 100 feet, close to the dimensions of the pavilion we spoke under. He said some of his vines grow past those boundaries. Bob attends or volunteers at the meetings of various agricultural groups – he said he is constantly learning by going to agricultural extension and soil conservation meetings to learn more about the soils and in particular wheat varieties so that he can impart information to the people he interacts with while on the job. This helps him know what to look for when visiting farms, such as problems related to heat, drought, insects, and plant spacing. He said it is important to keep up to date on "modified practices."

Wallace Bitseedy

Wallace and I met at the Indian City Lanes and Sports Grill, a bowling alley in Anadarko, for lunch on August 10, 2010. Besides having an interesting conversation, a memorable part of our noisy session was watching cockroaches run about the dimly lit premises. We introduced ourselves at the April 8, 2010 Beginning Farmers Workshop in Anadarko and he expressed interest in talking with me. Wallace is Apache and is well educated, with a Masters degree in educational psychology from Northern Arizona University. He was a schoolteacher for many years in Monument Valley, Utah. At least four generations of his family have lived in the Anadarko area, and his grandfather was a farmer. He is a relatively new farmer and rancher since his retirement from teaching, for five years. Wallace farms around 320 acres leased from family, in cattle, wheat and hay. He made it at point to say, unlike many of the other farmers, he does not practice conservation techniques such as no-till, and said we rely too much on technology at the expense of our own knowledge. He has attended Oklahoma State University agricultural extension training workshops and was attending the Beginning Farmers program. He indicated that late freezes and floods have "wiped out" his efforts in the short time he has been in agriculture.



Figure 4. Indian City Lanes and Sports Grill, August 2010.

Dixon Palmer

Dixon is the youngest farmer I spoke with, in his early 20s. Collaborator Dorothy refers to him as "Baby Dixon". He pulled up in his tractor and we spoke under a large shade tree at the Redstone Baptist Church on August 10, 2010, a very hot day. Dixon is Kiowa and is at least a third-generation farmer. He said he owes everything he knows about farming and weather to his famous grandfather Dixon (an artist, dancer, and tipi maker, who passed away in March 2011 at age 90). The Palmers have significant land holdings in the Redstone area, and the land just west of the church is farmed by Dixon. He started farming on his own when he was just 16 years old, in custom hay cutting and

bailing, and has been involved in farming and ranching in some way since age 5. He farms about 600 family acres of grass and crop land, mostly in hay and wheat (not no-till) and some milo, and performs another 600 acres of custom hay bailing work with the equipment he has been able to purchase, keeping him busy year round. He grows the hay for his cattle and horse ranching, saying, "We try to grow everything that we need to feed with." In 2010 he produced enough bales to sell the excess in the fall, and this income augments his cattle sales each spring. He undoubtedly is the most experienced and successful agriculturalist I interviewed despite his youth. He farms with his father (who also is a carpenter) and friends, and employs two farm hands for his custom hay business. He said, "We all get together whenever we need help and we're behind. We all help each other. It's one of those deals where if I scratch your back, you'll scratch my back. We're just a big family." Dixon took vocational college classes to become a state-certified diesel mechanic, an invaluable skill for tending to his farm equipment and that of others – "We try to do everything ourselves on the farm – it saves us money that way." He is an independent – when I asked if he belonged to any farming organizations he replied emphatically, "No sir!" He added, "We're trying to stay independent so we don't have to have somebody telling us how to farm – it's hard these days to be able to do that. I just don't like somebody having a say so in how we do business." He attributed this ethos to his grandfather, who wanted to do things himself and did not want to depend on others. He and his farming buddies sit down at the coffee shop and trade information, which includes their insights on the weather and any consensus that may form. He, like Wallace, is not a fan of no-till, indicating, "That's not the best thing. It's always best to turn the ground over, to work it, and your crops will be a lot better." He indicated more

chemicals are required for no-till, to kill the grass and weeds, which is the opposite of what I had been told by others. "The only way to kill the plant is to plow the ground." Weather is big deal to Dixon due to the size of his operation. He said, "It is hard to make choices when you can't predict weather." As will be seen later, he observes turtles, and for his custom hay business, in which he must make the decision that day whether or not to cut, he also checks the weather on his phone every ten minutes to see if conditions are changing.



Figure 5. Redstone bluffs south of Redstone Baptist Church, August 2010.

Dorothy White Horse DeLaune

I met Dorothy, a Kiowa elder, at the National Hall of Fame for Famous American Indians in Anadarko on August 23, 2010. Maya had recommended her to me, whom she calls "Grandma Dorothy", and she indeed is a kind soul. As we spoke, Dorothy recommended I speak to eventual collaborator Stuart and to the curator of the Anadarko Heritage Museum. Dorothy is a storyteller and a singer and has made recordings for the Smithsonian, and was working at the time with a researcher from the United Kingdom on a book about Parker McKenzie, the Kiowa linguist, whom Dorothy called "Our Sequoyah" for helping preserve the Kiowa language. Dorothy's pre-marriage name is White Horse, and she's written notes about her life that she will reveal someday. My conversation with Dorothy was the longest of any, lasting close to 100 minutes. At the end of the conversation she asked me to go by the Valero Gas Stop just down the road to get a 32-ounce Pepsi with ice and an Anadarko newspaper, which I gladly did.

Dorothy grew up on allotment land with Randall's father and near Dixon's family in the Soldier Creek area of Caddo County, near Apache Wye. Through marriage she spent a lot of time in France. She can speak Kiowa fluently. She is proud of the fact that the Kiowa language is now taught at both Anadarko High School and the Kiowa Learning Center located in a mostly-abandoned shopping center between the Hall of Fame and Temptations Restaurant. Dorothy was born in a tent and is the youngest sibling in her family; two older sisters, ages 84 and 86, and a brother, age 94, are still alive. She gave a lot of credit to her mother for her intellect and the way she was raised; her mother was one of the first students who attended the Rainy Mountain School. Her father gardened, and grew corn, potatoes, beans, watermelon, cantaloupe, onions,

radishes, and pumpkins. He did not grow squash, which she made a big point of. Her family also raised chickens for food and eggs. She made some pointed comments about how Native people are not eating healthy. When talking about tribal leaders she caught herself a couple of times using the word "chief" to describe them – she quickly corrected this to "leader". She said Stuart's family keeps her supplied with fresh produce. Dorothy keeps herself busy with many things, including being a part time curator at the Hall of Fame. She spent a lot of time in the southwestern U.S. selling turquoise items and has been to all of the reservations in Arizona, especially in Navajo country (at the time of the interview, she was helping someone set up an Indian store in Medicine Park). She commented on how the Hopi could grow things with little or no water.



Figure 6. National Hall of Fame for Famous American Indians, August 2010.

Richard Tartsah, Jr.

Richard Jr. and I formally sat down together on November 2, 2010, at the Anadarko Community Library, but we had spoken informally several times before at various events. He is a friendly and kind man who always makes it a point to greet me. He is Kiowa, and has a Bachelors degree in agronomy from San Diego State University, which he attended on a golf scholarship. His lives in the area, but for 28 years he was the golf course superintendent for Oklahoma City Parks and Recreation. He now is attempting to enter into cattle ranching. His maternal grandfather was a farmer, and he is a cousin of collaborators Garrett and Rudy Jr. He has exactly 155.5 acres west of Apache that he currently leases to an award-winning farmer that grows alfalfa and cotton. He attends the meetings of the Langston Beginning Farmers Program and Kiowa Farms LLC, and has attended at least one Langston Small Farmers Conference. He said he goes to the meetings to "listen and learn." He said Kiowa Farms LLC established a garden at Ware's Chapel west of Anadarko that produced well for the community. He intended to fill out applications to obtain heifers from the USDA. He does not watch television much, but likes Gary England's weather forecasts, and said his weather information was crucial for his golf course watering operations. Richard Jr. is a noted spiritualist and ceremonialist, and performed drum and sang during the opening ceremonies of the International Summit on Indigenous Environmental Philosophy in April 2010.

Stuart Owings

My last interview was with Wichita traditional gardener, elder, and singer Stuart, on December 22, 2010, at Temptations Restaurant. His back was bothering him on this

day but he was still gracious enough to meet me. Randall happened to be at the restaurant and said "hi" before he had lunch with a business associate, and I also saw Ricky later that day at the Valero Gas Mart. Stuart is revered in traditional gardening circles. He has a Bachelors degree from USAO and a Masters degree from Southwestern Oklahoma State University, both in education. He taught school in Verden and Anadarko, and then at Riverside School for 13 years, where he taught science, history, and social studies. He also coached several sports there, including basketball, softball volleyball, and football. He, along with Native elders like Dixon Palmer, was recognized at the 2010 AARP Indian Elder Honors in Oklahoma City. Although he has lived in the area for years, he said his father's family is from Missouri and migrated to southeastern Oklahoma near Atoka and Coalgate before settling in the Anadarko area in the 1930s. Stuart has been involved in agricultural-related activities "since I could walk I guess" because his family always had a garden and his ancestors were agriculturalists. He said his family on his mother's side kept their allotments. He has maintained a traditional garden at home on his land is east of Riverside School since he was married in 1968, though he considers it "more or less" a hobby. He has a one-eighth acre plot, and said the vegetables he cannot put up himself he gives away to others, including Dorothy. In 2010 he grew potatoes, onions, tomatoes, yellow crooked neck squash, zucchini, jalapeno peppers, watermelon, green striped cushaws (a winter squash that some call Indian pumpkin), and corn. He said the corn he grows comes from seeds that have been perpetuated from the time of his grandmother, and this is what he is most known for.

Stuart described how his father used a planter to plant corn seeds, but his grandmother said that was not the traditional way to plant – instead, you must dig the

hole by hand, plant the seed, and then tap the soil over the seed by foot. Four or five seeds would be planted in a hill or mound, with the hills neatly lined up in rows in the north/south and east/west directions, and also in diagonals. Ultimately, though, Stuart said, "All corn is Indian corn", commenting on the ancient roots of the crop, and now he sometimes relies on a tiller and a planter because of his health and age. He still dries his own corn, though, and is the only one in his tribe who still works the corn to the point of creating a green corn mush. Stuart also talked about how Wichita people would bury food in caches along the river for safekeeping for later retrieval in the winter; he said this is how Cache, Oklahoma, came to be named. His son-in-law is a large-scale farmer (on about 700 acres of family land around Anadarko) who mainly grows corn, wheat, and soybeans. Stuart said his son-in-law was the first farmer in the area to practice no-till.

PARTICIPANT-OBSERVATION ACTIVITIES AND FIELD OBSERVATIONS OF REAL-LIFE SITUATIONS

Here I provide description of the activities I have observed and participated in along my pathway that served as additional data collection and context for my work. Supplemental background research augments some of the material here. These are listed by site in Table 2 and described by event in the text. The first meeting with Kiowa farmers was described in Chapter One. These events were invaluable for networking, and as stated earlier, allowed me observe what is going on in both Indian Country and within the Native farming community. They provide context around which to understand what the collaborators told me, particularly for Chapter Nine. Figure 7 is a map of the Indian and Oklahoma Territories from 1892 (obtained from http://memory.loc.gov/cgi-

bin/query/h?ammem/gmd:@field%28NUMBER+@band%28g4021e+ct000224%29%29) showing the original lands of the Kiowa-Comanche-Apache in southwestern Oklahoma and of the Muscogee (Creek) Nation in east central Oklahoma, areas containing my field sites listed in Table 2. Figure 8 provides detail of the Kiowa-Comanche-Apache field site area, denoting my field sites of Anadarko, Fort Cobb, and specific rural sites from Table 2 in rural Caddo and Kiowa Counties.

Table 2. Points along my fieldwork pathway.

Place	Activity/Event
Anadarko Community Library, Anadarko	First meeting with Kiowa farmers about my project (February 2009); meeting with Kiowa farmers and a retired USDA conservationist on the possibility of growing castor beans as a biofuel (November 2009); two interviews (November 2009, 2010); Langston University Beginning Farmer Program meeting "So You Want to be a Farmer" (April 2010)
Langston University, Oklahoma City	18th, 19th, and 20th Annual Small Farmers Conferences to assist under-served farmers (May 2009, 2010, 2011); two interviews (May 2010, June 2010)
Apache Tribal Park, west of Fort Cobb	Apache Tribal Environmental Camp for Native American children (June 2009, 2010, 2011); met Chairman of the Apache Tribe of Oklahoma (June 2009);
Temptations Restaurant, Anadarko	Six interviews (July 2009, August 2009, September 2009, December 2010); Keepseagle Settlement Meeting with lawyers on how farmers who were discriminated against by the USDA in attempts to secure loans could participate in the settlement (February 2011)
Caddo Kiowa Technology Center, Fort Cobb	Oklahoma Tribal Conservation Advisory Council (OTCAC) Workshop about conservation programs available to Native farmers (February 2010)

Muscogee (Creek) Nation Complex, Okmulgee	2nd and 3rd Mvskoke Food Sovereignty Initiative Symposia on tribal and local grassroots farming efforts, organic agriculture, climate change, cultural revitalization, food security, healthy lifestyles, and the future of local communities (March 2010, February 2011)
Redstone Baptist Church, rural Caddo County	International Summit on Indigenous Environmental Philosophy – forum for 22 Indigenous thinkers from around the world to discuss how Indigenous philosophy is distinct from Western environmental philosophy (April 2010); two interviews (June 2010, August 2010)
Caddo County Fairgrounds, Anadarko	79th Annual Indian Exposition and Fair 1st Annual Native American Vegetable Contest to help judge vegetables, and one interview (August 2010)
Indian City Lanes, Anadarko	Interview (August 2010)
Museums – Anadarko Heritage Museum; National Hall of Fame for Famous American Indians; U. S. Department of Interior Southern Plains Indians Museum, Anadarko	Spoke with museum curators (one of whom I interviewed) and saw an art display by the Urban Indian 5 collective that provided interesting perspectives on nature – e.g., "If we pay attention to the animals around us, they reveal messages to us." (August, November 2010); one interview (August 2010)
Rainy Mountain, south of Gotebo	Rainy Mountain is a sacred spot for Plains Indians (December 2010)

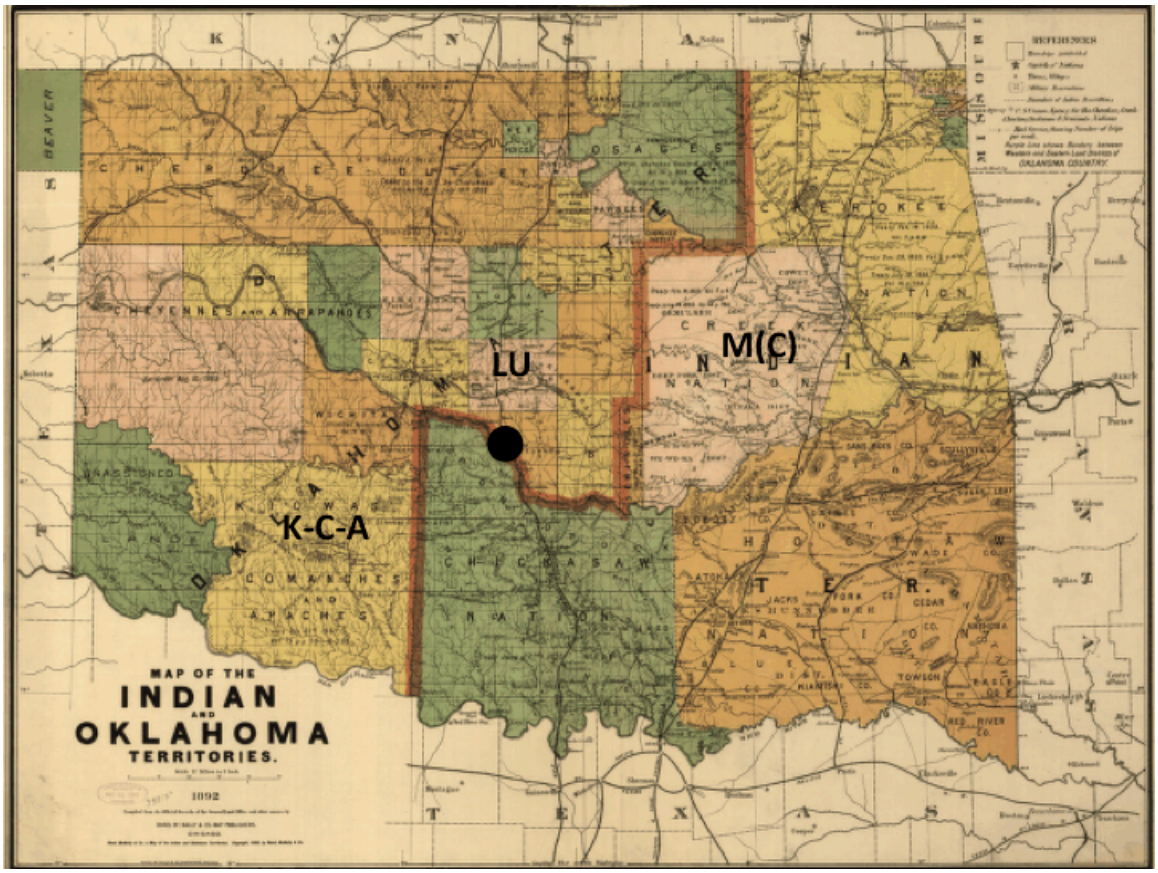

Figure 7. Map of the Indian and Oklahoma Territories, 1892, showing general locations of fieldwork sites listed in Table 2. K-C-A denotes Kiowa-Comanche-Apache lands in southwestern Oklahoma; M(C) denotes Muscogee (Creek) lands in east central Oklahoma; LU denotes Langston University-Oklahoma City. The black dot denotes Norman. Map courtesy of the U.S. Library of Congress, Geography and Map Division. Access is provided for educational and research purposes

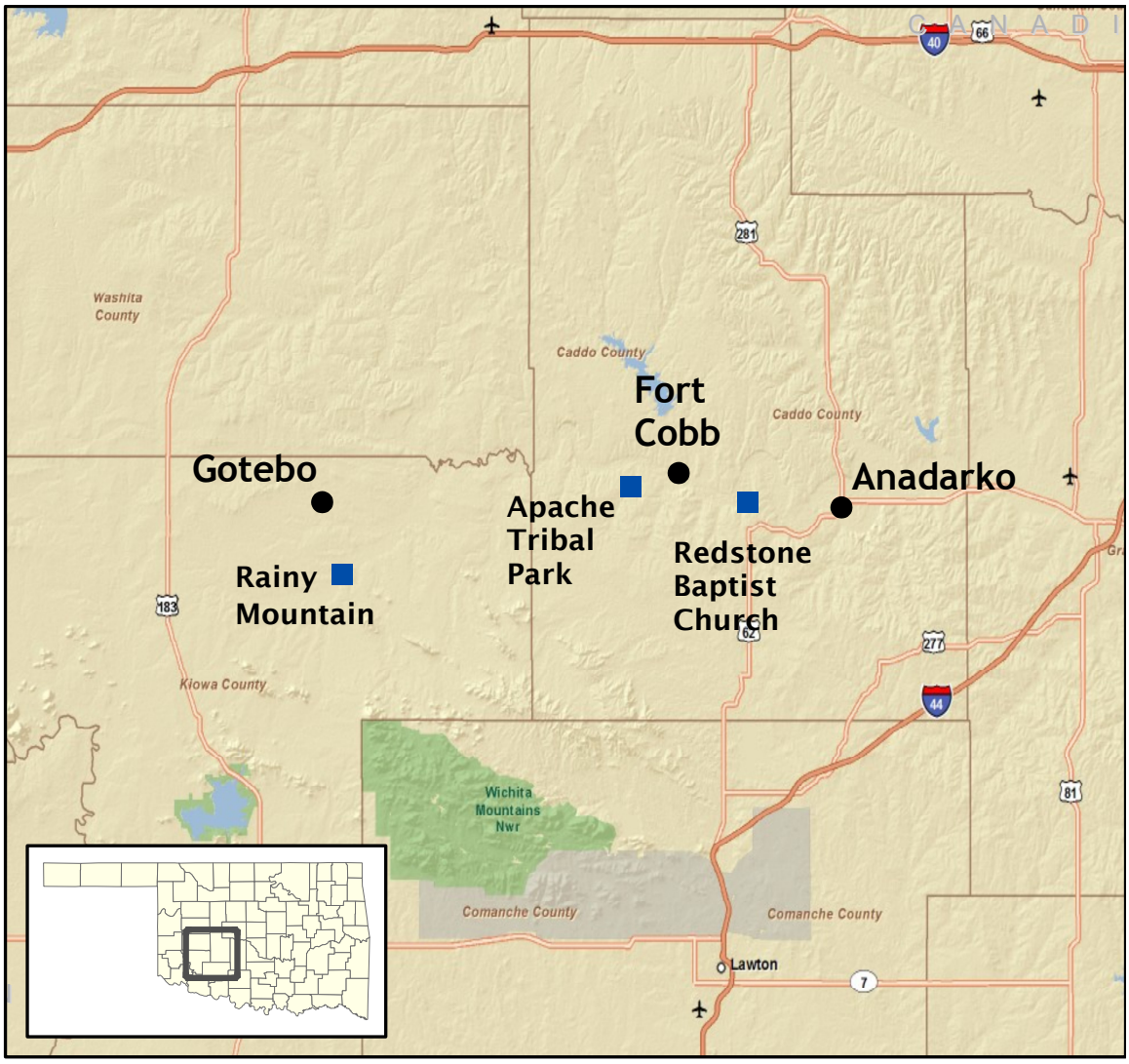

Figure 8. Detail map of the Kiowa-Comanche-Apache field site area, including the towns of Anadarko (where most activity occurred) and Fort Cobb, plus key rural locations listed in Table 2 (Apache Tribal Park, Redstone Baptist Church, and Rainy Mountain). Map was created with ArcGIS Online by William G. McPherson, Jr. Credits: 2009 Esri, TomTom, AND.

Langston University Annual Small Farmers Conferences

I attended the 18th (May 28-29, 2009), 19th (May 27-28, 2010) and 20th (May 26-27, 2011) annual conferences, all held at the Langston University-OKC campus on North Lincoln Blvd. north of the Oklahoma State Capitol building. Langston extends a Small Farmer Outreach Training and Technical Assistance Project (a similar program exists at

Alabama A&M University) that is funded by the USDA Cooperative State Research, Education, and Extension Service. The vision of the Langston program is "fully served and self sufficient small farmers, ranchers, and rural communities" (Small Farmers Conference program, 2009).

At the 2009 meeting I spent time with collaborators Randall, Ricky, Rudy Jr., Garrett, and Richard Jr., and also Ben Yahola and Vicky Karhu of the Mvskoke Food Sovereignty Initiative. Randall was introduced as the Langston University Extension Outreach Specialist and it was clear he is an important person in these circles; he also co-organizes this annual conference and helps chair sessions. While there, Randall told me he was lining up farmers for me to talk to in Carnegie and Clinton (these never happened, unfortunately). Ricky described the regular gatherings of the elders (possibly the daily gatherings at the Kiowa Elders Center in Carnegie that Gus Palmer, Jr. wrote about in 2003) and that I should come sometime, but this never materialized either, as I would need a chaperone. Randall asked me to participate in the Apache Tribal Environmental Camp on June 9, my first one, which I agreed to. At one point during the conference Randall mentioned Garrett's weather predicting abilities and how his hair stands on end during lightning (a lot of laughing ensued because Garrett's hair is long).

Ben Yahola agreed to spend a few minutes with me – according to Karhu he works with the more traditional members of the MFSI community. He suggested I read Vine Deloria Jr.'s book *The World We Used to Live In: Remembering the Powers of the Medicine Men* (some of the rainmaking described in it is described in Chapter Three). He told me of an article written years ago in the *Oklahoma Times* (which I was not able to find) about an Indian man who was sucked into a tornado and saw the "old people". He

said to “come on over” to Okmulgee sometime, but if I wanted to talk to people involved in the MFSI I would need to meet with the cultural coordinator of the Muscogee Nation first about the proposed work and to extend my Institutional Review Board approval. Ben said this person would be interested in my end products and to know about me. Ben described the holistic nature of the relationship his people have with the non-human world and how everything is interconnected. He mentioned how he won’t eat corn until the Green Corn Ceremony has taken place. A possible angle for future collaboration with the MFSI would be in conveying how local, observational weather and climate knowledge can play into traditional and sustainable agriculture.

The 2010 and 2011 conferences were less relevant for me, given the presentation topics and people attending. I was able to reconnect in 2010 with collaborator Larry, and as described above I interviewed him on the spot, and in 2011 with Alan. I also formally met collaborator Sandy during the 2010 meeting and I set up an interview with her for the following week. In the three years I have attended the conferences I have noticed an increasing upward trend in female participation in the various farming activities. A highlight of the 2011 meeting was watching a parking lot demonstration of how to make biodiesel using recycled cooking oil.



Figure 9. Langston Small Farmers Conference, May 2011.

Apache Tribal Environmental Camps

I was invited to participate in and attended these environmental camps for Native American youth in 2009-2011 (June 9, 15 and 16, respectively) and I hope this participation continues long after this research is completed. Randall now introduces me at these events as "our weather expert." This camp, which is sponsored by the Apache Tribe of Oklahoma and its Tribal Environmental Program, targets Native youth from ages 6-17. About 75 children attended the 2009 camp, and about 50 and 35 at the 2010 and 2011 camps, respectively (it was extremely hot in 2011). The goal of these camps is to "provide youth with increased awareness of the environmental, conservation and the wildlife resources. It gives the participant a chance to explore possible careers in the environmental, natural resources or related fields" (camp flyer, 2009). They are held at the Apache Tribal Park about 3 miles southwest of Fort Cobb on Indian Road. It is a nice

facility that includes a tribal dance site with covered seating areas and restroom facilities. These have provided me with an opportunity to meet people and to give back to the community. A highlight of these camps for many is a cookout lunch that is provided to everyone.

At these events I have usually driven over a vehicle outfitted with weather instrumentation and brought various weather instruments for the children to look at and touch. In 2009 my colleague Mark Palmer happened to be there for a while in the morning – he was in southwestern Oklahoma with his father Gus, Jr., doing fieldwork on Kiowa placescapes. I met and had my picture taken with then Apache Tribal Chairman Alonzo Chalepah (and his security entourage) – I described my Ph.D. work and he seemed very interested. He also was interested in talking about weather. In 2010 I talked informally a bit with Dorla Tartsah, who is involved in the Kiowa Tribal Environmental Program. She mentioned a female elder who would have some of the information I am seeking and said she would talk to her and get back with me (this most likely was Dorothy, whom I met through other channels). It was immediately after this camp that I conducted my interview with Maya at Riverside Baptist Church. In 2011 the scope of the camp was broadened to include "cultural teachings." A cultural activity was offered on Delaware environmental views, which was conducted by collaborator Larry. The best part of this program was the description of the turtle and how it signifies the earth – Larry showed a hand carved wooden shaker with handle that has a turtle on one side and a tree on the other (Hale 1984b described the significance of the turtle to the Delaware). I met with the Apache Tribe's cultural outreach coordinator for youth. He indicated he would

like for me to bring a mobile weather vehicle to the high school sometime (likely Anadarko High School since the tribe is headquartered there).



Figure 10. Cultural table at the Apache Tribal Environmental Camp, June 2011.

Mvskoke Food Sovereignty Initiative Symposia

I attended one day each of the second and third annual food sovereignty symposia, held on March 13, 2010, "Our Seeds. Our Food. Our Survival." and on February 19, 2011, "Food & Fitness". The theme of the inaugural symposium in March 2009 was "Return to Your Roots" but I was unable to attend. These are held at the Muscogee (Creek) Tribal Complex Mound Building on the north side of Okmulgee. My collaborator Maya attended the 2010 symposium and Randall presented in 2011.

The 2010 meeting featured several speakers who emphasized Indigenous knowledge and beliefs. Guillermo Vasquez, a Mayan farmer now in San Francisco, talked about "Indigenous science." Indigenous observation includes water, soil, sun, and wind ("we depend on them 100 percent"). Farming practices include composting, crop rotation, pest management, and maintaining soil fertility. He talked about planting and harvesting around moon cycles, and described the "soil peoples" (worms, bacteria, etc.) that improve soil fertility. Rupert Nowlin, an Arapaho rancher, talked about how the Cheyenne/Arapaho reserve near Concho, Oklahoma, raises free-range buffalo that provides meat for tribal dances and for sale. Traditional pasture management using fire is still practiced there – he said it produces "fresh tender green grass". The 2011 symposium featured a presentation by Randall on his Kiowa Native Farms LLC and ICARD ventures, which are described in Chapter Nine.



Figure 11. Presentation during the MFSI Symposium, February 2011.

Anadarko Conservation Meeting

This meeting was held on November 4, 2009, at the Anadarko Community Library – Randall invited me to attend. It featured Darrel Dominick, a member of the Choctaw Nation, retired Oklahoma state conservationist and former USDA Natural Resources Conservation Service range conservationist. Other attendees besides Darrel and myself were Randall, Ricky, Rudy Jr., and Alan. I then interviewed Alan later that afternoon in the library. The topic of this meeting was the possibility of growing a specialty crop, castor beans, as a biofuel. In addition to growing crops for feed and food, Kiowa Native Farms LLC is interested in biofuel crops as an income source for farmers.

The participants talked about a 20-acre test plot. A main concern expressed was how to harvest the beans – at present they have to be picked by hand – Randall suggested they employ teenagers and others who were out of work, though Darrel cautioned it was a dirty, tough job. The discussion was fascinating.

OTCAC Conservation Workshop

The Oklahoma Tribal Conservation Advisory Council (OTCAC) workshop was held on February 11, 2010, at the Caddo Kiowa Technology Center in Fort Cobb. OTCAC was organized with the assistance of the USDA Natural Resource Conservation Service in May 2002. Its mission is to "conserve and preserve natural resources in Indian Country through a process exercising sovereign rights of American Indians, and by obtaining funding for each tribe to control the destiny of their ecosystems including soil, air, lands, water, flora, fauna and cultural sustainability" (OTCAC n.d.). This workshop was held a couple of days after power had been restored after 12 days of outage following a severe late January ice storm. It snowed on this day but the roads were in good shape. There were probably 30 people in attendance, and as usual for these sorts of gatherings, a very hearty lunch was served. I was able to reconnect with Darrel Dominick, who ran the workshop. This gathering mostly showcased what the various Oklahoma and federal agriculture and conservation agencies can do for Native farmers. Among collaborators in attendance were Randall, Garrett, Ricky, Rudy Jr., Milton, Larry, and Maya. It was here that I met Maya and learned she was running for an Oklahoma House seat. Ricky gave the opening invocation and said later in the meeting during a short address, "We are all working together." Randall again talked about the issue of allotment lands and leases,

and that despite people now wanting to enter into farming, "Lands are tied up – we have to wait till they become available." After the meeting some small talk ensued, and Randall said, "I might have two couples for you to talk to sometime the next week." Milton said to me, "I was thinking about you" before the recent ice storm – he said he saw "lots of hawks, all different kinds, landing" and "ducks flying south" before the storm. He said he wanted me to come speak sometime but didn't mention to whom.

Langston University Beginning Farmer Program Training Meeting

This meeting was the first in a free series of five that leads to training certification for farmers, ranchers and gardeners. This particular series is held for southwestern Oklahoma farmers and was at the Anadarko Community Library; other series were being held at the Muskogee Public Library, the Museum of the Red River in Idabel, and the Langston-Oklahoma City campus. The goal of this in-community training program is to deliver outreach and technical assistance to beginning farmers and ranchers so that they can successfully acquire, own, operate, and retain sustainable farming and ranching enterprises. Langston also promotes that this training will enable participation in USDA programs and services. This particular Anadarko series was co-sponsored by Kiowa Native Farms LLC. The 2010 series was the first time this annual program was offered.

Randall led the introductory evening meeting ("So You Want to be a Farmer?") held on April 8, 2010, which was attended by about 25 farmers, including several families (space was limited to 30 people, so this was an excellent turnout). Randall had invited me to participate to explain my research to the attendees and to set up interview opportunities to those interested. Ricky also was on hand. I was able to introduce myself

to and set up interviews with eventual collaborators Larry, Wallace, Sandy, and Richard Jr. Four others who gave me their names and phone numbers eventually declined to be interviewed. As snowball sampling goes, this was a successful evening. At the end of the meeting Randall invited me to participate in the 2010 Apache Tribal Environmental Camp. I also was invited to the January 25, 2011 graduation reception at the library for the 17 families that eventually made up this program's graduating class, but I was out of town at a national meeting. Randall said at graduation time that he had a list of 240 more families interested in this training. Interestingly, one federal agency person who responded to Randall's graduation announcement lamented that her office had not been invited to participate. After an e-mail exchange in which I told Randall not to worry about her feelings being hurt, he responded, "As usual Randy, you're a real trooper, we, appreciate the PR and feel free to communicate and lets talk about our 501c3 (ICARD) Indian Country Agriculture and Resource Development Corporation!! Randy if we can partner/work together on a grant lets go for it!! We are in business!! Ah-ho!! I have spoken!!"

International Summit on Indigenous Environmental Philosophy

The International Summit on Indigenous Environmental Philosophy conducted "a forum for Indigenous thinkers from around the world to gather in a retreat setting to discuss how Indigenous Environmental Philosophy is distinct from Western Environmental Philosophy" (International Summit on Indigenous Environmental Philosophy 2010) and was held in late April 2010. The first part of the summit was conducted at the Redstone Baptist Church where I interviewed Maya and Dixon, and

concluded at the University of North Texas in Denton. Delegates from around the world attended, representing 17 U.N. and 22 Indigenous nations, although they announced at the beginning they were there to speak for themselves and not necessarily for their tribes. The Oklahoma portion of the summit was arranged by the Kiowa Tribal Environmental Program. Among collaborators who attended were Maya and Richard Jr. – Maya and her family helped record the event, and Richard Jr. helped perform the opening ceremony. I attended the opening day, April 26. My participation for the most part was accidental and perhaps frowned upon by some (I was the only white person there). Randall had alerted me to it in passing (and I do not think he knew much about its details), but after doing some web research I decided to attend. When I arrived I pulled up at the same time as Maya. We were early, so she shepherded me around. We met the University of North Texas facilitator of the meeting, Professor Jonathan Hook. Without Maya's introductions and help I am not sure I would have been allowed to stay since it was an invitation-only event. Fortunately, several people came up to me and introduced themselves.

The day began as a social gathering in the large grassy area south of the church and hall, where several tipis had been erected and served to house some of the delegates. The summit then moved inside a meeting hall on the north side of the church that doubles as a small basketball gym. Summit participants sat in a meeting circle with a drum in the center, and the rest of us sat in old church pews on the periphery. Richard Jr. tapped on a drum and sang two songs, one about God being the reason we were all there and another asking for healing, especially of the earth. In my subsequent interview with him in November 2010, he told me that this is the "Healing Song" and was taught to him by his grandmother. It teaches that God will preserve the land and that man should not disrupt it

– we should instead keep to the old ways. A few tribal leaders then spoke about environmental philosophy, which is captured in Chapter Eight. Earnest Redbird, a Native American Church Road Man, gave the opening blessing, called a cedar ceremony or "cedaring." The evergreen (cedar) represents everlasting life. A staff of golden eagle feathers was submerged into cedar smoke and then patted over all of the delegates. Redbird said those in attendance were not there by coincidence – the Lord had brought them there.

Hook gave the facilitator address and asked, "How did this start?" He claimed the one issue that unites Indian communities is climate change. A discussion ensued on a definitive summit outcome – it was agreed to craft a collective statement from the delegates that focused on climate change. Kiowa Chairman Donald Topfi welcomed such a statement and said he would try to take it forward. The preamble of the statement states, "Indigenous communities are perhaps the most impacted by Climate Change and the least responsible for causing it. Indigenous elders and environmental specialists have also been the first to warn of changes and offer viable suggestions for response strategies yet their critical messages have usually gone unheeded by dominant societies" (International Summit on Indigenous Environmental Philosophy 2010). The full Redstone Statement, "Leave Us A Future!" was adopted on May 1, 2010 and can be found at the same website. It includes the passage, "Indigenous environmental philosophy respects a mutually supportive network of interconnected physical and spiritual entities that is sustainably maintained, and which connects the ancestral past with the distant future." It also states, "The vision of our Indigenous peoples is to reach spiritual and material well-being through conscious action. Mother Earth is a living,

dynamic being with inherent value, and her principles must be actively embodied in order to remain in harmony and balance."

The rest of the first day's focus was on delegate introductions; the next day, the indigenous environmental philosophy of each tribe represented was to be espoused, and the following day the focus would shift to climate change and how Indigenous environmental philosophy can be brought into its discussion. Regrettably for me, the sessions those two days were closed door, so I was not allowed to return. However, it was a fortuitous blessing to have attended the opening day. I was able to have lunch with Maya and her husband, and delegates from Siberia, whom we spoke to through an interpreter.



Figure 12. Tent display, Indigenous Environmental Philosophy Summit, April 2010.

First Annual Native American Vegetable Contest

This contest was held on August 5, 2010, in conjunction with the 79th Annual Indian Expo at the Caddo County Fairgrounds in Anadarko. Langston sponsored the event. I found the flyer for this event on the web, so I wrote to Randall about it and he invited me to judge squash. The flyer language included, "Ever wonder what to do with your home-grown veggies besides eat them? Ever have grown a veggie that you are so proud of you just have to show it off? Well, we have the event for YOU!" I arrived at the event well before the 10 am start, about the time the Moving Wall memorial of the Vietnam War was to arrive, so there were a lot of people milling around the fairgrounds even though the daily activities of the Expo itself were not scheduled to begin until 11 am. The Wall never arrived for various reasons, disappointing the attendees.

The veggie contest was lightly attended, as it appeared the word had not gotten out. Noticeably absent were Maya and the esteem garden girls, who had not heard of it. Nevertheless, it was a nice event, and I ended up helping judge melons because no squash were entered. Judges on hand besides myself included collaborators Milton and Sandy, plus Micah Anderson, the market coordinator for the Oklahoma Department of Agriculture, Food and Forestry, who knew the most about judging vegetables. We used forms that Anderson provided, labeled "Judging Food Crops", in which we were to score vegetables from 1 to 10 in each of five categories: market condition, uniformity, color, size, and form. This was a learning experience for me. In the end we made sure everyone in attendance received at least one ribbon. I met collaborator Bob there, who presented some of his melons, interviewing him when the contest ended.



Figure 13. Winning produce, First Annual Veggie Contest, August 2010.

Anadarko Museum Visits

Three non-tribal affiliated museums in Anadarko house artifacts and information about Native Americans – the Anadarko Heritage Museum (also referred to as the Philmonic Museum), the National Hall of Fame for Famous American Indians, and the Department of Interior's Southern Plains Indians Museum. I visited all three on November 2, 2010, but have been to the Hall of Fame several times, including when I interviewed Dorothy there in August 2010.

The Hall of Fame, established in 1952, mostly houses statues of famous Native Americans, some inside a small building and the rest outside along a large rectangular

walking area adjacent to Highway 9. This site was heavily damaged by the May 2009 tornado – several of the statues were decapitated and many of the older sycamore trees were badly damaged or felled. Funding appears to be an issue here, as restoration has not taken place. Despite limited displays, this museum provides an interesting glimpse into Native Americans deemed famous. I chatted here during one visit with an informal collaborator who asked not to be identified, and was told the Wichita and Delaware story regarding use of a butcher knife to split a storm.

At the Anadarko Heritage Museum I spent time with museum curator Robin Willis. The women of the Anadarko Philomathic Club founded this museum in 1935. The most notable Native American section of this museum housed a collection of Indian dolls and other artifacts. The building housing this museum is the former Rock Island Depot, not been used for passenger trains since the late 1930s. Several interesting railroad artifacts sit outside the station. Willis taught high school science at Riverside Indian School along with collaborator Stuart – she gave me his phone number and directions to his house. She made a point to tell me that the Wichita, Caddo and Delaware traditionally were the farmers and gardeners, while the Kiowa, Comanche and Apache, and Cheyenne and Arapaho were hunters. She went into the archive room and brought out folders of old clippings related to agriculture in Anadarko, including several almanacs. I also sifted through albums of old photos that have been donated to the museum. While I found nothing of direct relevance, I asked her to contact me if she ever found anything related to my work. One interesting item in a folder was a 1¢ postcard, titled, "The News About Southwest Oklahoma Issued Monthly" and dated August 1, 1908. It contains comments about booming agriculture in the area, such as, "Weather

fine for corn and cotton. Corn will be the big crop this year – is earing well. Largest fruit crop since the opening of the country to settlement. Peaches retail at 75¢ per bushel. Alfalfa is making a heavy yield."

The Southern Plains Indian Museum is sponsored by the Indian Arts and Crafts Board of the Bureau of Indian Affairs and dates back to the late 1940s, and appeared surprisingly decolonized for a government museum. It mostly contains windowed displays, and also houses the Oklahoma Indian Arts and Crafts Cooperative Gift Shop that was attended by two Native women. The most interesting part of this visit was the Urban Indian 5 art exhibition in the museum's Rosemary Ellison Gallery. Five Native American artists partnered with the Oklahoma City Indian Health Clinic to exhibit work in what the artists called their Art of Healing Gallery. Besides works of art, two passages from the artists caught my eye on the importance of looking to animals as natural barometers, and are provided in Chapter Six in the section on animal signs.

Rainy Mountain

After interviewing Stuart on December 22, 2010, I traveled west to find Rainy Mountain and the Rainy Mountain Kiowa Indian Baptist Church, both considered cultural icons. I traveled west on Highway 9 to just east of Mountain View, then headed south on State Road 115. I cut west on E1380 and then north on N2350 before I got to the church turnoff. Some Internet information indicated that Rainy Mountain would be visible from State Road 115, but it is not. From the corner of E1380 and N2350, however, you can see it off in the distance to the southwest, so I knew I was getting close. The church and cemetery are a bit north of this location, so I went to see them first. The church, which

dates to 1893, the adjacent Gotebo Hall, and the nearby Rainy Mountain Cemetery and K-C-A Intertribal Burial Grounds are neatly kept. The white church building was decorated with holiday garland, but the doors were locked. The hall is used to conduct important tribal meetings and receptions. From there I headed north on N2350 to Highway 9, then west to State Road 54 at the east edge of Gotebo. Highway 54 south leads you near Rainy Mountain, about a mile east of the highway on E1380. E1380 dead ends into "Rainy Mountain Ranch" on N2320, which runs directly south toward Rainy Mountain before curving east into E1390.

Rainy Mountain is a small, isolated mound detached from the rest of the Wichita Mountain range. It is located at 34.99N, 98.85W, at 1,529 feet elevation. It is a surreal place on the landscape, and the fact that it was a beautiful, sunny late December day helped create the mood. I stayed there for a while and took in the ambiance. Rainy Mountain is a sacred spot on the landscape for the Plains Indians, particularly the Kiowa. Scott Momaday wrote about it in 2002 (*Sunrise at Rainy Mountain*, first published in *Oklahoma Today*) – the sense the mound expresses, and its overall significance, made it a place I felt I needed to see. One passage in Momaday's story goes as follows: "Rainy Mountain is an ancient sentinel of the sun. When the Kiowas came down from the north hundreds of years ago, they ended their journey there. Rainy Mountain became the center of their world. It is said that whenever they camped there it rained." Momaday continued, "But I think it was the sun, the sun appearing through the mists of rain and rising to a brilliant eminence above the clouds and above the whole of the land, that struck wonder in them and held them in thrall. Even now, in that place, is it so for me. There do I believe in the sun." Mark Palmer tells me there is a way to climb the

mountain from the southeast side. Rainy Mountain Creek runs past it, and flows off to the northwest across Highway 9 between Gotebo and Mountain View. On the way home I drove past the Kiowa Tribal Complex on the west edge of Carnegie. I remember Randall once telling me this complex would be a lot handier for people if it were located in Anadarko (the Apache and Delaware offices are housed in Anadarko). On this day just before Christmas, as I drove through the various towns, it seemed that Anadarko, Fort Cobb, and Mountain View have at least some viable economic activity, but that Carnegie and Gotebo are quite depressed.



Figure 14. Rainy Mountain, December 2010.

Keepseagle v. Vilsack Class Action Settlement Meeting

A meeting for area farmers and ranchers was held on February 20, 2011 to describe the settlement of the Keepseagle v. Vilsack Civil Action No. 1:99-cv-03119 (DDC) (EGS) lawsuit brought by George and Marilyn Keepseagle (Standing Rock Sioux) and other plaintiffs in November 1999 against the USDA. This lawsuit alleged that the USDA discriminated against Native Americans in its farm loan and farm loan servicing programs. After years of depositions, document review, and testimony, a settlement agreement was announced on October 19, 2010, in the amount of $680 million for the plaintiffs. Native farmers and ranchers in Oklahoma are included in and can benefit from the settlement. More than 50 people jammed into the modest banquet room of Temptations Restaurant in Anadarko that day to hear two of the lawyers involved in the winning class action. Background information here on the settlement comes from handouts provided by the lawyers.

Randall distributed two large handouts and called the meeting to order, which lasted for 90 minutes. Randall asked me to take photos. Milton gave the opening invocation, and numerous collaborators were at this meeting. The lawyers provided background and described the key features of the settlement, which was followed by a lengthy question and answer session. The mood of meeting attendees ranged from hope to apprehension, as even though the settlement had been agreed to and changes in elected leadership in Washington cannot interfere with it, there remain doubts that claims will actually be paid and skepticism that the agencies cited for wrongdoing will actually improve. The details of this settlement are described in Chapter Nine.



Figure 15. Farmers listening to Keepseagle settlement lawyers, February 2011.

CHAPTER SIX

"THE BEST WAY TO DO THINGS IS TO LOOK AT THE SKY AND LOOK AT THE ANIMALS" – OBSERVATIONAL SIGNS AND PERFORMATIVE RITUAL

This chapter documents what I learned about weather and climate knowledge from talking to my collaborators. As will be seen, this knowledge possesses strong local and cultural characteristics, and comes to them first through intergenerational transfer. It is stratified here as five types: animal, plant, meteorological, and celestial indicators, and performative ritual. When revealed by my collaborators, I describe how they relate what they observe, experience, or practice to their agricultural activities and decision-making. I also describe the other types of weather information the collaborators seek out and use, such as from television or the Internet, and how they use it, or not, in relation to their own knowledge. I then discuss briefly the overall sources and characteristics of their weather and climate knowledge and how they ultimately fold these into an insight useful for their agricultural activities. Throughout this chapter, I make linkages from my collaborators' knowledge to the results of the historical context research documented in Chapter Three to help demonstrate a continuity of thought and practice that is facilitated through the intergenerational transfer of knowledge.

It should be noted that some of the environmental indicators described by the collaborators are not necessarily predictive, but are the result of observation of weather conditions that have already occurred and the impacts they have caused (e.g., plant characteristics such as green grasses produced by recent rains that allow for strategic animal movement for grazing). As such, some of their indicators are diagnostic, but they are still useful to note with regard to how they affect agricultural planning and practice.

As a footnote to the discussion in Chapter Four regarding my collaborators allowing me to use their names, the knowledge presented in Chapters Six through Ten will be identified by name so that I can properly attribute their knowledge and beliefs to appropriate person. I identified each by full name in their Chapter Five biographies, but throughout the work that follows I identify them by their Christian first name only. This convention is not meant to be disrespectful, but is meant to convey the personal nature of our interactions, and makes our conversations seem close and familiar (which they were) rather than distant and cold. We greet each other by first name when we meet or run into each other. There are 15 unique first names, but not 15 unique surnames, so this convention also will lead to less confusion throughout the text.

ANIMAL

Animals often sense or react to natural events before humans know about them and as such their behavior can be good indicators of upcoming events. As an example, animals at the National Zoo in Washington, D.C., reacted to the 5.8 magnitude earthquake (epicenter more than a hundred miles away in central Virginia) on August 23, 2011, anywhere from seconds to 15 minutes before the quake was felt by humans and recorded by sensors (Smithsonian Conservation Biology Institute 2011, August 24). From the Urban Indian 5 art exhibition I viewed at the Southern Plains Indian Museum in August 2010, Shan Goshorn (Eastern Band Cherokee) said of her paintings and work with orphaned and injured migratory songbirds, "Working with these barometers of the earth's health, I feel satisfaction that I am giving back to the first mother." Gerald

Cournoyer (Oglala Lakota) wrote of his art on display there, "If we pay attention to the animals around us, they reveal messages to us" (for his painting, *I Bring News*, 2008).

People who have depended on a life outdoors have always known this, and have closely observed such behavior to infer what the weather and seasonal climate will be. This also is true of the people I spoke to.

Beavers

Randall said that he can forecast drought by the beaver – if beavers are building a lot of dams, you can be confident there will be drought because they are pooling whatever water there is. Garrett said he had been observing dams on his property and found at least three of them, which portended drought. He said the beavers were chewing up his pecan trees for material for their dams. He said, based on this observation, "We are in a dry period!" Ricky said his dad knew the beaver, indicating, "He could tell what was going to be in store by the way he (the beaver) gathered." The Minnesota Chippewa Tribe had written to Senator Kerr in 1951 about the large size of beaver houses as a predictor of the upcoming (hard) winter.

Cattle and Horses

Several of the collaborators described the behavior and movements of cattle and horses before a storm. The Gros Ventre of Montana had described similar movements in their response to Senator Kerr in 1951. Randall and I will often send text messages during severe weather season about whether the cattle are gathering to go into the woods – they have been right more than they have been wrong the past couple of seasons with

regard to an impending severe weather threat. This has become a source of some amusement to us. Alan talked about this as well, "I can tell, too, if we're due for some bad weather – my cattle will go back in the woods and lay down – it's a sign – when they start acting sensitive, the weather is going to change. When it gets bad the animals will give us a sign."

Garrett attributes his wife as an observer of cattle. He said, "She will say 'Garrett, I think it's going to rain. Look at those cows – they're all bunched up together!'" Randall said that cattle face in the direction the storm is coming from – "they'll gather and face the weather." Rudy Jr. said that in the winter, "When the cows are laying down something is happening or the horses are running around, you know you got that storm coming in – and those things will tell you, too." Richard Jr. talked about his grandfather's cattle. He said, "Those cows (he had) – just the way they feel – their sensitivity to the air. You could just know when there's a change of weather – the way they react, their sounds, the way they eat. A lot of times when there was cooler weather coming in, they would eat more, they were storing up." Alan described cattle behavior in relation to incoming weather: "I can tell by the animals. The animals give us a good sign when the weather is going to get bad. Like the storms coming from the north our cattle will go to the south. When it gets really, really bad they're going to sit down. They're gonna lay down." About 90 percent of them will let kind of let you know the mood."

Garrett talked about one of his horses. "There's a horse out there. It will whinny and run around the field when a storm is coming – I can't even see it yet with my eyes – but a storm is coming and a big one, too." About horses in general, Garrett said, "From what we observe through the years is to detect the storms coming through animals and

their behavior – especially the horses, they run around in circles when the storm is coming in." Ricky corroborated, indicating, "You could tell by a horse, the way that horse acted, if a storm was coming, they knew." The Gros Ventre of Montana had mentioned horse movements, and recalling from earlier, the horse is an important part of Kiowa lore as part of the symbol of the violent winds of the tornado.

Milton described the hair on horses and cows and what that might mean for feeding. "If they start shedding their hair it's going to get warm. Or if they start growing long hair then you know you're going to have colder weather or you're going to have a colder winter. You might start stocking your feed up a little more or plan on a little more supplemental feeding." The Pima-Maricopa in Arizona had described the thickness of horse fur in relation to the strength of winter.

Squirrels

Randall told about the size of a squirrel's nest – the wider they are, the worse the winter would be. Ricky also talked about the way the squirrels built their nests: "If they built that nest and it was real thick and it was long, you could say you knew the winter was going to be kind of rough."

Milton talked about squirrel activity, indicating, "If the squirrels and things like that are more active then you know it might be a little rough this winter, or if they are out early in spring then spring might be a little early." Dorothy mentioned their storage behavior: "They (the old people) saw the squirrels and even the mice storing stuff (portending a hard winter). I remember those from my grandmother and my dad. It's uncanny – they just knew." The Potawatomi of Indiana and Michigan had reported on

the gathering and storage behavior of squirrels to Senator Kerr in 1951, and the Pima-Maricopa of Arizona had remarked similarly to the Senator that year about the gathering habits of small animals in general.

Deer

At my initial February 2009 meeting, a couple of the collaborators mentioned that when the deer are fat, it is a sign of a hard winter. Randall and Ricky both said it is important to observe the thickness of the deer's coat, especially on its chest, as an indication of the severity of the upcoming winter. I was surprised that I did not hear additional anecdotes about deer given their abundance and given how Native peoples have interacted with them for millennia; Lake-Thom (1997) described the mating habits of deer. The Chippewa Tribe of Minnesota wrote to Senator Kerr in 1951 about the importance of looking at the thickness of animal fur in general as an indicator of the upcoming winter.

Ants

Ricky described how ants would gather things to take into the hole on a nice day – this is a sign of upcoming bad weather. Randall shared a similar account. "There's another thing too I noticed when there's a storm coming, when it's still clear and blue, is by the ants – they move, they start storing food in their shelter. Watch those ants, too – they have knowledge." This storage also is an indicator of a cold, hard winter. The Crow Agency in Montana (1950) and the Pima-Maricopa of Arizona (1951) had written to

Senator Kerr about the movements of ants and their preparation of the ground before rain or cold weather.

Milton said his father taught him to watch the ants for knowing what to do with feeding. For example, "If they were active or you noticed they were really putting their feed stocks up and really putting stuff in the den, then you'd think maybe I need to put up more hay or count on some extra days of feeding livestock for snow days or ice days when they can't eat." He also said that this ant behavior may cause him to think about stocking up on feed supplements like cottonseed meal or other concentrates to help livestock get through the winter.

Turtles

Dixon is a strong believer in observing the movements of turtles to guide his haying operation. While lamenting, "All of the TV stations have a different answer," he said: "The best way to do things is to look at the sky and look at the animals. That's always the main thing. Especially around here, if you see turtles crawling uphill or crossing the road, that's always a sign we're going get rain. That's what my grandpa always told me – it's one of those deals, and what do you know, it works."

Dixon described, "You know, I never thought anything about it until I got into the haying business and we're down at Riverside, and my hand told me 'I've seen a lot of turtles.' I should have stopped but we kept on going, kept on going. That evening we got about six inches of rain (ruining what they had done earlier). The animals, they know everything. People take that stuff for granted." In practice now, Dixon said when he sees turtles crossing the road, he looks at the weather on his smartphone to make sure of what

is going on. The turtles serve as an early alert system for him. He closed, "If I see a turtle crossing the road, I say 'Where's another one at' and we're looking around trying to find one! That's the only thing I look at, the turtles – they don't want to get swept away!"

Birds

Most Native peoples have described the movements of birds, especially geese, as foretelling impending weather or changing seasons. My collaborators were no different. Garrett described the motions of "bullfrog birds" as an indicator of weather change and has been watching them since he was young. He said that when they dive down to catch insects they sound like bullfrogs (this could be some type of crow), and this is an early indicator of rain. He told a story of when he watched a number of them diving. He said, "I went home that Friday evening and it started raining about 6 o'clock. By midnight there were floods – it was flooded. I got a call about 11 o'clock that the flood washed out the road. A niece and cousin got washed off the road – it was dark and they couldn't see - the water was over that bridge and slowed them down and they drowned." He had moved his horses to higher ground the day before based on the birds and it turned out that the bottoms where they had been flooded. He said, "I moved them to higher ground about a mile away. I went over and looked and the water had receded…fences and other things were washed away. The sky had busted open and tore everything up."

Milton observes bird migrations. He said, "The birds tell you – you watch the birds as they migrate and how they migrate. Whether they're sticking around and staying at resting or are they just flying on through. Whether they are flying high or flying low –

where the cold air is at." He said the different species do certain things in reaction to the clouds or the changing seasons, indicating "You can kind of tell by watching them whether it's going to be early or late spring by what they're doing – if they begin to build nests in the early spring then you know its going to be an early spring – they're getting ready to have an egg hatch or they're going to hatch early. The martins, if they come down early, then spring's coming down." Milton had told me at the OTCAC meeting in February 2010 that before the recent destructive ice storm he saw "lots of hawks, all different kinds, landing" and "ducks flying south." Ricky also watches for when birds begin gathering items into their nests as a sign of a changing season.

Randall and Alan observe geese and ducks. Randall said, on the morning of September 2, "I see some geese going south this morning already – it's telling me the cold is getting ready to come this way and we better prepare ourselves. We know that there's going to be a frost coming up real soon." He said this is important knowledge for fall harvesting of alternative crops like canola because the first frost will kill the plants. Alan said this indicator is pretty simple and straightforward: "Like the ducks – when they go south it means wintertime is coming early, and when they go back north springtime is coming back early. When the weather is nice the birds are out. Whenever the birds start disappearing it's letting you know wintertime is coming because the birds are gonna go south." Dorothy also spoke of the old people's observations of ducks and geese. She said, "I remember they would all pray when they'd see the first ducks and geese go north – I remember them predicting we're going to have a hard winter." Geese migrations figured heavily in the knowledge that had been expressed by the Oneida Tribe of Wisconsin (1951) and the Gros Ventre of Montana (1951 to Senator Kerr, and also

was revealed by the Cherokee in Oklahoma (Duke Collection) and the Delaware along the eastern seaboard (Tantaquidgeon 1977).

Fish

Alan was the only person who talked about fish as an indicator. Similar to his duck observations, he said, "Same when you go fishing – the closer you get to winter the less the fish are going to bite. When you catch them in the wintertime you have to fish deeper because the water stays one temperature in the lower part, and then in the springtime it gets warmer and they come closer to the top." The tail of the great fish was said to denote the whipping and thrashing of the tornado in Kiowa lore.

Buffalo

Alan spoke about the historic movements of buffalo as a guide for watching his cattle today, also described by the Gros Ventre of Montana to Senator Kerr in 1951. He said, "The buffalo taught us a lot – they would go north when it was hot and south when it got cold. They moved with where the grass grew, and that kind of helps me with my farming and my cattle methods today." Of the grasses, he said, "We've got some native grass that takes a little longer to grow but it has protein that's natural. Trying to stay off of the artificial planting. Trying to graze our animals natural (as they move with the grass)."

PLANT

Less was told to me about plant appearance or behavior, and no one mentioned the thickness of corn shuck, which was described by four tribes as listed in Chapter Three. Milton described mesquite blooms. He said, "One thing we do watch - spring is not here until the mesquite blooms – if the mesquite doesn't bloom, cold weather is not over yet." He said this knowledge came to him from an old farmer where he grew up. This farmer used to tell him, "It ain't spring until that mesquite blooms." Milton said that since it is generally the last brush to bloom in the spring, it is a good indicator.

Ricky watches pecans and plums. He said recent drought in the past few years has meant fewer or no pecan and plum crops. On pecans, he said, "You could look at the pecan shell – if that shell was thick you knew there was plenty of water and everything was going to be fine. But if you look at that shell now and how thin it is, that would tell you that weather conditions weren't going to be good at all because of that." For plums, Ricky indicated, "If that plum bush was going to be healthy our weather conditions were going to be good, we're going to have plenty of water. But the leaves are small and don't have that dark green color to them." Ricky also talked about walnuts and possum grapes. He talked about how walnuts used to grow to 3 inches in diameter (he gestured with his hand) but now they are lucky to reach half that size. On possum grapes, he said, "You used to be able to tell by them at the water source how the conditions were. If the fruit was going to be big or small – that kind of told about conditions of what the weather might be."

Wallace talked a bit about the grasses. He said, "You can watch grasses. It depends on the rain. If we get good rain the grass will stay until September or October

and it's palatable for our cattle. But if it dries up fast and have a dry winter, maybe some freezes are coming." Alan mentioned the how the leaves were still green when we spoke in early November, that because fall is lasting longer, wintertime would go faster.

METEOROLOGICAL

Some of the people I talked to are pretty good meteorologists - they make observations of the weather itself, including prevailing patterns, and how these affect farming, ranching and gardening.

Winds

Garrett described how people plant their gardens in north/south rows since the winds in southwestern Oklahoma generally blow from the north or from the south. He said this helps the plants "breathe" and keeps them from being blown over by crosswinds.

Randall described how when he was a child in the early 1960s the elders would know that a dust storm was coming – he claimed they would be right even though it may have looked nice outside at the time of the forecast. Rudy Jr. speculated that there must have been reddishness to the sky that they recognized. Randall said, "Grandfather said, 'Hey, there's gonna be a dust storm coming today. You kids better stay close to home, I don't want you all to get caught.' Heck we didn't pay any attention to it – we just ran off. And I'll be darned if we didn't get caught right in the middle of a field with that thing. He was always right." Randall said that these dust storms would hurt because he and his playmates would not be wearing shirts.

Rudy Jr. related how people knew the Chinook (cold windy air) was coming when

he lived in Alberta, and how they gathered up items for storage while the weather was still warm in preparation for the snow the Chinook brought. He said, "Over in Canada it's called a Chinook – when they see the wall coming – it would be beautiful all day, and then all of a sudden you would see the cloud wall coming and the cold spell is coming in – probably the jet stream or something?" He also said the people looked for "cold tornadoes" (cold air funnels) that sometimes produced 80 mph winds, and how the people would watch out for them when feeding the cattle or working the horses.

Randall also described how farmers' wives seem to know about the winds. He said, "A good forecaster is my wife – the farmers' wives have a lot of knowledge, too. They grew up on farms and raised chickens. They predict because they were taught by their grandparents. (They said) Whenever you feel hot air and then you feel cold air, you better run."

Storm Patterns

Garrett talked about observation of prevailing storm patterns. He remarked, "At home you know we used to have this pattern of storms come along – you look west or southeast or southwest or northwest. And look at it while you are working on fences or maybe when we were plowing or getting ready to plant something." He added, "We would look around and that's how I would determine how to plant. If it's going to rain we're not going to do this or that." Others remarked that the storm patterns relied upon in the past are no longer valid because of a changing climate – these observations are discussed in Chapter Seven.

Clouds

Observations of clouds are a good indicator for the collaborators of what is going on "right now" and impending weather changes. Clouds characteristics as signs were described by Tantaquidgeon (1977, Delaware) and Lake-Thom (1997), and also extensively by Kiowas (Duke Collection), and the production of clouds was the goal of most ancient (and modern) rainmakers. The Potawatomi of Indiana and Michigan had remarked to Senator Kerr that even in the early 1950s it was becoming more difficult to use the clouds as signs due to the above-ground atomic tests. Nevertheless, several of my collaborators still use observations of the clouds as signs. Alan said generally, "Just knowing the moods of everything is good to have – you don't want to get caught out there with something bad." He described, "I can watch the clouds and I can adjust (what I am doing) to the high and low clouds, even the snow clouds, just by looking at them, observing them. I can tell how just how bad it's going to be." He added, "Just growing up, the old people used to tell you, you have a hot day and the cool front hits it and the clouds come and you better watch out because it's gonna get pretty bad. The weather is always getting mixed up and turned around (here), and I've seen tornadoes pop out of the sky, in the middle of the sky when the sun's shining like this."

Milton, as discussed in Chapter Five, is a keen student of cloud observation, dating to his childhood when the Walters tornado came up the creek near his house. He said, "I could kind of look at the signs, the clouds I had been taught and observed, and I could tell if it was going to rain or get a storm to go to the cellar, things like that. And I always could always outdo the weathermen with regard to their predictions. The clouds are where I got a lot of tip from."

Garrett was the one other person I talked to who seemed to take the most interest in the clouds and sky conditions. In an account similar to the one above in which he observed the flights of the bullfrog birds to move his horses out of the way of floodwaters, he related an instance in which he moved his horses out of areas flooded the next day because of his sky observations. He said, "Like three years ago I was out working the horses and looked back west and was looking south and I was thinking, I wonder if I should move these animals to higher ground. Some instinct told me I better move my horses to higher ground cause we going to get a good rain coming. I could see it coming." He described the clouds he saw as having rolls. He said he could do this because "I live there and grew up there, I can tell."

Randall described cloud observations, saying, "The elders knew what was coming because they knew what the clouds looked like – that's what they taught me first." He said they could forecast the hail according to the "hail clouds." He said, "Man we better cover up – and sure enough it hailed because they knew what the hail clouds looked like. And the hail clouds that they said were hail were billowy on the front part like that (gesturing). They said, 'Hey those are hail clouds, hail is coming'." Milton, whom I also happened to be talking to at the time, said, "Those are turbulence (clouds) – they are different from the others."

Surface Water

Alan talked about his observations of surface water: "If the rivers get so low you can walk in, we're going into drought. If creeks that run off of natural springs go dry, it means we are below average in the rain season because our water table is too low."

Humidity

Humidity also is used as an indicator. Garrett said, "I can see some of this coming – we'll be out there working and I told Rudolph Jr. we've got 30 minutes to get this well in – and sure enough the rain hit. I think a lot of ways we predict the rain is because of the humidity." Dixon also commented on the use of humidity, "How it feels outside. If you've got a lot of humidity, there's always going to be something building, and if there's a dry heat you're probably not going to get anything."

Lightning

Randall spoke about knowing when lightning would come. He remarked, "I think we all have that common belief in a lot of things. They knew, Indians knew, when you were going to get lightning struck. The hair on your arm or your head – when that darn thing started to stand up, you better run. We were lucky that never happened to us." In Kiowa lore lightning is said to come from the mouth of the Storm Spirit, or Red Horse (e.g., Momaday 1969; Greene 2009).

CELESTIAL

To my surprise, I did not hear as much about the moon and the sun as I expected, but much of what I did hear is similar to what I found in archival documents and other writings (e.g., sun dogs portending cold, damp weather: Gros Ventre of Montana to Senator Kerr in 1951, Kiowa – Duke Collection, and Delaware – Tantaquidgeon 1977; moon rings portending rain or snow: Gros Ventre in 1951, Cheyenne/Arapaho, Creek, and Kiowa – Duke Collection, and Delaware – Tantaquidgeon 1977; and generally in

Lake-Thom 1997). Randall had an interesting anecdote about the ubiquitous nature of the sun and moon to tribes everywhere and the apparent level of ownership tribal peoples have taken in them as indicators despite their similar use by land users and people outdoors of any ethnicity. He said, "Indians – you hear the same stories when I go out on my travels – how they knew and how we knew. They had the same kind of beliefs and teachings. A tribe way up in Montana – the same thing they believe is the same thing what we heard. And another tribe out on the east coast, what they had said is the same that we knew, too." He went on, "So somehow or another they all knew, there was a connection somehow in there – I can't really pinpoint it. They had the same beliefs. They all knew that. We talked about this one time – talked about it in a small group – they said, 'Hey, we've always said our grandpas told us about that' – and we said, 'Same way with us!'"

Moon

Garrett talked about the importance of the moon. He plants potatoes and onions by the full moon since it allows him to see at night. He said planting at night always results in a bountiful harvest. Ricky said, "I am trying to pass on what I know to my little ones – to look at the moon – the ring indicate that there is going to be moisture." Alan spoke about the moon. "The moon gives you a lot of signs, and there's different signs we heard from the old people to watch out for. When the clouds build up and there's a ring around the moon, that let's you know the rains are going to be coming."

Stuart had a humorous response when I asked him about using observational signs for his planting, saying, "When it's raining, I stay in the house!" He then talked about

cycles of the moon with respect to planting. He said, "(I plant by) the cycles of the new moon, going to full. The plants that grow up out of the ground, I usually plant them during full moon before it's going to change to the new. So the plants would grow with the moon." He said this goes along with the Farmer's Almanac, which he believed was the same as how the Indians planted in the old days. He said with plants like onions and potatoes that grow in the ground the moon "didn't really make any difference."

Sun

Randall mentioned rings around both the sun and moon and how each portended bad weather, knowledge that he attributed to a grandfather, Henry Tenadooah (a prominent peyote Roadman also known as Medicine Bird). Randall said, "Some of the things he showed was 'Look at the sun up there, there's a rainbow around it.' That tells us there's going to be weather coming, when they see the rainbow around the sun. I remember him telling me that in the early 1960s."

PERFORMATIVE RITUAL

I was also told about performative ritual that is conducted in response to the meteorological experiences of some. This was described in the form of bringing rain or splitting storms. The storm-splitting accounts turned out to be the most fascinating ones I heard and were very similar to ones from the Kiowa, Delaware, and Wichita described in Chapter Three.

Bringing Rain

Rainmakers and rain dances were described in Chapter Three as existing in many tribes, including the Apache (Sacred Rain Arrow license plate), Cherokee (Butler 1937-1938), Cheyenne/Arapaho (Duke Collection), Chickasaw (Adair 1775; Cushman 1899), Choctaw (Cushman 1899), Comanche (Deloria 2006), Creek (Stanley 1846), Delaware (Hale 1984b; Bierhorst 1995), Ponca (Duke Collection), Seminole and Shawnee (Lyon 1988), and Wichita (Curtis 1930). Richard Jr. described a Comanche rainmaker, stating, "A Comanche guy, Woogee Watchetaker. He could make it rain." Some additional research found this person, as the Native Arts of America website (Native Arts of America 2009) describes George Smith "Woogee" Watchetaker, who was said to be the adopted son of the Comanche war chief Quanah Parker. He was hired in the early 20th century for his services by towns during times of drought. It was said that rain often appeared after Woogee performed his rainmaking ceremony.

Alan and Randall also talked about rain dancers. Alan said, "They used to have rain dances – when they needed rain they danced until it rained. They had those ceremonies for days and nights, and they got it." Randall elaborated on rain dancers and Rainy Mountain. He said, "That's how Rainy Mountain got its name for the Kiowa tribe. There was a spring drought back then and they prayed for rain and it came. Our people were spiritual people. They had to have strong faith in God to help us back then."

Talking to, Splitting or Disrupting Storms

I heard several interesting accounts of speaking to storms to make them pass over, or of using sharp devices to split them. These correspond closely to accounts in

Momaday (1969) and Greene (2009) regarding the Kiowa speaking to storms to make them pass over, and in Hale (1984b – Delaware) and Tingle (2003 – Choctaw) regarding splitting storms with axes and knives. Bierhorst (1983) also provides an account of how the Cherokee frightened storms away.

Larry told about how his Delaware grandmother could split storms. She would walk outside when a storm approached and pray to it. She would either hold a knife high or place it in the ground, in both cases with the sharp side facing the storm, in order to cut the storm in half and make it go around their property. According to Larry, this always worked. My anonymous collaborator also talked about the Delaware and Wichita version of using a butcher knife to split a storm. This collaborator said you hold up a knife to the storm and then cast it into the ground, and had performed this rite as a precautionary every spring except for one, 2009, when Anadarko experienced the tornado. This person's comment was, "Who knows!" Maya told me that she has also heard people say that a Caddo or Wichita way is to put a hatchet into the ground, and the storm splits and goes in two directions. Maya said, "I've also heard people call it an old wives' tale, or American folk kind of remedy to get rid of a storm. Either a tribe has taken that on and used that as their tradition or Anglo farmers have taken that on as their tradition. I'm not too sure where that comes from but I've noticed that it's in both areas (cultures)." She added, "You are supposed to point the blade toward the storm. I've heard of a Creek family that uses the same (hatchet) method." Ricky related a similar story about how his Kiowa grandmother would talk to an approaching tornado and throw a hatchet into the ground to split it.

Randall also described how his grandfather talked to the storms to split them in

half, echoing the passages written by Momaday and others about how the Kiowas talked to the storms. Randall elaborated, lamenting that he wished he had listened more when he was young:

> Our elders knew how to talk to the storms to make them move and all that – they were really religious people. They really relied heavily upon God to hear their prayers and everything. I stand here as a personal witness to it. I saw it happen. A tornado was coming to our home like that, we had my grandfather and uncle there, and they went outside and talked to the storm and it missed us. It was coming dead at us. He (grandfather) was standing there, and it was a strong faith to talk to the storm to miss us. Occasionally it split, too. Unbelievable. A lot of these things we see first hand. My generation, we were really tied in close with our elders. We really listened some but yet wanted to play and everything – it was kind of like a hit and miss. I wish I had paid more attention now to what my grandfather was trying to teach me.

Maya provided two poignant Kiowa accounts of splitting storms and how she practices this activity herself. She said of this, "It's kind of just inside. I can feel when there's going to be a storm. My husband asks 'What's it gonna do?' Well, I don't really know but I have a feeling – it's probably going to split as it comes this way and it usually does." She continued, "When we see severe weather coming we usually will pray – my husband (who is Comanche) goes out with tobacco and says a prayer. Then he takes the tobacco and offers it to the storm in the direction it's coming from, and asks for it to pass over us. And it does." She described two specific events, described below, when she prayed to split tornadoes – the May 13, 2009 tornado that hit the east side of Anadarko, and the May 19, 2011 storm that produced a brief tornado between Fort Cobb and Anadarko, west of her home.

The destructive May 13, 2009 tornado that damaged the east side of Anadarko, and the storm's associated rear flank downdraft (straight-line winds) that affected the west side of town, happened when it was dark. Maya offered a detailed account of how

she talked to the storm in Kiowa. Wallace and Dorothy also told me about this storm and the extensive tree damage it caused in Anadarko. Maya said:

> It was an odd storm because it came from the northeast. That was odd, and threw me off totally. I kept seeing things dropping and said this is not right. The stations said 'There is no rotation, there's nothing here' and I said that's not right, wait a second. Something isn't right here, and then the power went out and the wind started blowing. We saw that straight-line wind, we were definitely feeling that, we could feel it on the roof. When we were praying, we took the mattress out. We have a storm shelter very close to our house, a community storm shelter, but we had no time when that wind started blowing and debris started blowing straight south. We had no time to get in there so we put the mattress over the kids. As we started praying, we spoke Kiowa to the tornado because that's what our ancestors used to do and that's what my grandmother used to say. And some of my aunts told me this is what you're supposed to do. And I got a text message from my cousin saying 'There's a tornado coming – talk Kiowa, talk Kiowa!' – she kept saying that. And I said well where is it and she said 'It doesn't matter, just start talking Kiowa!' So we started saying [in Kiowa] 'I'm Kiowa', or 'Do you recognize us, we're Kiowa?' I know about storms, and I'm an educated person, but at the same time I knew that this is something we needed to do and use that tradition. And even saying that calmed the family down, calmed my kids down. They felt like they had power to say something, power and control over that storm, and they calmed down. At that point, when it got really, really strong, I felt a hand come on my back and just push me down over my kids and my husband. It was the weirdest thing – I thought 'Do I fight this?' No, it just pushed me over and I just put my hands over them and we just all started praying and speaking Kiowa. And then we could hear a train going far away – that's it (the tornado), going east of us. As we kind of calmed down a little bit and you could still feel the wind – it wasn't as strong but pretty strong still. My brother called me and I said it's already passed, and he said 'Yeah they're saying it's passed, it's on the east side of town. But what if there's other rotations you don't know about? You need to get to the shelter.' So, we each took a twin, my husband and I, and I grabbed our oldest and we ran. As we ran I looked up and I could see this huge white wall – it was this massive white wall to the east of us – and that was the straight line winds you were talking about – it was just huge, like you could touch it. It was pretty scary. So we just ran into the shelter and waited. I can feel when a storm is coming and feel how strong it's going to be – I know that's weird, I know that's not scientific or anything, but I don't understand how I can feel that way having not been here my whole life. Now I can understand an elder that's been here their whole life – they know storms are because they've been here and they know the patterns.

Through personal communication (May 20, 2011), Maya described how she also spoke Kiowa to the May 19, 2011 storm – the tornado was confirmed to have touched down about two miles west of the Redstone Baptist Church, according to a National Weather Service spotter. About this storm, she said:

> Yes. We have no sirens, but we were listening to the TV and watching the skies. We had just returned from Fort Cobb Lake. There was so much rain it was hard to spot. But once I saw the inflow, I knew. Although it was small, I made my family get into the shelter. We also helped an elder and neighborhood kids get into the shelter. I stayed above to watch, and to speak Kiowa to the storm. It worked! The tornado went back up just a half to quarter mile west of the house and was trying to drop again, right over our backyard. That was when I took the picture (she was looking west, so the storm was just north of the church at that time). Talk about a crazy way to start the summer!

Dorothy provided a detailed account of how the old people split storms and how storms used to be more predictable. She said:

> I've seen my elders know when the weather was going to get bad – we had no radio, no nothing, no way of communicating. They also knew how to stop a tornado that would be coming. The practice went to my brother. Grandpa would tie a handkerchief in four knots and go out to the back, and a lot of the Kiowas will tell you their grandmothers or their grandfathers had done that. They go out to the back. In those days too all of the weather came from the northwest or the southwest. Now the tornadoes are hitting from the north, they're hitting from any direction. That's just not what the Indians believed in the old days. They'll say, 'Oh it's okay, it's in the north it's going away.' Now, this (May 13, 2009) tornado that hit this place (the museum) came from the north. It was uncanny – because they'd either take a hatchet, a little hand hatchet, or a knife, a butcher knife we called those, and go out to the back of the house. And all of the Kiowas called that cutting the clouds – you prayed to the Spirit and you say 'Go to where there are no people, don't hurt anybody'. I've heard some of them even call the clouds 'Brother' – 'You're not here to destroy people, we're poor.' Those are prayer words. Sure enough the clouds would pretty soon dissipate – I've seen it happen. Anybody my age or around that era will say 'Oh yeah, grandma used to do that, too.' I don't know the ritual – I should have went out there and watched.

On the performative ritual element in general, Dorothy talked about the knowledge of her

father. She said, "Dad used to always know when the seasons were going to be changing. Dad just knew ahead of time. I always credit spirituality to that, and prayer. Because every morning he stood on the porch and we knew there was a supreme being, the man who made everything."

LOCAL WEATHER KNOWLEDGE, SCIENTIFIC WEATHER INFORMATION, OR BOTH?

I asked the farmers about what types, if any, of scientific weather information they consult, and how they value and use it. Several of the farmers I spoke to said that while they respect and even use scientific weather information that is produced elsewhere and shown on television or the Internet, they trust their own local observations, and the situational awareness and intuition that are built from them (including gut feelings and common sense). They take pride in their own knowledge, and ultimately meld the various ways of knowing to form their overall insight. Several said they rely more on their own knowledge. Bennett (1982, p. 76) had found, based on research with agriculturalists on the southern Canadian prairie, that weather forecasting to them remained largely an art and local lore was as accurate for them as any other form of weather prediction. Several of my collaborators provided interesting comments about how they use (or do not use) scientific weather information and their trust levels of it, and their use of it in decision-making, and those are described below.

Garrett has mixed feelings about meteorologists – while he depends on them for planning purposes, he often is frustrated by their lack of accuracy, and ultimately trusts his own intuition for last minute changes. He said, "I kind depend on the meteorologists you know. Before I leave (in the morning) I usually get up really early and turn on the

TV to see what the day's going to be like with how hot it's going to be or if we are going to get any rain." Then, based on the forecast, he said, "If it is going to rain there's a lot of stuff I won't even try to do. We look at the weather to determine what we will do. If there's a storm coming midday or there's a 50/50 chance it will determine our day. We get the seed in the ground before it rains." On forecast accuracy, he said, "The meteorologists say this or that, but then when I go out there to work they're not always 100 percent correct." He related a story about how the television forecasters predicted a 30 percent chance of rain, and later dropped the percentage to 10 percent, but then a heavy rainstorm occurred that necessitated action by him in the middle of the night. He called this forecast "a bust." So, although he watched the weather in the morning before he heads to the fields, he said, "When I get out there, I start looking around. A lot of times I've relied on TV and got swamped by rain coming – I thought it was going to be clear – the darned radio and weatherman said it would be clear."

Randall was a bit more supportive about scientific weather information. He said, "We really rely upon the meteorologist today – it's timing. If we are expecting rain for three days we better work the ground up and put the seed in. Or for fertilizer, it's got to have rain to soak into the ground, so we've got to have perfect timing." Randall said the farmers will often talk about the weather when they gather for coffee: "Really, the funny thing about it is, they look to see what everybody else is doing and then they know it's going to rain. We debate a lot. 'It's gonna rain. No it's not, it's gonna fade to the north.' You know how that goes." Randall particularly looks at local television and the Internet, especially the Oklahoma Mesonet information, and weather radio. He uses this and his own knowledge to form his insight for cutting and planting. For cutting, he said, "We

need to cut hay according to the forecast of rain – we need to look about 5 days away. We can't cut and bale hay if there's rain coming – you have to get most of the moisture out of the grass before you bale it up. So we're on hold you know." With regard to planting, he said, "We rely heavily on that to plant as well. If they're forecasting the rain three days away we're gonna be out there planting until it's planted and wait on the rain to germinate our seeds. We really rely heavily on that – the weather information you gave me on the Internet, where I can actually see everything." He said the Oklahoma Mesonet information was "something we didn't have before. Now I'm able to argue when we can plant with the other farmers."

While Milton heavily values his own knowledge, he still consults scientific weather information. "I want to see real-time weather," he said. "I look at the radars a lot, the satellite pictures a lot. I try to watch Channel 9 and Channel 4." He also consults the Oklahoma Mesonet online. He saw the May 3, 1999, tornado when it first formed near Elgin. "That's when we really started watching it" (television weather). His son-in-law in Arkansas showed him an iPhone weather app that he decided he would buy. "It's just like $4 a month – it's worth it to me because I have to know what the weather is up here. I live in Elgin and by the time I get to Indian City (Anadarko) I run into ice, so I need to know what it is up here." Milton admitted, "I honestly and truly feel like up until oh, I'd say seven years ago, about the time they started using Doppler (radar) regularly, I could always outpredict the weather stations. But after Gary England got the Doppler then he had the best, when they started seeing inside the storms, then they were doing better than I was."

On use of weather information for farming, Milton said, "Like today, it's cloudy. And say we're gonna plant and put some fertilizer down or do some spraying for weeds – if we can get good weather information then that dictates whether we're gonna spend money to put something out there that's gonna wash out in 12 hours, or is gonna go down to the stream in another six hours. That real time weather or as current as I can get it really helps." He likes to look at longer projections for planning. He said, "When I can look at what the weather's doing and where the jet stream is going and how that's going to affect our weather – whether we've got a High sitting over us and we don't have to worry about what the jet stream is going to be doing, then that makes a difference." However, he is wary of television meteorologists whose knowledge about the local area is lacking. He said, "I look at what they look at, and if they seem like they know what they are talking about, I listen to them. Those down around Lawton, they still haven't proven to me they know what they're talking about. They're still batting about 50 percent." He also talked about the need for the television meteorologists themselves to acquire local knowledge: "They'll get a new weatherman and the first time he says "Chicka-SHAW" (not Chicka-SHA), I know this guy is not from Oklahoma or he's not from OU. The first tip is whether they pronounce some of the Native American words that are in the state, cities or towns – if they pronounce them right they have probably been here for a while."

Rudy Jr., who is not a traditionalist when it comes to weather knowledge, said, "This is a modern world. I don't look at the moon, I don't look at anything – everything is so modernized. You just push a button and turn the TV on or a computer so you can see what's happening with the weather forecast, what's coming up. To me it's simple,

probably the simplest thing." Although he admitted he ultimately trusts his own intuition as much as the information he finds from other sources, he particularly likes to watch Gary England (Richard Jr. also is a fan): "He seems to be the most accurate to me, but I've been watching that guy so long." He also consults Accuweather's 21-day outlook, which he uses to help make farming decisions. He gets up early, around 4 am, and checks the weather on television. He said, as described by most of the other farmers, that he and the other farmers will sit in the coffee shop or stand by the pickup trucks and talk about the weather, combining their various insights and opinions from various sources, to come up with a consensus forecast.

Ricky and Alan seem less convinced by scientific weather information, and trust their own intuition over other sources. Ricky said, "We have to do our own observations – have to look at the clouds, the color they are gonna get, how far away they are. That's about all we can really do." But, he admitted he looks at scientific weather information. On a typical day he said weather is crucial to him – on the day we spoke, he was concerned about the 30 percent chance of showers forecast because he and others wanted to fix fences, and since they needed to set the posts in concrete, they decided not to do the work. He also is interested in the rain forecast percentage before cutting hay, as it needs to be dry for a few days beforehand. Alan said "not really" when I asked if he uses scientific weather information, although he sometimes looks at future forecasts. Instead, he said, "I kind of take it day by day. Growing up I kind of know how the seasons are going to change. I listen to the weathermen – they can kind of predict a little bit – but they aren't always right. I can (predict) just by experience, just growing up around the tribes and my family." Alan made the interesting point that weather forecasts from

television are not specific enough for him in time and space – he said they are instead made (too) broad for an area.

Wallace, although not a true believer in natural indicators, also said he would not trust trained meteorologists: "Good or bad, I wouldn't put my money on the weatherman's prediction on TV, either. They can't pinpoint." He related a rather incriminating story about weather science:

> We took a trip down to Norman at that big weather thing there (the National Weather Center) – we took that tour. I was really impressed. But of all that, they still can't (predict). And those guys have their PhDs walking around there and some have been there for 30 years probably – a lot of intelligent people there but they still cannot (predict). They can track what's going on and tell you it's heading this way, but they can't pinpoint. It's better than it used to be (though) – when I was a kid, you just watched the clouds and you headed to the cellar and stayed there all night.

Bob said he also does not look at weather information on television or the Internet much, indicating that television weather is too Oklahoma City-centric. Instead he trusts his own observational and experiential intuition. For the purposes of his gardening, he says he waits long enough to plant for the last freeze to pass. He does not get excited about rain chances until they are at least 70 percent. He said a 50 percent prediction "doesn't help" and likened it to a coin flip.

Dorothy thinks meteorology has been detrimental to retaining local insights of weather. She said, "It was just the era. We've tainted the (old) ways. I think it was the times – the Lord gave them not enough knowledge about it like our meteorologists now – so they had to have something inside that they knew." Wallace echoed that the reliance on technology "has wiped it out and replaced it." Ingold and Kurttila (2000) had noted that reindeer herders admitted to "losing their skills" of reading the non-human world for

indications of impending weather changes as technology crept into their lives, including the increased reliance on television and radio weather forecasts.

Dixon offered some interesting thoughts on valuing his own intuition over information he can find from other sources, and technology. He said:

> Every place is different – living here for so long, you know what to feel, and how it feels. You watch other things and how they happen, so you know what's going to happen. I kind of like the older way of telling how the weather is going to be instead of some guy on TV or somebody on the computer telling me how it's gonna be. They're not out here to feel it. That's the way I like to see it. The weather, it can change like that, especially out here, right now it's sunny but next thing you know it, later this evening, we could have rain because storms can build that fast. It (local knowledge) is important. You can't always trust technology. There's always people that depend on it, and once the electric goes out, that's it. When I run out of battery I think to myself, I'm getting high-tech, too. I've got a GPS in my tractor, but I try to keep everything to where it's not fully automated; I try not to overdo it.

While Dixon values his own knowledge, he watches television in the morning before he heads out and uses technology to refine his forecasts, much like Milton does. While in the field he gets weather information on his phone, which has Internet, and checks it every ten minutes to help make decisions on cutting hay. He uses his own observations, particularly of the turtles, as a broad early alert system against which he can then consult weather information on his phone to fine-tune his thinking. He also values and includes the weather discussions he has with his farming buddies when they gather at the coffee shop.

DISCUSSION

As this chapter has shown, many of the people I talked to possess and deeply value their own local weather and climate knowledge. Their observational, experiential,

and performative ways of knowing, passed down by parents, grandparents, or even great-grandparents through oral tradition and observational example, help make up an important continuity of thought and practice from past generations through intergenerational knowledge transfer (e.g., Suzuki and Knudtson 1992; Mistry 2009; Lefale 2010; Green et al. 2010). This knowledge closely matches that culled from the Duke Collection of Native elders in Oklahoma 40 years ago, people who would have been the same age as my collaborators' grandparents or great-grandparents.

This knowledge is a place-based observational complex that follows and studies patterns and cycles of animal, plant, meteorological, and celestial indicators, and in some cases involves interaction with the non-human (environmental and spiritual world) to form a local situational awareness about what is going on around them. This fosters a place-based intuitive insight, or wisdom, possessing local relevance that they cannot obtain from other sources of weather and climate information, and many ultimately privilege their own insights in their agricultural activities (e.g., Monroe and Williamson 1987; Basso 1996; Antweiler 1998, 2004; Berkes 1999; Maurial 1999; Nazarea 1999b; Cajete 2000; Kidwell 2002; Roncoli et al. 2002; Orlove et al. 2002; Pennesi 2007a; Orlove et al. 2010; Lefale 2010; Crane et al. 2010).

Their weather and climate knowledge is socially mediated in complex ways of relatedness (mixed and cross-pollinated) through exposure to other sources of information from media (newspaper, television, Internet, radio), daily conversations at the coffee shop or around the pickup truck with others about weather and farming, observations of what others are doing in the fields based on present conditions, and attendance at meetings that introduce new ways of knowing to them such as that provided

by the Oklahoma Mesonet's AgWeather applications, all of which help my collaborators develop a consensus regarding the day's forecast and its impact on planned agricultural activities (e.g., Rundstrom 1995; Antweiler 1998, 2004; Cruikshank 2001; Jennings 2002; Ford et al. 2006a, b; Crane et al. 2010). Observational insights are maintained and retain their integrity through regular observational practice and experiences that adapt as conditions change (Turner and Clifton 2009 – see Chapter Seven), and they are maintained through performative practice during times of pandemonium such as an approaching tornado (e.g., Turnbull 1993; Huber and Pedersen 1997; Grenier 1998; Ingold and Kurttila 2000; Lauer and Aswani 2009).

And, there is a cultural situatedness to and value placed on this knowledge – it is "traditional" and sacred to them (e.g., Suzuki and Knudtson 1992; Antweiler 1998; 2004; Berkes 1999; Cruikshank 2001; Merculieff 2002; Henshaw 2003; Ford et al. 2006a, b; Mistry 2009). This identity attribution is attained not only through the intergenerational knowledge transfer described above that values the ways of the ancestors (people who had to rely on their own intuition in the absence of any other weather and climate knowledge system), but also through, as Randall described, how "All the tribes had the same kind of beliefs and teachings." Indeed, the knowledge described by my collaborators in many cases matches closely that polled by Senator Kerr from tribes across the U.S. 60 years ago that he and his aide described as "Old Indian Ways" of knowing. The Gros Ventre informant who responded to the Senator lectured that "there is much – very much – that the Whiteman fails to appreciate because he doesn't study…the 'Indian's way' that would contribute greatly to the progress and advancement of the Whiteman's civilization." The value of this knowledge to Native peoples then is

not only in its local relevance but also in its cultural relevance as a remembrance and maintenance of the past – as Mistry (2009) describes it, my collaborators are helping to maintain a "social memory."

However, other than the performative ritual knowledge that was described to me regarding particularly storm disruption, it is difficult to claim that the observational indicators of my collaborators have undeniable Native American roots. Generally speaking, many of these indicators are local vernacular knowledge or common folklore. Indeed, I was told things that have been observed by peoples of any ethnicity for centuries across the world. That said, particular indicators I was told, such as the condition of pecan shells along the Washita River, may be entirely meaningful and unique to, for example, the Kiowa people who told them to me, an area inhabited by the Kiowa-Comanche-Apache and Wichita-Caddo-Delaware for over 100 years. The people I spoke to seem to have taken ownership of them as unique and special – a cultural valuation against other forms of weather and climate knowledge. This may be due to the nesting of their environmental knowledge within a belief system that promotes a closeness or intimacy with the non-human world and a respect and reciprocity when interacting with it, including a need to closely monitor it (see Chapter Eight). A key point here is the value the people I spoke to place in their local observations, their continued observation over time, and the resulting insight they glean from them, which may not be the same for other people in the area who may privilege scientific conceptualizations of weather and climate and may situate their knowledge within different belief systems regarding environmental interaction.

CHAPTER SEVEN

"THINGS ARE NOT BALANCING OUT" – PERCEPTIONS OF A CHANGING CLIMATE

Given the topical relevance of climate change and its potential impacts on Indigenous people, I discussed with my collaborators their thoughts on climate change – Have you noticed changes? What impacts do these changes have on you, including both on your observational signs and on your agricultural activities? Turner and Clifton (2009, p. 185), for example were told by salmon and shellfish harvesters in British Columbia, "Everything is different now with the warmer weather; harvesting times are way, way different." Similar thoughts were conveyed to me regarding the impact of changes. This chapter chronicles the thoughts of my collaborators on various aspects of climate change and variability.

OBSERVATIONS OF CHANGE

The observations of change told to me were wide-ranging, and are categorized here, as in Chapter Six, by type – here, animals, plants, expected seasonal changes and weather, and water resources.

Animals

Garrett said he has noticed more armadillos on his properties, which he attributed to "heat down south," causing them to move farther north. Milton said, "And the little horny toads – I haven't seen many of them, I haven't seen one in five years. Yeah, it worries me, and I don't know what the cause is." Randall added, "And just like turtles in

the pond year round without even hibernating, I've seen that going on out there. Our animals are confused."

Some related how birds are remaining year-round. Milton said, "I have seen geese and ducks staying here year around where they used to migrate." Ricky agreed, saying, "Even the birds – you used to could tell when the geese were coming how the weather was gonna be for the winter months. But even that has changed. You got birds staying here now that should have left. Even the animals don't know what to do anymore. Our climate's so much changed over the last 10 years." Bob said that he has noted more crickets and ants.

Rudy Jr. commented on how his fishing has been affected. "You know what, I cannot really find any earthworms. A few years ago when you wanted to go fishing, you could go out almost anyplace in the area to dig up worms to go fishing. Now, where do you go to find these things? Do you need an earthworm farm or something?" He said that he now instead goes to the convenience store when he needs bait. He also said that crawdads are harder to find: "I used to go down to the creek to find those things and go fishing. You don't see those things around here anymore. It's just drier."

Plants

Rudy Jr. talked about the affects of change on pecan trees and plums. He said, "We have a pecan grove along the creek – hundreds of trees – and they make every other year. Right now this is the third year they didn't make – the plums, this is their third year. We don't understand." About the causes, he said, "We don't know if it's the (lack of) rain or if it's the land or if it's the fertilizers – they're nature and they come up by

themselves. The plums never did come this year – no fruit. Kind of makes me wonder what's going on, you know."

Dorothy provided some interesting remembrances of how things were related to plant abundance when she was young, in the 1930s and 1940s. She said, "Last year we got the big idea to hunt for choke cherries. They're orange and they used to be mixed with a corn mixture that was like our dried meat patties that they carried – well, these were cakes. We had the hardest time finding those, and in my day they used to have bushes all over. And finally we found some up on the side of the road up by Fort Cobb." She also related a story about what used to grow along the Washita River:

> We'd go down to swim in the Washita River, as red and muddy as it is, and we'd have a muddy slide. On our way down you could always find something – they'd have a melon field and we thought nothing of pulling that out and breaking it in two, and they had those grapes that were little, not like the big winery grapes, there were little bitty wild grapes and everyone remembers them from my age group. (Dorothy called these areas "rich gardens.") Even my mother used to make grape jelly with that. But you could pull a whole vine of them down and eat them. And there were a lot of wild plums. You just always knew where things were growing all over. And all of a sudden, I don't know what era, the weather just started not doing like it's supposed to.

Expected Seasonal Changes and Weather

Ricky described how expected seasonal changes are not happening. He said, "The winter months – I remember snow this deep (gesture) but now you're lucky to get an inch. Or even if it snows at all. You used to depend on that, and the sleet, the snow. But it's no more." He also mentioned rain patterns: "Even the rain patterns have changed – they used to say April rain brings May flowers or something like that – but even that has changed. We don't even know anymore – the weather patterns have changed." He also quipped about El Niño, "Who ever heard of that 20 years ago?" Larry

said that since he did not grow up in Indian Country it was difficult for him to say much about changes, but he did remember more snow in the 1960s (with drifts in feet) and more ice storms now, with this trend beginning in the 1970s, though the last couple of years have been snowier. Maya told me about the increasing frequency of ice storms. She said, "I have noticed the ice storms getting worse. They are so much worse. Out here on the plains it's not the blizzard that's the problem but it's the ice that forms. I've noticed those in the past four years. We used to have like one every five or six years, now it's two a year. That's what I've noticed."

Sandy talked about hailstorms coming out of season. She said, "Back in February 2009 there was this hailstorm, and that's considered winter. We heard this noise almost like a train that loud in the basement. After that was over it got real quiet and we all came up – the ground was covered with hail, just like snow. We had hail damage on our cars and so forth but that was really unusual to have a hailstorm in February."

Alan described increased variability: "In the past ten years it's been bad, it's been odd, it's not the same. Ever since they talked about the ozone layer, it's showing. Sometimes we get more rain than we need and then we get less, it's not balancing out like it should be. Then our heat – it's getting warmer. And sometime it gets cold, it's odd." He added, "It's a little bit more unpredictable because the way the climate is changing." Maya also talked about increasing summer heat: "The heat, I don't ever remember it being this hot. We used to spend summers out at Fort Cobb Lake, and I don't ever remember it being this hot, being so hot for so long."

Dixon remarked generally on changes in expected patterns. "Last year is totally different from this year. It's all changing. It used to be winter would get cold and you'd

have a snow, springtime it would be wet, summertime would be summertime. Now they're having tornadoes in the fall, everything is starting to mix up, the weather is changing, the atmosphere is changing. And it's hard to deal with stuff like that anymore. It isn't like it used to be." He talked about the previous winter: "Last year we had that blizzard and all that ice – we hadn't seen anything like that in years. And the year before that it was completely dry – no snow, just cold and dry. Drought in the wintertime!" On unpredictable summers he said, "Then it will be a wet summer – we got like 16 inches when we had that last hurricane come through (summer 2010). And that other summer (2007) we had two months of nonstop rain – I lost 400 or 500 acres of hay and that about put me about of business, most of that was custom work – I didn't work for two months. You talk about hard. But, once it dried up we had the best hay season we ever had." Richard Jr. also commented on tornadoes, saying "Years ago there was like a set pattern – tornado season was from March to May. But now it's just anytime. It just doesn't give you time to react anymore."

Dorothy provided an interesting observation about rain from her childhood days, saying, "My earliest recollection – we always had so much rain, but it wasn't this nasty kind (like we have now). It was the kind that it would rain real pretty and I remember even swimming in the road ditches, the water was abundant. We had abundant rain, sometimes it would feel so good because the drops were big and there would be no thunder and lightning." She also said there were more rainbows when she was young.

Water Resources

Randall has noticed changes in water resources. He said, "Our water table is being affected by this climate change. Our creeks are drying up. It's because our water table is low – they say because the farmers irrigated coming out of our aquifer, but it's not, it's from the change in the weather." He said that farmers in the area do not irrigate as much as they used to since there are fewer peanut farms. Alan said rivers have fallen so low that "you can walk through them." He also said some springs have dried up. He mentioned how fishing has gotten worse because the water temperature is higher than it used to be. Wallace also mentioned a loss of water resources.

AFFECTS OF CHANGE ON LOCAL OBSERVATIONS

An important consideration here, which my farmers echoed, is how climate change is rendering some of their observational indicators less reliable. Some anecdotal evidence from other places in the world suggests this as well. For example, Majoros (2010) wrote about the effects of changes observed by Gordon Restoule of the Dokis First Nation Reservation in Ontario. In the past, when he heard owls in a swamp at night, he was confident that rain was coming (a screeching owl meant cold air or a storm was coming). Now, these owls are heard so infrequently that he claims their sounds do not signify anything. Also, deer used to head for cover in low-branched trees like hemlocks and pines during a cold spell or in advance of a storm, but now they gather under hardwood trees with higher canopies, such as oak, which do not provide as much protection – Restoule attributed this to warmer winters. From the introduction to this chapter, Turner and Clifton (2009) had noted amongst salmon and shellfish harvesters in

British Columbia that warmer weather was causing havoc with expected or anticipated seasonal activities.

Some of my collaborators remarked similarly about the increasing unreliability of animal signs. Randall summed it up succinctly, "You know what, I see that even the animals are confused because of our change. Our world is sick." Ricky provided detail with respect to animal and plant signs. He said, "All the signs that told the conditions about the weather that people relied on are no more. But even the animals don't know anymore. I don't even know if they could tell anymore." He described how the animal signs that his father used, like the gathering habits of beavers, the thickness of the fur on a deer's chest, and the nest building characteristics of squirrels and birds for determining the severity of the upcoming winter, or observations of horse behavior before an impending storm, seem less reliable than in the past. He said, "The animal knew."

Wallace said that although he "wouldn't put money on it" (watching the animals), he thought animal signs are being lost due to change. He said, "My grandfather used to tell us how about the birthing of wild animals – if they are birthing early or late, it will have an effect on the early winter." He discussed squirrels, saying, "Some animals like squirrels will get a growth of hair, but it's been hard for me to detect. The animals that were in his era are not in my era. It's changed. There's not as many squirrels here as there used to be to look at, to study. I suspect that my grandfather studied that, whatever he could see or looked at." Regarding his own animals, he said, "I've watched my cattle to see how they act, but I can't detect if there's changes."

Ricky commented on nut characteristics: "You really can't go and look at the nuts or the pecans or the walnuts and see how the shell was, to tell what was going to take

place or what was going to happen because it's all messed up."

Donald Topfi, Chairman of the Kiowa Tribe and great grandson of Silver Horn, made several points of relevance here during his opening address at the International Summit on Indigenous Environmental Philosophy at the Redstone Baptist Church in April 2010. He said the weather and climate patterns have changed. While his people (in particular, his grandparents) used to be able to predict the weather, they cannot now. He said the weatherman tells us what is happening and why, but we already know that things have changed. He noted in particular how storms now come from the east instead of the west or south.

FARMING ADAPTATIONS TO CHANGE

Some of the farmers offered insight on how they have adapted to changes they have observed. Garrett has made changes in his wheat farming based on the perception of freezes coming later in the fall. He said, "We'll plant our crops (wheat) later in the fall, close to November, because we learned that if we planted too early we got failed crops. The late freezes hit the early crops and killed them, and we lost those. The ones that were planted late hadn't come out yet, so after the cold spell went by they started sprouting out." Rudy Jr. corroborated, saying, "That's how we saved our wheat – we planted 30 days later – the frost didn't get to our seeds." Dixon described his strategies to combat recent later spring freezes: "We always plant in early spring, and usually we try to get in after a freeze. Last year we had planted some crops already and it was April, and then we got a late frost. A late frost, that will put you out – it sets everything back, it will kill everything. So this year we were scared to plant anything until at least May 1."

He added, "The cold winter set everything back – we didn't get our first cut of Bermuda grass until June 1, and we're supposed to have it in the middle of May."

Ricky talked extensively about how increased climate variability is making it harder to plan. He said, "Weather plays a vital role in what you're going to do. All the farmers would plant if they would know what the future was going to hold – are we going to have a drought this year or floods? It's too unpredictable – we really don't know – we can have an idea of what might take place, but it's just a gamble." He admitted that he may have to rely more on television weather to forecast. He added an interesting thought on taking control of nature: "It's about taking chances anymore and going on your best intuition – we can't rely on nature anymore because nature doesn't know what to do anymore. We're going to have to rely on man-made abilities for our crops – because we're going to have to rely on irrigation systems to put water out. We'll have to make our own change of weather ourselves."

Sandy offered thoughts on a farming adaptation that might help limit carbon emissions and reduce climate change. While her husband is not practicing no-till on their family farm, she believes it is an important component of carbon sequestration. She said, "The key to sequestration is not cutting, not plowing, not moving the soil, just allowing the soil to remain in its state, using less energy, because energy is one of the problems why we have the warming. So it is kind of all tied together – no-till is right in there trying to create a better atmosphere."

DISCUSSION

The contemporary relevance of the impacts of climate change on Indigenous peoples is manifesting itself in various ways. Two recent examples of heightened awareness of this issue took place as I wrote this dissertation. In *Facing the Storm: Indian Tribes, Climate-Induced Weather Extremes and the Future for Indian Country*, the National Wildlife Federation (2011) reported, "The high dependence of tribes upon their lands and natural resources to sustain their economic, cultural and spiritual practices, the relatively poor state of their infrastructure and the great need for financial and technical resources to recover from such events all contribute to the disproportionate impact on tribes." And, the Smithsonian Institution's National Museum of the American Indian presented "Conversations with the Earth: Indigenous Voices on Climate Change" during the latter half of 2011 – this multimedia exhibition I visited explored the impacts of global climate change from the perspective of 15 tribal communities in 13 countries using photography and community-created video and audio recordings. It is said to be the first exhibit of its kind to highlight Indigenous science and examines how Indigenous communities are disproportionately affected by climate change. No tribes from the contiguous U.S. were involved, however, which allows for a future research opportunity (see Chapter Ten).

This chapter demonstrated how, according to most of my collaborators, climate change is a real phenomenon perceived at the local scale and is impacting their ability to observe relied-upon indicators, and has caused them to make changes in their agricultural endeavors. Generally, it was conveyed to me that weather and climate have become less reliable or predicable with respect to occurrences such as normal seasonal changes and

expected rains, with perceptions of more drought and heat, and less snow – a general feeling that the climate and its weather have become more variable overall. It is interesting to note here that the people I talked to, much like Ingold and Kurttila's (2000) reindeer herders, perceive seasonality mostly as a phenomenon of experienced weather (the recurrent rhythms of plant growth and animal movement and their effects on everyday life) rather than as a phenomenon of recorded climatology (the record of averages and fluctuations of atmospheric attributes without particular regard to affects on the lives of plants, animals, and humans). To the farmers, fall begins or is near when the indicators tell them so. Conversely, as fall approached in 2011, my meteorological colleagues proclaimed via social media on September 1 that fall began that day; September 1 often is referred to as "meteorological fall". The high temperature in Oklahoma City on September 1, 2011 was 102 degrees, not a fall-like day.

A most alarming view revealed in this chapter is the impact of change on the farmers' once-trusted observational signs. This is perceived mostly as confusion in animal behavior and in unreliability of once-assumed weather patterns and seasonal changes. Nevertheless, most still make their observations and adjust their insights about them in light of changes and variability that has been perceived.

The increasing unreliability of their natural indicators may force my collaborators to consult or value scientific weather and climate information more than they desire, but recall the reticence of some to do this as described in Chapter Six. The perception of change as experienced variability and disruption of recurrent natural rhythms rather than as a recorded climatology may impact the collaborators' acceptance of scientific weather and climate information, and may influence their views on why change is happening and

their trust levels in climate scientists or the messengers of climate change. Crane et al. (2010) summarized how attitudes toward climate predictions, including beliefs and feelings, are as important as comprehension when it comes to believing or using climate information (McCrea et al. 2005) or how people relate culturally and socially to the means and messengers of information delivery (Sherman-Morris 2005). Jennings (2002) study of northern plains farmers concluded that cultural meanings about phenomena like climate change are derived from the everyday experiences in which peoples' values and beliefs about themselves and others are formulated, with climate conceptualized as a context or filter for ecological experiences and perceptions that can influence decision making. Ingold and Kurttila (2000) found that the cognitive disconnect between the understandings of Samí reindeer herders and climate scientists rendered useless efforts by the scientists to convert climate change predictions into information relevant at the local level. The point here is that most of the people I spoke to feel a similar disconnect between their own experiential relationship of climate variability and the scientific conceptualization of climate change, which seem to impact their views on the larger discourse surrounding global warming and its messengers, and their basic trust in or desire to use scientifically produced climate information at all. Ultimately, their views here are formed in complex, socially mediated ways, strongly influenced by group decision-making dynamics through their participation in various farming and social units (described in Chapter Five).

Reasons for climate change expressed to me ranged from man-made causes to natural cycles to God's will. Among the man-made causes described were air pollution (ozone was cited several times), general overconsumption, a thirst for fossil fuels and

energy, and even the planting of shelter belts in the area in the 1930s, which Larry thought might be responsible for some of the local changes noticed. Others described change as being part of a natural cycle or rhythm, while one said it is simply "what you believe" (i.e., climate change is a social construction). On changes in general, Ricky said they "are not made by nature's problems, but all man made stuff. Our nature wants to change (compensate) but we're not allowing it." Stuart agreed, believing it is obvious: "Everything is human influence. We're supposedly the thinkers and the smartest ones able to do anything, and yet we're the ones destroying the trees and straightening creeks and all that kind of stuff." Garrett blamed air pollution, echoed by Milton and Rudy Jr., "All these chemicals that's been put into the atmosphere, this ozone and all this – the man made chemicals sent up into the air have been destroying the atmosphere. All this stuff going up there is deteriorating the ozone layer and getting into the weather systems." On over-consumption, Maya said, "Everybody in this society – it's 'We want it and we want it now' – it's that take-out and to-go drive-through culture. If you don't have your energy, if you don't have your electricity right here and right now, people will be mad." Sandy described the nuance between climate change and global warming: "The reason I referred to it as climate change rather than global warming is because we've been having excessive cold times that may even out the warm times. So for that reason I don't know it's truly a warming – it may average out to close to what it's been but yet it's at extreme rates right now." But, Dixon remarked, "It's just what you believe. We don't know what this world's going to do. You look at a book – the geologists say this happened before we even started. Well, how do you know? Just because you find some dinosaur bones, or an asteroid hit the earth. There are always certain people who think we're all

producing global warming – I think it's all just happened." Milton is not sure what is happening, either, but believes we can reverse the trend by getting away from fossil fuels: "We do need to develop other green energy and protect our planet more. I think that's a good solution (wind turbines) – I think the geothermal is good – anything that is renewable, whether it's for electricity or biodiesel or fuels – as long as it's a green product that is renewable then I don't see anything wrong with that."

Some of my collaborators indicated that before they can form an opinion on the larger climate change debate, and develop more trust in the information produced by scientists, they need more information. For example, Milton said, "I listen to them (climate scientists) but my opinion is still out, because I need to see more. But I'm afraid of what I'm going to see." Rudy Jr. indicated, "(The debate) gets my attention and I listen to it but other than that I don't really care." Stuart said similarly, "I listen to them (climate scientists), probably not as much as I should. I read things in the paper and listen to a lot of what they talk about." Others, like Sandy and Maya, are surer that the scientists are right. Sandy said, "I've watched CNN to keep up – I think they (the climate scientists) may have something there. I don't think they are just cuckoo or have their own agenda. I think they are studying and trying to tell us, just trying to relate information to us." Maya added, "I only know as much as I hear and read. You hear people in our state say there is no global warming. And that to me is just ridiculous because there is scientific evidence that, yes, there is. I do believe it is man-made, because if my grandma was still around she would probably agree with me that it was never this hot – that would be going off of her information." Maya provided a telling anecdote on the disconnects in conceptualizing climate change: "There is a lady that we

call Grandma Dorothy (my collaborator Dorothy), and she says the same thing – she doesn't remember it being this hot running around in this area when she was a little girl. But then if we asked her about global warming she'd be like, 'What do you mean?' She wouldn't understand that part." Others, like Wallace, do not like some of the messengers of climate change. He said, "As far as climate change, that guy Al Gore, he's been made a millionaire off of that. I don't believe him – he used a lot of words that were new to people, new to me, too, about weather and changes, about polar caps and how they are melting, how it's going to do this or that. Shoot, I'm not going to waste my time to follow him." Wallace likened Gore's credibility to that of "the local weather guy," another indictment of television weather forecasters.

CHAPTER EIGHT

"EVERYTHING WORKS TOGETHER" – OUR RELATIONSHIP WITH THE NON-HUMAN WORLD

I asked the farmers and traditionalists the question, "What are your views on the relationship of humans with nature?" I was provided heartfelt and often emotional responses, many echoing thoughts expressed by Suzuki and Knudtson (1992) and others who wrote about Native wisdom (Chapter Two). I asked this question with the assumption that their (often) reliance on their own weather and climate observations is informed and contextualized by their philosophy regarding the human/non-human interaction. Responses here are categorized by Native environmental philosophy, environmental wrongdoing, and suggested or ongoing environmental practice for better environmental interaction.

NATIVE ENVIRONMENTAL PHILOSOPHY

Milton provided a succinct introduction on Native environmental philosophy:

> I've always been taught by my grandmother and grandfather and my dad that we as Native Americans are one with the land – it's Mother Earth and we have to take care of her so she'll take care of us. We only take what we need and give back what we can. As long as we deal fair with the environment and farming, what we do in nature with that mind set, we feel like we can evolve and not hurt Mother Earth. We'll leave her for our children. That's the way I look at everything I do – I want to leave it better than what I found it.

Alan expressed this similarly, saying, "I believe we should protect as much land as we can, preserve it. I believe that's why it was issued to us, so we can protect what we have." Randall, speaking for the Kiowa, said they are a "spiritual people who value nature." He has told me many times, "Everything works together." Rupert Nowlin, an

Arapaho rancher, emphasized tribal religious beliefs about the non-human world at the 2010 MFSI symposium I attended. He said, "We are raised to be part of the ecosystem – we are guardians and custodians of the earth and we were not put here to do as we please. We cannot own something that will be here much longer than us."

Dorothy talked about how her dad and others would pray before taking anything from the non-human world. She said, "They would pray before they cut a pair of moccasins, even. And they tell that animal, 'You gave us everything, and we want your blessing from this.' People like to dirty things by throwing stuff. (But) you're throwing at our mother, you are defiling our mother by throwing all that trash and stuff. Everything, they (the old people) thanked Mother Earth for."

Richard Jr., a spiritualist, said, "This is God's land – we have taken and not put much back. My grandmother – she made a song. They (the old people like her) were firm believers in their Creator. They had concerns about this land. The song they would sing was that God would preserve this land and to not let mankind disrupt its course. Keep it back to the old ways." Wallace, a pragmatist, said, "Even though it's terrible at times, nature is given to us by God to challenge us, and try us, and test us, and I think humility is the key factor you need to keep in mind. You can't curse the weather or curse God, and I think that sometimes we've been guilty of doing that in society." About Native Americans and farmers, he said, "Who would be the most spiritual and humble? Next to Native Americans, it's the farmer and the rancher that has more gratitude and spiritualness, about as much as Native Americans do."

Sandy remarked that because we are not taking care of the non-human world, it is reacting negatively to us: "My view is that nature was created for man and we should

live in harmony with it. And because we have in my opinion not lived so much in harmony, nature is coming back on us with storms that are huge, like the baseball sized hailstones that pelted my son's car a couple of weeks ago." This sentiment is similar to Wallace's belief that it is "challenging us."

Appropriate here are the thoughts on environmental philosophy spoken during the first day of the International Summit on Indigenous Environmental Philosophy held in April 2010. Leslie Standing, President of the Wichita and Affiliated Tribes, described how the tribes are fighting daily for their natural resources; just trying to keep what is natural is "a hassle." He is worried about chemicals that are put down on the farms and what is put into the air. Jeff Houser, Chairman of the Fort Sill Apache Tribe, said that since we now mostly buy our food from the grocery store it is easy to forget about our reliance on the earth and how important it is to us. Donald Topfi, Chairman of the Kiowa Tribe, spoke about how we are not taking care of the earth and that we need to teach the young people how much we love it, and must pass down what we know about it, now. He said we should take what we learn at this summit and share it with others. A passage from the Summit's Redstone Statement, "Leave Us A Future!" summed up the collective philosophy of the delegates (International Summit on Indigenous Environmental Philosophy 2010):

> Today, we are at a tipping point at which humanity is in danger of being removed from the cycles of Mother Earth. We bring this urgent message in response to Indigenous women, youth and children from around the world who have consistently asked us to leave them a more balanced planet.... Environmental, social, economic, and political conflicts over natural resources and access rights, climate change concerns, and other significant issues threatening international and local communities did not suddenly erupt on the global landscape. Rather, they are an outcome of the historical process that today affects every area of creation. Spiritual, cultural, social, economic, and political structures and values lost their

> connections to the communities and now focus exclusively on the individual. The world shifted from the circle of community to the ascendancy of the individual, resulting in a dangerous environmental imbalance with significant spiritual and health consequences. Balance must be restored in order to heal the earth, and it must include the participation of all ages, races, genders and cultures.

ENVIRONMENTAL WRONGS

To understand this philosophy better and how it might tie in to their observational and performative weather knowledge, it was important for me to ask and know through examples how my collaborators feel that the environment has been wronged and how it has affected what they observe or how they farm. Randall has indicated to me many times, "Our lands are unhealthy." Ricky, who was the most passionate when talking about this topic, provided a telling anecdote: "Our relationship with nature as a body is lost because we take things for granted." For instance, he said, "If you go to the top of Mount Scott, if you walk down the side of the mountain and see all the pollution - the beer bottles, the water bottles, the trash. You can go to creek bottoms and see all the old refrigerators, air conditions, car bodies, waste oil. People don't value those things (the mountains and creeks) anymore."

Air Pollution

Ricky described air pollution: "All the pollutants going into the air – the aerosol. That's why we are having all of these problems with asthma – they say there's an asthma problem with old people and young people that's because of all the pollutants in the air – we're guilty of that ourselves." He commented on the negative effects of pollution on some of the plant indicators he likes to look at. He said:

> You used to tell by the fruit, the trees, they could tell you things. Like the walnuts or the pecans, by the shell, the way it looked. A pecan, if you looked at that shell, and it would be just nice in color, no impurities on it, but if you was to get that now that's going to have discolor in it or the shell is going to be deformed. Where does that come from? It comes from our environment – of all the things that are in our air. These trees catch it and it goes into their system and then it comes out in their fruit (gestured about how small walnuts have gotten). It shouldn't be that way.

Ricky also described the effects of air pollution on being able to use sky color as a weather indicator. He said:

> You used to look at the sun and how it rose – with the different colors that it had would tell you what lies ahead with the weather. If the sky was gonna be an orange color or if it was gonna be clear that you could tell, but you can't tell anymore because of all the pollutant in the air, it deceives you on what you think it may be. A lot of those ways that were foretold with our old people, they had to rely on those things because it was their survival. But our world has changed – I just always think about what the old people would have really thought.

Sandy similarly talked about the inability to use red skies on the horizon for anything now, due to pollution. She said, "My grandmother believed that if the horizon was red in the evening you would have rain the next day. Well, due to pollution, global warming, and so forth, we can't count on things like that anymore. We have a lot of red sunsets now due to dust particles and pollution."

Water Pollution

Ricky and Randall both talked about water pollution. Ricky said, "It's the (farm) chemicals – when you plant something and then it rains, where does all that washout go? It goes into our creek beds, our water supply. We're drinking it. These animals, our natures, don't know what to do. We're going to have to do our part, too, for the environment, for the waters. We rely on those things." Randall added, "There used to be

a lot of birds in the creek and you don't see them as much anymore. It makes you think – what's happening out there, what's going on? You know, it all works together. These streams – you got a healthy stream, you got fish in there. That's how you know you got healthy streams."

Wallace had particular words about how the local towns have contributed to water pollution:

> Our waters are worse off than before. Every little town up and down this Washita River here used to dump their raw sewage into the river – they did that for decades. We used to go swimming in it, and fish. Now they tell you it's cleaner, but I don't believe them. It's a losing battle – our humans in relation to the environment – we are just destroying it a little at a time. I think the Creator of this world knew we were going to do that. I think he's got a plan we don't know about yet because we haven't taken the time to find out.

Water Engineering

Some talked about other ills involving water, created by humans changing the course of the land. Wallace talked about the effects of farm ponds:

> When I was a kid my grandfather would take us fishing and swimming in that creek (the one where flash flooding occurred during Tropical Storm Erin in summer 2007, resulting in at least three deaths), which was as big as the Washita River. What changed that, the face of that, the topography, was conservation. They (the government) built all these little ponds on people's land to conserve water and erosion, which was a good deal, I think. But it still did some harm that reached into the future that they did not anticipate (like flash flooding). They've learned, but you can't change it now. I was trying to get a pond built, but they said they don't really do that anymore. They will not admit that they made a mistake.

Stuart and Richard Jr. talked about the negative effects of stream straightening. Stuart said:

> One of the biggest things that hurt the farmers on Sugar Creek was when they straightened it out. If they had left it alone, the ground on either side would have been a lot better. I don't know how many acres of farmland

> were lost when they straightened out Sugar Creek. My dad tried to tell them that, while it the floods down on this end, it stays out only three days – as soon as the Washita goes down, the Sugar starts flowing and the water goes back into the creek. Now our farmland on either side of Sugar Creek is lower than previous, and we've lost I don't know how many acres of land.

Richard Jr. described this in reference to the Washita River, saying, "This Washita River, when the Corps of Engineers came in and rerouted it for whatever reason, then it started to overflow in the last ten years. It was all right until they stuck their hands into it. People in Apache, in the bottomlands, had to move out."

ENVIRONMENTAL PRACTICE

Several of the farmers described practices that they believe will help the environment heal and fit within their desire to be environmentally respectful. Many focus on no-till agriculture as a way to achieve this. Though it is considered to be a relatively new practice, it is seen as a way by a number of my collaborators to get back to a form of agriculture that causes a minimal amount of harm to the land. Dorothy had told me, "The Kiowa word for plowing means 'tearing the ground up.' That's our word for the farmers that came through. So dad would stand there with his one little plow and pray, but he still said, 'I'm tearing the ground up. I'm tearing Mother Earth.'"

Soil Treatment

Of no-till, Garrett said, "It helps keep the moisture in the ground, and helps keep the minerals intact in the ground." Randall explained the thinking behind this practice:

> What we're doing, being Native Americans, we are conservationists. We care heavily about our lands. We care about its nutrients, we care about what kind of health it's in, what kind of state it's in. We found out the no-

> till drilling of plant cropping preserves our nutrients in the ground. You are not disturbing the soil. It has a tendency to heal itself. When you plow the ground up and you disturb the soils and it rains, you see red river and red streams – the topsoils are all leaving the fields and washing into the streams. With our no-till system in place the water is clear and when it runs off there's nothing going into the streams or ponds. The no-till method keeps the land moist – whenever you turn the land over it dries it out. The more the moisture stays in the ground, you know – we've had some good results. Without good soil you can't get a good crop out. There are a lot of people that like it and some that don't. They're afraid that it attracts larvae and bugs, but it hasn't affected our crops. With proper care and proper grass management, it's workable. We are believers in conservation and we believe in no-till to preserve our land and soils. We're trying to make a difference here.

Larry sided with this and talked about how soil erosion and runoff has affected Fort Cobb Reservoir over the years – there used to be numerous peanut farms in its vicinity that contributed to this. He said the algae created by farm chemicals like nitrogen and potassium reduced oxygen levels to the point that several mass "fish kills" took place in the 1990s in the lake's coves. He also said that due to soil erosion and silt buildup "the rivers don't move as freely as they used to."

Farm Chemicals

Along with this desire to limit erosion and runoff is a strong desire by many to limit the use of farm chemicals. Milton said one way to do this is to grow certain plants with other plants in a complimentary way so as to create natural fertilizers and pest deterrents. He said:

> There's a practice, not only in our tribes but tribes in general, for example, to plant legumes with their corn - it places nitrogen and fertilizer to help it (corn) grow. It was planting other types of plants within the species that had natural barriers to certain insects or certain pests that bothered those. The way they planted it helped the whole garden. And I saw that, it might have been in Stillwater in the library somewhere, it showed how they used to plant them around the corn plant. It wasn't just putting fish in the

> ground – it was actually using plants to help plants. The way you planted was just natural – just understanding nature.

Milton expressed a concern about the application of chemicals in general:

> I've changed my opinion, my practice, and my advice to people when they ask about different things because of what I'm learning, because of what I'm seeing. If people ask about chemical fertilizers or pesticides or things like that, I would tell them to do more study. Do you really need to spray now, or is there enough beneficial insects out there to take of what you do have, or is there another type of fertilizer you can use rather than what you are using? For example I've always used granular or anhydrous – well we just talked to Mr. Granger and he showed where putting liquid fertilizer targeting that plant instead of the whole surface is cheaper and better. And I believe it. I see it. Because I've dealt with the other, and I know broadcasting is not the answer because you are feeding everything. I don't want to feed everything. I just want to feed that plant. You just have to keep looking and studying.

Alan said, "Even if I could afford fertilizer, I would limit it because so much fertilizer can kill the fish and natural habitat – I'd rather have less (of it) than to destroy something. I think there should be a limit on that." He uses his knowledge of the seasons instead of chemicals to help him mange. He said:

> As a farmer, you want to know how soon you can plant (in the fall). If you plant too early the grasshoppers will eat up your plant, so you have to give it a freeze to kill some of those insects. I watch the seasons instead of using pesticides. I kind of know. Like when I wean my calves in the wintertime I don't have as many problems with my animals picking up parasites in the water because they (parasites) have a harder time living in the cold water than the warm water. The calves might have a harder time making it otherwise. That's when you go back to all these people giving them chemicals – if you do it with the seasons, instead, you get pretty healthy animals.

Alan also uses natural grasses for grazing because they do not require chemicals to maintain. He said, "We have the natural buffalo grass – I like to leave it like that."

Water Conservation

Milton discussed how he has changed his thinking about water conservation. He said, "We were always taught to save water, to conserve water (through ponding). When I started out, even when I got out of college, I was draining wetlands to pond. I was doing things I that now I wouldn't do because I know why the wetlands are there, I know why certain things are done."

Ranching

Rudy Jr. talked about the need to build fencing the correct way so as not to harm animals:

> When we do cross fencing, we make sure we don't run into any of nature's homes, animals. Sometimes the owls got their burrows in the ground and you don't want to plow them up, and the squirrels and different things like that. Birds are sensitive to sound sometime – birds that have their nests on the ground and they get out to get your attention to get you away from their eggs. So we don't want to plow those up.

Alternative Energy

Ricky advocated using more solar and wind energy as a way to heal the environment. He said:

> By two or three people understanding that we need to get our nature corrected some kind of way then we're gonna be able to save the generations down the way, maybe rely more on nature itself with the solar, the winds to help us, instead of going with the fossil fuels that are polluting. I believe there are people out there who have ideas, but there is so much money involved in our economy now they don't want to change to the solar for automobiles and for our homes. How much could that (a windmill) provide? What if everybody was to get a little windmill? How much would that save us? But those people that are pumping that gas, they don't want that. There's too much money involved – they're not worried about how it's affecting our environment.

Alan agreed, “If we can survive off of more natural things (such as wind energy) I think we can survive.”

Advocacy

Milton concluded, “There are things I feel as a Native American, as a citizen here, that I want to see continued and I want to take care of. I’ve been able to be on some national boards on the environment or agencies within the Department of Agriculture, and I’ve worked with committees and boards within this state to try to protect our environment. I’ve helped the tribes with their national conservation associations to get started.”

DISCUSSION

The weather and climate knowledge told to me is nested within a belief system that encourages a closeness and intimacy with the non-human world, and promotes respect and reciprocity when engaging with it. The words of Milton to begin this chapter epitomized what I was told about this. Some may see this “Native view of nature” as a stereotype or as essentializing Native peoples as wise environmentalists (e.g., Hames 2007); Native peoples sometimes portray themselves that way as well (e.g., Suzuki and Knudtson 1992). Posters in my office contain the phrases “We are all connected” and “Everything works together.” While this portrayal may serve as a useful tool for Native political interests, I did find that my collaborators indeed do have a deep-seated belief that they are intimately interconnected with the non-human world and that it is important for their survival to treat it well. This intersects with the review in Chapter Two on

Indigenous ways of knowing as sacred environmental wisdom (e.g., Suzuki and Knudtson 1992; Lake-Thom 1997; Maurial 1999). In the view of most of the people I talked to, if you treat "Mother Earth" well, she will give back to you in a positive way such as with a bountiful crop, and if you do not treat her well, there will be consequences – this is described below.

This overall closeness and intimacy with the non-human world, and the resultant respect and need to deal with it in reciprocal ways, may help explain why many of the people I spoke to still value their environmental observations as a barometer of things to come, and that changes in the non-human world may be a sign that we are not taking care of it. Some believe we are taking too much and not giving enough back (Richard Jr.'s thought), or that the changes being observed are a sign that we need to ease up a little bit and if we do not, there will be consequences (discussed by Sandy in relation to hailstorms), or that we are being challenged to do better (Wallace's view), with the overall implication from the people I spoke to that they could take a lead in conducting responsible practices with respect to their environmental interactions. These thoughts echo those of Lake-Thom (1997) concerning a need to heal this relationship – many of the people I talked to believe their lands, water and air are sick, blaming chemicals, fossil fuels, and overconsumption. Efforts in using no-till agriculture seem to be one way in which people are using a relatively new technology to treat the earth in a more respectful way that hearkens to the ethics of the past – it prevents tearing up the soil (the concern expressed by Dorothy above, dating back to the time of her father and grandfather), prevents soil erosion, preserves water, and seems to limit the use of chemicals.

An alternative view was expressed regarding going overboard with respect to our relations with the environment. Dixon told me:

> Sometimes, we do dumb things (environmentalism). It's good that we are going green, but it's hurting everybody. It's always one-sided. One person thinks we should all do this, and one person says we should do this. It's whatever you believe. I believe it's all going to happen in time. This world is not always going to be here, something is going to happen. I just thank God that we are here. We have to do what we have to do to make a living. Not everything in life is free. You have to work hard. We've just got to deal with how nature reacts, the way the weather is changing, it is hard to make it anymore. It's pretty tough.

He would agree, though, that while the agriculturalists need to be nimble and adjust to whatever the environment throws at them in order to survive in agriculture, they still need to take care of the land, water, and air, and practice their agriculture and take care of water resources in ways that they see as being sustainable and conservationist, and doing all of these things will make for a better overall relationship with the environment, and a resultant improved quality of life.

CHAPTER NINE

"WE OWN THE LAND. WHY CAN'T WE FARM IT AND SUPPORT OUR FAMILIES?" – AGRICULTURAL INDEPENDENCE AND GRASSROOTS SELF-DETERMINATION

One way in which to view the farmers' desire to rely upon and value their own ways of knowing about the weather and climate is a similar desire to cling to and retain tribal identities. Their related efforts of agriculture independence may also be seen as a way to preserve and extend these identities, and a way to further self-determination. Gonzales and Nelson (2001) found that contemporary tribal movements, such as those to be described in this chapter, work to revitalize traditional cultural practices in a modern context. Self-determination as a concept refers to Native peoples attempting to take control of their own lives through self-governance, cultural renewal, and control of education, and here also, through grassroots efforts of agricultural independence. Some background on self-determination, and on land dispossession, a historical roadblock to Native involvement on the land, is provided next.

BACKGROUND

Self-Determination

The period of loss of Native self-determination began in the mid-1800s as Indian communities increasingly came under direct federal administration (e.g., Castile 2006). Native peoples were not included in the federal governing process and their own governmental institutions were dismantled in what Castile called a "general program of deculturation and destructuring" (p. 6). As part of a program of forced assimilation, the General Allotment, or Dawes Act of 1887, furthered the process of recognizing the

Indian as an individual and not a member of a tribe. It was not until the Indian Reorganization Act of 1934 that the idea of self-determination was renewed (at least in theory); it attempted to address Indian land loss and economic reform, and provided a mechanism for reorganization to grant certain rights of home rule.

Tribal governmental authority was limited, however, and true self-determination as a law was not enacted until 1975 through PL-638, "The Indian Self-Determination and Education Assistance Act" (e.g., Castile 2006), in part fueled by the civil rights movements of the 1960s and the concurrent increased political visibility of Native Americans. The Act encouraged federally-recognized tribal participation in and management of programs that had been administered on their behalf by agencies of the Departments of the Interior and Health and Human Services, and authorized the tribes to take over the administration of those programs through contractual arrangements with the agencies. The Act also established a goal to provide education and services to permit Indian children to achieve by guaranteeing the involvement of Indian parents on school boards, and it committed to maintain the government's continuing trust relationship to tribes and individuals. Castile (2006) ultimately questioned the very meaning of self-determination in this legislated scenario, however, as the tribes, even though they were administering these programs themselves, still relied upon government funding to execute them.

Land Dispossession

The history of roadblocks and discrimination in attempts by Native Oklahomans to enter into or remain in agriculture is long, and is centered on dispossession of land.

Here, I provide a brief example of the plight of the Kiowas as reviewed by Lynn-Sherow (2004) and Palmer (2011). They documented the impacts of allotment and loss of direct control over lands on the demise of agriculture at the local scale for Kiowa people. Their work describes the Kiowa's land-based transitions from following the buffalo to confinement on reservations, to the breakup of those reservations (which had supported a reasonable subsistence and independent animal raising and gardening culture that was seen as pragmatic and self-directed) into individual land parcel allotments, to dispossession of land altogether. The allotment of lands to individuals first, and then the subsequent opening of the reservations to white settlers and sale of "surplus" lands early in the 20th century, all resulted in a large-scale dispossession and transfer of millions of acres from Native to non-Native ownership, and the leasing of much other land to white settlers.

By most accounts, the initial transition from nomadic existence to reservation subsistence socioeconomic structure went well, including the raising of stock, the putting up of hay, and the raising of crops. The initial selection of lands by Kiowa during allotment, rich in water and timber, reflected their past culturally relevant land uses and future desires to continue those uses, lands that did not necessarily the support of row crops, although their proximity to water often caused them to become the target of white settlers. Those who were able to stay on the land after allotment were usually forced to develop alternate land use practices, including the raising of stock, the leasing of grass lands for money, and individual commercial crop production, leaving behind the pre-allotment Kiowa band structure of centralized communities for a patchwork of much smaller individual allotments dispersed over a wide area.

Among particular reasons for the demise of (or attempts in) farming and ranching by Kiowas in the twentieth century have included factors such as: small farm sizes (160 acres made it difficult to graze animals sustainably); owner fractionation (too many land owners of one piece of property, often within families); children marrying people with their own allotments, leading to sale or lease of the unused land; loss of lands due to the Burke Act of 1906, which required payment of taxes after Native people were deemed "competent" that resulted in loss of land through default and auction, and due to the opening of the reservation in 1904 to white settlement; insufficient financial resources to farm or an inability to obtain them; the challenges of mechanization and deficient backgrounds in commercial agriculture, including active neglect by county extension services of the USDA and the white agricultural community at large; occasional severe drought; and later rural to urban migration. According to Palmer (2011), these factors resulted in a decrease in Kiowa trust land by 59 percent from 1901 to 1995.

EFFORTS AT AGRICULTURAL INDEPENDENCE AND REVITALIZATION IN NATIVE OKLAHOMA

An unanticipated outcome of my fieldwork was learning about new initiatives to create agricultural independence and, in some cases food sovereignty amongst Native peoples in Oklahoma. The reasons for these initiatives are many, and include: a basic desire to begin doing things on their own; a need to create more sustainable livelihoods through agriculture on their own lands in the face of unemployment, poverty, and the struggles of their youngest generation; an inability to obtain financing and other incentives from programs that are supposed to be helping them as an underserved minority; threats to cultural identity though loss of traditional ways of conducting

agriculture, preserving seeds that have been passed down from past generations, and maintaining the culturally-important foods that are made in part from these seeds; and the desire to create healthier lifestyles in the face of rampant diabetes and obesity.

The rest of this chapter will move through the examples of agriculture independence and their revitalization objectives I have witnessed, drawing heavily upon observations made and discussions heard at participant-observation events. This part of my work contributes to an emerging activism and scholarship highlighting the decolonization of food-producing activities and the creation of food sovereignty initiatives. Examples include the Society for Applied Anthropology's 2010 session "Food Sovereignty: Methodological Approaches and Practical Challenges"; FoodFirst.org's 2002 "Forum for Food Sovereignty"; a proliferation of web presences, such as FoodFirst.org and Grain.org; documentation of the international peasant food sovereignty movement, including La Via Campesina (e.g., Patel 2009; Martínez-Torres and Rosset 2010; Holt-Giménez 2010; ViaCampesina.org); and case studies of food sovereignty and cultural preservation, such as McAfee's (2008) description of the conflict between Indigenous maize and genetically engineered crops in Mexico.

To open, these are the words of a Muscogee youth on food sovereignty, which embody the efforts taking place in Native Oklahoma ("Este Menettvlke Emponvkv – Youth Speaks: Colonization, Survival, and Food Sovereignty," Chako, MFSI November 2009 Newsletter, Vol. 9, Issue 4, p. 6):

> Food sovereignty means being able to choose for ourselves what we eat and how we get it. It means being able to grow our own food and support our own communities. If we really could grow our own food, it would be a first step in having more control over our own lives… For those of us who are serious about wanting to learn our language, our knowledge, and our history – not just as a hobby but as a way of life – revitalizing

> traditional agriculture is a logical step. We cannot both depend on our colonizer and at the same time fight for our identity and sovereignty.

Obtaining and Providing Training

As described above, one of the historical obstacles to successful commercial agriculture was the mostly non-existent access to training and technology, including the actions of extension agents who excluded Indian farmers, African Americans, and poor whites from new technologies and practices (Lynn-Sherow 2004; an early forerunner of the USDA discrimination described later in the Keepseagle v. Vilsack suit). Entry into agriculture now is being seen as a way in which to create livelihood sustainability (if successful) and perhaps restore past social and cultural traditions. However, teaching oneself to farm is difficult, especially if one was not raised in a tradition of agricultural. The Langston University Small Farmer Outreach Training and Technical Assistance Project program tries to fill the need for training, focusing on small farmers, including also African American farmers since Langston is a Historically Black College. Langston focuses on providing technical assistance and extending information about government programs available to underserved farmers, and accomplishes this through its Beginning Farmer Program of in-community training, and through its annual Small Farmers Conference. The overall project was birthed by Section 2501 of the 1990 Farm Bill ("Outreach and Technical Assistance for Socially Disadvantaged Farmers and Ranchers") to provide education, assistance and support to underserved farmers and ranchers and those with disabilities (The National Agricultural Law Center n.d.), and nurtured by successive Farm Bills, the last enacted in 2008. The 2008 Farm Bill provides for equal opportunity in obtaining financial and technical assistance (i.e., training), and improved

access to USDA programs and services (National Sustainable Agriculture Coalition n.d.). As will be seen in the section on the Keepseagle v. Vilsack settlement below, these provisions have been less available to Native farmers than advertised.

This is where Randall and Sandy come in – Randall is the extension agent who organizes and helps provide the training in southwestern Oklahoma, while Sandy administers the program and oversees Randall's activities. Of him, she said, "They've had a difficult time in the southwest (Oklahoma). He's (Randall) been a sort of like a pioneer down there." The Beginning Farmer Program training series delivers the outreach and technical assistance in the community. Among things I heard discussed at the April 8, 2010 "So You Want to be a Farmer?" kickoff meeting included "Wichita corn" and the ability to preserve its seeds (the Wichita once raised large quantities of corn and traded surplus to neighboring hunting tribes – this probably is the type of corn that Stuart still grows); discussion of community gardens to grow with traditional seeds and perpetuate traditional foods; and establishment of a Native farmers' market somewhere in the Anadarko area to market what is raised. It was announced at this meeting that a tiller had been purchased for use by anyone in the community wanting to establish a garden.

Langston also works with Heifer International. Heifer is a humanitarian organization with a vision to help end hunger and poverty by assisting families and small farmers to produce food and help themselves. It presented qualifying Native and African American farmers with gifts of livestock and training to get started in ranching. I once found an on-line photo of the regional director of Heifer standing with Randall and Milton in a pasture with cattle that had been presented to a rancher.

Establishment of Tribal Conservation Districts

The Kiowa Tribal Conservation District is the only USDA-sanctioned tribal conservation district in Oklahoma, and at the time of its establishment in December 2007 was one of only 29 in the U.S. Interestingly it does not have a presence on the Kiowa Tribe's website. It was established through a cooperative conservation agreement between the tribe and the USDA Natural Resources Conservation Service. These tribal conservation districts are being established to "focus on working with USDA agencies and other local partners to care for Mother Earth, strengthen agriculture, encourage youth 4-H and FFA, work to increase the number of Tribal farmers and ranchers and to help protect and strengthen the amount of culturally significant plants and animals" (Natural Resources Conservation Service, 2008, April 15). Randall had told me at our first February 2009 meeting that the idea for establishing the Kiowa conservation district came about as five people sat around a coffee shop table. Ricky is the chairman of the district, and Randall, Garrett, and Rudy Jr. are board members. Ricky said the conservation district is extending Farm Service Agency loan information as well as information about new farming techniques and equipment. It receives about $167,000 annually from the USDA.

Establishment of Limited Liability Corporations and Non-Profits

Two apparent outgrowths of the Kiowa Tribal Conservation District and the Langston outreach program are Kiowa Native Farms LLC (KNF) and the Indian Country Agricultural and Resource Development Corporation (ICARD). These entities are separate from both tribal and government affiliation and embody the self-determination

spirit discussed above. KNF is a for-profit entity that focuses on the establishment of meat processing facilities, community gardens and farmers' markets, and economic development in general in southwestern Oklahoma, and is not limited to Kiowas. Someone at a meeting referred to KNF as a "producer organization." ICARD is a non-profit sister to KNF that focuses on grant writing to facilitate additional outreach and training opportunities.

The ranching side of KNF includes plans for mobile meat processing facilities that can travel to where the animals are, and a permanent facility in Cyril. Randall said that the farmers are proud of their animals and they feel like they should be able to compete in any market, with the inference that they cannot now at existing feedlots and slaughterhouses. Youth and women are getting involved as well by raising calves and bulls, including Randall's daughter, who is learning how to raise Brahma bulls. Larry, who has become involved in meat processing part of KNF, said the mobile facility is particularly needed for slaughtering buffalo, because it is difficult to pen or transport them live. The idea is to take it where the buffalo graze and perform the slaughter there.

KNF horticulture projects have the goal of saving culturally important healing herbs, roots, vegetables, and their seeds, plus peyote. The idea is to build community gardens and greenhouses for tribes and communities to perpetuate these, especially the healing herbs, and to establish farmers' markets to share what is grown. To ensure the success of gardening in Oklahoma's climate, KNF has adopted the practice of "plasticulture" (Oklahoma Agriculture Food and Forestry n.d.), which dovetails with desires expressed in Chapter Eight to farm as organically as possible. Randall explained:

> The ground is worked and raised, and covered with black plastic. Then you put a drip line in there. It's an organic garden – we are not putting

> fertilizers in it, everything is natural. You put that black plastic on it and it makes the ground sweat. It creates moisture and attracts the worms to come in and produce all that natural fertilizer. It's the healthiest fertilizer you can put in there. Our garden (in Fort Cobb) is so healthy, it is producing humongous vegetables.

On the concept of the community garden, Randall said:

> We're doing it to help the community – we're giving the vegetables away to the community. We're not selling them. We're giving them to the elders, to the children, that want vegetables. They're happily picked. It's a joy whenever you see a grandma walking with two grandkids just laughing, having a good time, and they're picking vegetables. 'Hey grandma – get that.' They're loading up and they thank you for that. They bring their lawn chairs and they sit there – they like what they see there. Every year we put in one – this year it's going to be bigger. Right now it's about a half an acre and next year we are looking to put in an acre. Last year in Hobart we had 14 families that put in gardens we had assisted with. At our meeting there we had a meal and everyone brought their produce – it was delicious.

The desire to ranch and farm organically is seen by those involved in these endeavors as essential for producing a better food supply and eating habits for Native people. Ricky spoke of the need for both now and in the future:

> We survived on the nature God gave us, the animals – now our systems cannot handle these processed foods and that's what they're saying with us, as Indian people, why we have these problems. It is because we don't have this gene within us that hasn't evolved yet for us to cope with all these foods – that's why we're having these diabetic problems. But that's getting back to nature, you know. Our local gardens – our homegrown animals, our own beef, are good for us and for our bodies. I was telling my wife – 'Hun, do you know what fresh meat is? What do you look for in the store – what do you call fresh meat?' She said, 'When I'm looking at it it's good and real.' I said, 'You know what you're looking at? You're looking at dye. They're putting in that chemical that makes that meat look fresh and real so you want to buy it. Regular meat when it's cut starts turning color within a few hours, it starts turning dark – you wouldn't buy it.' Then, we got a garden out at Randall's – it's plasticulture. We got zucchini in there that's this big (gestured), I mean it's huge, but it's got infirmities on it, you can see where the bugs have eaten it or it's got different colors. Boy, it's no good? You go to Wal-Mart and it's nice and pretty and it's just green, but they're not showing you all the things they spray on it. You want to buy that because it's

> pleasing to the eye. When it's not, when there's no chemicals on it, you're going to have those things on them because the bugs are going to want (to eat) them, because they look at them and they know they're good for them. When you put chemicals on them they (the insects) don't want anything to do with them because they got all this junk on them. I enjoy our gardens and eating healthy. We all need to do that. If we all had a little garden back of our house, can you imagine what would happen?

On the KNF and ICARD efforts in general, Garrett said, "We are coming together the past four or five years. This is growing day by day. We are changing from outside sources. It strengthens our bond – makes our Native American farming and ranching stronger and helps us achieve our objectives for our families and our tribes." Randall added:

> I see a need and a desire from tribal members of always wanting to farm and ranch their own lands. That's been the driving force. There's no jobs or manufacturing centers or anything like that. There's a way they can make a living by farming their own lands – that's always been the motivator. My philosophy on everything is, 'We own the land. Why can't we farm it and support our families?' That's the way I see it. We can make it. It is happening.

People are sharing their knowledge and time to make this happen. Milton said, "I'm working with them and the groups they have to try to share what I know with them, and I've told all of them, 'What I know is yours.' Because one of these days I'm not going to be here, and I want this to live on, because we need it. It is part of my calling. As Native Americans, as farmers, as Oklahomans, we need to know these things."

Not everyone I talked to agrees with this strategy, however (the comments to follow will remain anonymous). One person said, regarding how things are being done:

> They've got their own programs and ideals – we share some of the ideals but I've got more experience than they do. They want to experiment with new things. I think that's good if you can establish it to make a living off it without hurting anything, I don't see anything wrong with that. But me, I like to help people and get them going in the right way. I believe they have the right ideals but it just depends on your sources. They have a little

> key on more sources than I do, but I kind of like to keep my limits. I see opportunities that can be used. I like using my own resources.

Another said, regarding the strategy being taken:

> That's one thing I don't see coming out – it's more or less 'We have our property, and the white man can't tell us what to do.' That's not sovereignty. I said, look at us as a nation (the U.S.). I mean, we don't have the greatest relations with everybody but we're connected with them with businesses and so forth. That's what makes us the powerhouse of strength – the military, government, everything. They respect us. That's what we have to do, too. We have to connect with the city of Anadarko, the city of Apache, Verdon, connect with them, and build a relationship. That's constructive criticism.

Finally, one person criticized the training that was being provided: "It's good (about seeking training) – some people are not educated. They need to find somebody that knows how to do stuff, that's been doing it, not somebody that's got another job that does it part time. We call those guys around here 'Weekend Warriors'."

Food Sovereignty Initiatives and Seed Saving

A Muscogee youth defined food sovereignty as, "Food Sovereignty is the understanding of what food is, where it comes from, how it is treated and the right of the people to govern how they want that food to be cared for, raised, and processed." ("Este Menettvlke Emponvkv – Youth Speaks: Breaking Down Food Sovereignty." Adam Recvlohe, MFSI November 2009 Newsletter, Vol. 9, Issue 4, p. 5). The Mvskoke Food Sovereignty Initiative (MFSI) is a Native American-led organization in Okmulgee, supported in part by the Robert Woods Johnson Foundation. It seeks to preserve the food heritage and traditions of Indigenous peoples through hands-on classes, educational programs, inter-generational sharing, and sustainable agricultural practices. According to its website, "Growing, preserving and using traditional foods play an important role in

cultural activities" (MFSI 2009, March 30). The MFSI emphasizes youth participation in gardening and educating on the notion of perpetuating Native seed varieties, as ways to introduce and foster cultural heritage. The MFSI conducts workshops and training throughout the year within the Creek Nation, hosts an annual symposium in the early spring at the Nation's Mound Building, and extends information through its website and a monthly-to-seasonal on-line newsletter. MFSI may be the most organized and well-known initiative of its kind among tribes in the U.S., and draws some fairly prominent speakers to its annual symposium; the 2010 symposium featured an address by a University of Illinois climate researcher. At the 2011 MFSI Symposium, the MFSI youth director summarized their efforts, stating, "We are all connected, but no one is connected to the land like before. There is a disconnection from the land and our elders. What we are seeking is a revolution for our land."

The MFSI collects, saves and distributes traditional seeds; this work is described by the MFSI as important for self-determination. MSFI has collaborated with Native Seeds Search in its efforts to maintain traditional seed lines. The Muscogee people want to keep traditional foods like corn and squash alive in order to sustain their people and traditions through preservation of culturally important seed lines. A MFSI speaker at the 2009 Langston Small Farmers Conference lamented that climate change and seed contamination by genetically modified organisms (GMOs) have become major threats to their corn, and was seen as an issue of "social equity." At the time, Oklahoma House Bill 1471 was attempting to aide GMO businesses to the detriment of organic farming and seed saving; in essence, the state was trying to get into the seed control business.

The MFSI has worked closely with a traditional planter, Kent Sanmann, to

conduct and teach seed saving and traditional planting to its members. He, along with collaborator Stuart, and Deb Echo-Hawk, the Pawnee Tribe Keeper of the Seeds, contributed to a 2006 Oklahoma City newspaper article on the revival of Native corn varieties (Gibbs Robinson 2006, December 14). Sanmann has written and given workshops on heirloom seeds, especially corn varieties. Echo-Hawk has talked and sang about preserving culturally relevant seeds at the MFSI symposia. She said, "Our story continued as chance would have it…tribes repatriate your seeds…make your choices…take a chance." At the 2010 symposium, she described the Pawnee as the "original cornhuskers" from Nebraska, and showed various varieties and colors of corn seeds that are being maintained. In 2011 she talked about how seeds have a memory. She told the story of how the First Woman was sent down in the husks of corn and held the seeds of life within her – through the efforts ongoing to preserve seeds, Echo Hawk said we are "together again" with her.

According to Randall, discussions also are ongoing among the Kiowa to save culturally important seeds, and they have sought the help of the MFSI and others. He said:

> The Kiowa people traditionally depended on the buffalo – wherever the buffalo went, we went – we were meat eaters. We seldom stayed the four seasons. From my understanding, though, the Kiowas did have a corn they raised. They had a corn I just found out about two years ago from a friend of mine in Kansas. I thought that was really unbelievable that they did try to raise corn. They never stayed long (in one place) but apparently stayed long enough to raise corn. So, we had the Kiowa corn, and are talking about raising some of that. But I want a specialist to grow that corn. I don't want to lose that. It would be used in special ceremonies. We want to grow this corn to grow us more seeds so we can create an archive for those traditional Kiowas that want to grow this traditional Kiowa corn.

Local Activism

The Anadarko Community Esteem Project, led by my collaborator Maya, helps teenage girls work on self-esteem issues and rebuild the town of Anadarko through involvement in a variety of community-based activities. The girls also learn more about their culture. The reason for describing it here is that one of its biggest projects has been to create a traditional garden involving corn and squash and many other vegetables and herbs. A goal of the garden project was to teach the girls how to be sustainable on the land and to take care of it, and to develop a deeper empathy for the environment. This goal is similar to what the MFSI is doing to introduce gardening and environmental stewardship to youth – these efforts help educate young people on the importance of taking care of the environment and ensuring cultural preservation.

A small plot of land was provided for this purpose at the Redstone Baptist Church. The girls planted seeds and seedlings and spent the rest of the growing season taking care of and harvesting the garden. A key part of the project was having the garden and the girls blessed by a Road Man of the Native American Church before they began to plant. Maya explained:

> We were trying to be as traditional as possible. We had our cedar ceremony where my family's Road Man came out to say a blessing and did a cedar ceremony for all of the young ladies who were here. A Road Man is on the peyote road – they don't like to be called medicine men. He leads the Native American Church ceremonies in a tipi. We asked him to come out and to pray, and he had tobacco and he prayed the traditional way, the old way of praying, by offering tobacco to the spirits with a corn husk – with tobacco you roll that up and smoke it. It was beautiful. It was very calm out here and very nice. He had a fire out here and a lot of cedar from his family, and an eagle fan, so he said a prayer and all the ladies lined up and they received a blessing. The cedar, when you burn it, the smoke goes to the spirits. My husband put the ashes around the garden. When we took our first herbs we said 'thank you' to the herbs, took some tobacco and thanked all of the directions, then laid the tobacco down and

> picked some of our first crops, which were the herbs. That's something I learned from our Creek family (friends).

Regarding this effort, and her run for Oklahoma State House in November 2010, Maya said awareness of what she is trying to accomplish with the youth and in self-determination generally is not lost on Indian Country. She said, "I feel like if I start with social justice, and start showing everybody the needs that we have, that we need to take care of, then we have the ability, we possess the strength within ourselves to do that. We don't have to look up to anybody to do this. We never did. It was always a scheme. I hate to be sour about it, but now we can do that, we have the strength to."

OVERCOMING POLITICAL BLOCKAGE

It is important at this point to recognize the recent roadblocks that Native agriculturalists have encountered as they attempt to secure loans and other assistance. This section describes discrimination encountered and reparations that have been awarded.

Allegations of Discrimination

Difficulties entering into farming, particularly in securing loans and other assistance, are not limited to Native farmers; indeed, the reticence to provide loans to "high-risk first-time farmers" is characteristic of the entire lending industry ("High Costs Make It Harder To Grow Young Farmers", Clay Masters, September 23, 2011, National Public Radio). However, the difficulties encountered by Native farmers, and the allegations of discrimination against them when attempting to obtain federal assistance, are well documented. For example, during the past 30 year the USDA has been found to

be deficient in its management of its civil rights efforts and in providing assistance, described in the 1997 CRAT (Civil Rights Action Team) Report (USDA 1997) and updated in a 2008 GAO (Government Accounting Office) report (U.S. Government Accountability Office 2008, October 22).

Sandy and I talked about this during my conversation with her. She said some of the federal programs "have not been doing what they should." She elaborated:

> The CRAT Report discovered that in some offices of the USDA, especially the Farm Service Agency, that people were using the good old boys system, they were saving the funds for their friends – it wasn't an open pot of money for the farmers. After discovering that, there have been lawsuits, and due to those lawsuits and the CRAT Report, changes have been made. Some of the older people who were practicing this have now retired or moved on to other jobs. Four people were fired – they (the USDA) are taking responsibility for their actions. They (the people) blatantly did not do what they were supposed to do, what their jobs were.

During many of the agricultural meetings and events I have attended (e.g., the Langston conferences, the OTCAC workshop, and the MFSI symposia) I have witnessed government officials "talk the talk" in providing information about available programs to Native farmers. But, there have been problems when it has come time to "walk the walk" in actually providing loans and assistance, with the Keepseagle settlement described below as the single most significant effort made by the government to provide reparations. Some of my collaborators complained loudly about discrimination. As an example, Alan was quite vocal, stating:

> We are supposed to be protected by the federal government. But we ask for some help, and they come in and look things over, and they protect those other people (those who lease land from him) more than the owners (like him). When I first started farming I used to go to agencies to learn about programs. Thousands and millions of dollars available, and I would ask for a little assistance for insurance and things, and they would act like I didn't know what I was talking about. I had people come in from Washington, DC, and I gave them an idea of what I was going through.

> Just a year ago I was in a bind, and we had a bank that was about to close, and they were taking a lot of things back. If you were late they were taking everything and selling it. I was scared to death because I am barely making it, so I went to the agency and put in an application that finally helped me. But it took six months to get the loan. I also asked for operating expenses for my calves, and they didn't give me a dime. I'm still working with a lot of old farm equipment that I keep running. I'm still dealing with people on credit. When I had a good banker he would help me, but the new banker won't budge for a dollar. I plead with them to make an investment because we've got all this land out here. We've got a co-op that's closed. We've got an opportunity to bring things up here. We have land to divide between us. With our people starting to be educated and trying to use what they have in the land department, the doors have been closing a little bit. It's like the doors are closing for us.

Reparations

Details of the Keepseagle v. Vilsack settlement, introduced in Chapter Five, are provided here. This settlement is the result of the USDA's discrimination against Native farmers in its farm loan and farm loan servicing programs during 1981-1999. After years of depositions, document review, and testimony, a settlement agreement was announced in October 2010 in the amount of $680 million for the Native farming and ranching plaintiffs. The settlement includes three main provisions: (1) payment of damages to class members up to the $680,000,000 cap; (2) debt relief of up to $80,000,000, including loan forgiveness and debt servicing; and (3) programmatic relief via changes to how the USDA conducts its farm loan programs going forward to make them more responsive and less discriminatory. The USDA's Farm Service Agency was a prime culprit, while locally its Natural Resources Conservation Service was implicated by some of my collaborators.

Individual claim relief comes in the form of two possible tracks. The first, simplified track stipulates that documents are not required. Instead, explanations will be

made under oath and awards will be issued up to $50,000, depending on the total number of successful claims made on the $680,000,000. Tax relief for these awards will be paid up front – 25 percent, or $12,500, straight to the government, so that the actual award made will be the full $50,000. The second track, which has a higher standard of proof, stipulates that documents are required and individual legal counsel is highly suggested. However, if the burden of proof can be established, awards of up to $250,000 are possible, also depending on the total number of successful claims made. Tax relief is not provided in this second track, however. The lawyers who represented the plaintiffs at the Anadarko meeting in February 2011 suggested to those in the room that most will want to opt for the first track due to its lesser burden of proof. It turns out that many cases of discrimination were undocumented – oftentimes farmers and ranchers were denied access to loans before discussions or negotiations ever got to the stage of paperwork (i.e., there is no documentation). The settlement's official period of coverage is January 1, 1981 through November 24, 1999. The USDA cannot oppose any claims, and there are no live trials or appeals. A neutral adjudicator will review each claim, without appeal, and checks will be issued once decisions are made. There also will be a moratorium on foreclosures, debt accelerations, and referrals for debt offsets from the time of settlement approval through the determination of the last claim and award of relief.

Programmatic relief will be the key going forward to prevent future discrimination, and will take several forms. A 15-member USDA Strategic Action Team Advisory Board was formed on March 24, 2011 (USDA 2011, March 24) by Secretary of Agriculture Tom Vilsack to advise him on implementation of outreach and assistance efforts to socially disadvantaged farmers and ranchers. This advisory board also will

promote the participation of minority farmers and ranchers in USDA programs and support civil rights activities with USDA. Board members have two-year terms, and includes representatives from socially disadvantages farmers and ranchers, nonprofit organizations that work with minority farmers and ranchers, civil rights professionals, representatives from institutions of higher learning, and other persons the Secretary deems appropriate. In what has to be seen a high honor, Randall was selected to be one of the board's 15 original members, giving the farmers and ranchers in southwestern Oklahoma an even stronger voice. He is listed in a press release as "Farmer/rancher, Fort Cobb, Okla."

Other programmatic relief includes establishment of 10 to 15 USDA regional sub-offices to provide technical assistance, including instruction in financial, business and marketing management, and instruction in leasing requirements for tribal and restricted lands in coordination with the Bureau of Indian Affairs. The USDA will report progress in these areas to the advisory board. A customer guide also will be published to help navigate the "complex USDA lending process." It has been reported that the USDA also will create an Office of Ombudsperson for Native Americans and other minorities.

The claims process took place in Oklahoma in July and August 2011 at seven locations, with groups such as Kiowa Native Farms LLC and the Intertribal Agriculture Council assisting farmers and ranchers both in getting the word out and in filling out claims forms. The process took place at other tribal locations across the U.S. throughout July, August and September 2011, with a claims filing deadline scheduled for December 27, 2011.

A good discussion took place at the Anadarko meeting, including comments and

questions from my collaborators on eligibility. The lawyers explained that a complaint may take the form of simply having been denied the right to apply for a loan, or having been told to apply for less money than allowed – both are considered forms of discrimination. A complaint also can take the form of an individual having told his or her tribe that he/she had been denied, or if the tribe itself had been denied. Another form of complaint is never having received a response to a query. Claims can be filed on behalf of an individual or a farming operation, and can be filed by a relative on behalf of a deceased family member. Much leeway was granted in the settlement because of the USDA's poor or non-existent record keeping; it was said that many complaints over the years were simply tossed into the trash. Those shepherding the settlement were actively tracking down those they believe have a claim to make sure no one is left behind.

Now that the USDA's Civil Rights Office is said to be a properly functioning entity, the lawyers at the meeting indicated acts of discrimination should no longer take place. Nevertheless, there was a sense from the farmers in attendance that such acts, and foreclosures, were ongoing, certainly well beyond the late 1999 end date of settlement eligibility. There also was some skepticism that, beyond this one-time settlement, much will change. The lawyers reassured those in attendance that "bad offices will be fixed." There was a strong desire expressed by attendees to locate a regional sub-office in Anadarko (and the lawyers agreed), and subject to USDA funding, there may also be the opportunity to situate USDA representatives at tribal offices or on Indian reservations, staffed by "culturally competent staff." Wallace had expressed similar skepticism when I interviewed him, stating:

> I do see now lately that the federal government is trying to do restitution to the Native Americans. They've given them back their sovereignty. But

> Native Americans still aren't full-fledged citizens like you are – we're still wards of the federal government. I think that hurts us. I still get frustrated about that. It's like a ball and chain that I'm walking with. Trying to carry it sometimes, it falls, and I'm dragging it.

DISCUSSION

This discussion draws upon personal communication (April 28, 2011) with Emily Eaton of the University of Regina, who was the discussant for the 2011 Association of American Geographers annual meeting session in which I presented a talk on the topic of agricultural independence and food sovereignty.

As shown in this chapter, the farmers are attempting through training, establishment of independent entities, and creation of food sovereignty initiatives and seed saving efforts, to achieve some level of independence and self-determination in their agricultural activities. The efforts described also represent actions to free people from negative economic and cultural spirals, to inspire farmers, ranchers and gardeners to "do things on their own," and to help preserve food heritage and cultural traditions and practices through agriculture. This can be seen as a further, tangible manifestation of the farmers' desires to perpetuate and cling to cultural ways and to retain tribal identities, in concert with their continued use and valuation of their own ways of knowing about weather and climate, ways that, as seen in the last chapter, are complexly embedded within a belief system advocating intimacy with the non-human world. Agriculture independence represents a way in which to preserve and extend these traditions, identities, and beliefs.

However, the perceived need for continued government loans and other assistance, and participation in the Keepseagle settlement, may be seen by some as

continued dependence on the government and as such may oppose the goals of agricultural independence, or at least present a conceptual roadblock to achieving true independence and self-determination. The story of colonization is one in which Native peoples have been forcibly denied the self-sufficiency that had sustained them for thousands of years. They were systematically dispossessed of their ability to produce their own subsistence through the practices of settlers that removed them from their land-based economies. Among these practices was the establishment of colonial economies on the colonized lands that systematically excluded Native peoples.

One way to view this then, is that instead of seeing the Native farmers as still requiring the assistance of the government to succeed in agriculture, is to see the government as still owing the farmers a large debt, well beyond the Keepseagle settlement and its claims on the state, especially since the ongoing economies of the settlers remain wholly dependent (and can only continue to exist) on the land and resources that belong(ed) to Native peoples. Perhaps what I have been seeing, then, is a strategic discourse through which the Native community is attempting to use the settlers' existing prejudices and holdings for their own ends – that is, the appeals for funding and assistance from the government. In other words, if we think of colonial economies as being dependent on this large unpaid debt, then the Keepseagle settlement claims, and continued requests for assistance, are legitimate demands for reparations and should not be viewed as continued dependence. This turning-around of the argument could provide possibilities for articulating Native projects in more progressive ways that would recognize the real dependence of the settlers on Native lands and resources.

CHAPTER TEN

SUMMARY

The weather and climate knowledge professed by the people I spoke to follows closely what I found in archival research and in other sources regarding particular observational indicators and performative rituals (Chapter Three) and fits within the conceptual frameworks of Indigenous knowledge formation and maintenance described by the research of others (Chapter Two). The people I spoke to cling tightly to and privilege these ways of knowing as ways of their ancestors and have a strong desire to keep and pass along these intergenerational ways of knowing to younger generations. Their knowledge is perpetuated and valued through regular observational and agricultural practices, and is rooted within a belief system that promotes an intimate and respectful relationship with the non-human world. While the people I spoke to also consult scientific weather information, many still privilege their own local observations and the insights they glean from them – they see them as a form of situational awareness, intuition, and place-based wisdom that they cannot obtain from other sources. Our conversations also revealed interesting perceptions of and attitudes about climate change and how perceived climate variability may be affecting the observational indicators they look at. Those who use and value their own knowledge seem more apt to farm, ranch and garden in ways that promote a respectful conservation ethic. Viewing conservation strategies through the lenses of these agriculturalists and traditionalists, including their weather and climate knowledge and agricultural practices, may have broader societal implications with respect to our treatment of the environment and our ability to address

environmental issues that impact them in collaborative, co-productive ways. My work also revealed ongoing efforts of grassroots agricultural independence and self-determination to farm, ranch, and garden the land sustainably in order to create better livelihood opportunities, food sovereignty, and healthier, more prosperous lives.

This summary chapter (1) proposes a cultural model of the production and use of weather and climate knowledge revealed to me; (2) discusses the contributions this work makes to an ethnoclimatological line of inquiry in the U.S., and "doing" cultural geography in Indian Country; (3) provides ideas for engaging in meaningful collaborative activities with Native peoples in Oklahoma with respect environmental projects and issues affecting them, including a discussion of what *to* do and what *not to* do in collaborative projects; (4) discusses possibilities for my future engagement with the Native community; (5) makes suggestions for future research areas not fully investigated here; and (6) provides a closing word.

A CULTURAL MODEL OF THE PRODUCTION AND USE OF MY COLLABORATORS' WEATHER AND CLIMATE KNOWLEDGE

To summarize what my collaborators told me about their weather and climate knowledge, as documented in Chapters Six through Nine, and to situate their knowledge within past research conducted by others on the formation and characteristics of Indigenous knowledge, as documented in Chapter Two, I suggest a place-based model of the production and use of their weather and climate knowledge to help conceptualize how their weather and climate knowledge retains its value and utility as part of a larger system of actionable knowledge for agriculture. This follows the "cultural model" suggested by Paolisso (2002) from his study of Chesapeake Bay watermen's reasoning about blue crab

management, and later applied by Lazrus (2009) in her study of the perceived vulnerabilities of people living on the Pacific atoll of Tuvalu due to the risk of sea level rise caused by global warming. As described by Paolisso and Lazrus, these locally informed models describe the implicit and tacit understandings people have about how the world around them works. Such models can provide insight on how people perceive, remember, and describe natural features, and how they understand, utilize, and manage natural resources with this insight. As such, these models provide mental roadmaps that allow people to synthesize sensory input, make it meaningful, and formulate appropriate actions or responses. They may include knowledge given by or remembered from elders and that inferred or experienced from direct environmental observation, and consider the impact of core beliefs and values that are culturally specific or are nested inside of broader conceptions of the human/non-human interaction. From a research perspective, these models serve as a heuristic tool to enable explanation of a knowledge base or the prediction of behavior.

My application of this model seeks to summarize the different elements of and linkages between the place-based production, form and use of my collaborators' weather and climate knowledge. Table 3 and Figure 16 present this model by knowledge source and characteristic and describe the foundations and formations of each source and characteristic. Table 3 also provides linkages by source and characteristic to key citations in Chapter Two that conceptualized Indigenous knowledge. What is presented here, then, is not a complete view of reality, but serves to model my collaborators' understanding based on what I was told and what I observed. Considered as a whole, the model shown here is a product of the complex relations humans have with themselves and with the

non-human world (e.g., Antweiler 1998, 2004; Rundstrom 1995; Cruikshank 2001; Johnson Gottesfeld 1994), and as shown in Figure 16 with the two-way arrows, every component of their knowledge is interrelated in some way to every other component. This model intersects with the ethnoecological knowledge-practice-belief complex put forward by Toledo (1992) and Berkes (1999) and includes consideration of the dynamic adaptive decision-making capacities of people as they manipulate the environment (e.g., agricultural practices) in their efforts to conduct sustainable agrarian economies (e.g., Butzer 1989, Anderson 2002). My model is described next.

Table 3. Cultural model of the production, form, maintenance, and use of my collaborators' weather and climate knowledge.

Knowledge Source/Characteristic/ Outcome	Knowledge Foundation/Formation	Conceptual Linkages to Key Works Cited in Chapter Two
Intergenerational Knowledge Transfer (Source)	Passed down by relatives through oral tradition, observational example, and performative ritual – intergenerational	Suzuki and Knudtson (1992); Grenier (1998); Berkes (1999); Menzies and Butler (2006); Mistry (2009); Lefale (2010); Green et al. (2010)
Cultural Situatedness and Value – "Traditional" (Characteristic)	Maintaining ways of the ancestors; "all the tribes had the same kind of beliefs and teachings"; "Old Indian Ways" of knowing; social memory; identity; pride	Suzuki and Knudtson (1992); Antweiler (1998; 2004); Grenier (1998); Berkes (1999); Ingold and Kurttila (2000); Cruikshank (2001); Merculieff (2002); Henshaw (2003); Ford et al. (2006a, b); Menzies and Butler (2006); Mistry (2009); Speranza et al. (2010)
Nesting within a Belief System (Source)	Closeness/intimacy and respect/ reciprocity with non-human world – humans are not separate	Caduto and Bruchac (1988); Suzuki and Knudtson (1992); Merculieff (1992); Lake-Thom (1997); Semali and Kinchloe (1999); Maurial (1999); Menzies and Butler (2006)
Localness (Source)	Place-based observation and experience of patterns and cycles of animal, plant, meteorological, and celestial behavior; creates situational awareness and intuition – a place-based wisdom; local relevance not obtained from other sources; pride	Basso (1996); Huber and Pedersen (1997); Antweiler (1998, 2004); Grenier (1998); Berkes (1999); Maurial (1999); Nazarea (1999b); Ingold and Kurttila (2000); Cajete (2000); Orlove et al. (2002); Roncoli et al. (2002); Kidwell (2002); Pennesi (2007a); Lauer and Aswani (2009); Preston (2009); Orlove et al. (2010); Lefale (2010); Crane et al. (2010); UNESCO LINKS (2003); UNFCCC (2011)
Maintenance and Adaptability (Characteristic)	Repeated observation and experience (e.g., for agriculture) that adapts as conditions (e.g., climate) change; performance during	Turnbull (1993); Huber and Pedersen (1997); Grenier (1998); Berkes (1999); Ingold and Kurttila (2000); Menzies and Butler (2006); Lauer and

	times of pandemonium (e.g., approaching tornado)	Aswani (2009); Turner and Clifton (2009)
Social Mediation (Source)	Television, Internet, newspaper, radio; daily conversations with and observation of others; meetings introducing new information	Rundstrom (1995); Antweiler (1998, 2004), Cruikshank (2001); Jennings (2002); Ford et al. (2006a, b); Crane et al. (2010)
Actionable Knowledge (Outcome)	Cumulative knowledge for adaptive action, used for planning decisions, activities undertaken, techniques used	Butzer (1989); Toledo (1992); Berkes (1999); Turner (1999); Anderson (2002); Menzies and Butler (2006); Crane et al. (2010)

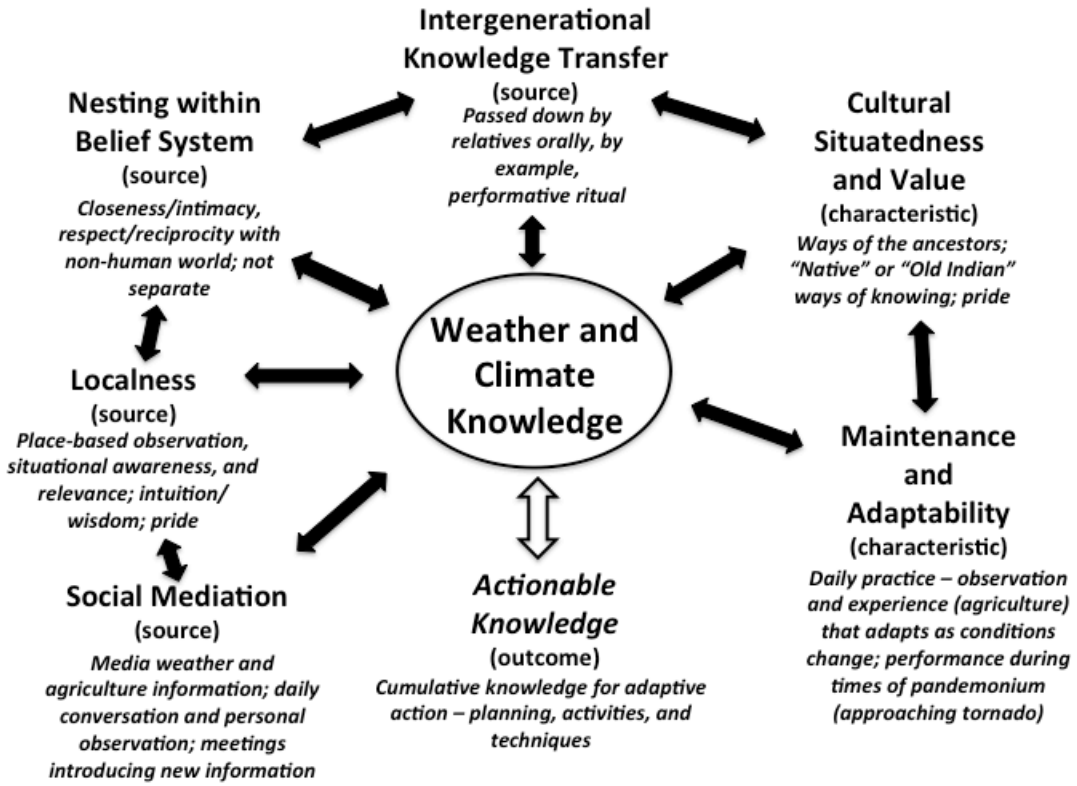

Figure 16. Cultural model of the production, form, maintenance, and use of my collaborators' weather and climate knowledge.

The primary and perhaps unanimous source of the weather and climate knowledge among my collaborators was its intergenerational transfer to them from parents and grandparents, and in some cases great-grandparents, through oral tradition, by example in the outdoors, and by observation of performative ritual. Knowledge transmitted through generations (e.g., Suzuki and Knudtson 1992; Grenier 1998; Berkes 1999; Menzies and Butler 2006; Lefale 2010; Green et al. 2010) contains a social memory that values and preserves the insights of past family and community members as a way to remember and maintain their ways (Mistry 2009). The knowledge I was told closely follows that found in the Duke Collection that was assembled over 40 years ago from interviews of people who were the same age as my collaborators' grandparents and great-grandparents. This continuity of thought from the past also was reflected by "James from Fort Belknap" from the Gros Ventre tribe of Montana, as described at the end of Chapter One, when in 2008 he described indicators similar to what his tribal representatives provided to Senator Kerr almost 60 years earlier regarding the forecast for the upcoming winter.

Likely due to its intergenerational transfer, there is a cultural situatedness and community-valued characteristic assigned to this knowledge by the people I talked to – it is "traditional" to them as the "ways of knowing of the elders." This cultural situatedness (e.g., Antweiler 1998, 2004; Merculieff 2002) is the result of its embedding within a particular cultural context (e.g., Cruikshank 2001; Henshaw 2003; Menzies and Butler 2006; Ford et al. 2006a, b) that often is part of a received cultural model of understanding of how things work (e.g., Grenier 1998). Randall had told me (described in Chapter Six) how, in his discussions with tribal members from other places across the country, "All the

tribes had the same kind of beliefs and teachings." Indeed, the knowledge told to me matches closely that gathered by Senator Kerr from across the U.S. 60 years ago and described at the time as "Old Indian Ways" of knowing. The Gros Ventre informant who responded to the Senator in 1951 lectured that, "There is much – very much – that the Whiteman fails to appreciate because he doesn't study…the 'Indian's way' that would contribute greatly to the progress and advancement of the Whiteman's civilization." Other than the performative ritual knowledge described to me on storm splitting and rainmaking that has undeniable tribal ties, it may be difficult, however, to categorize the observational indicators of my collaborators as strictly "Native". Generally speaking, many of these observational indicators have been observed by farmers and others around the world throughout time – they represent the vernacular, locally produced knowledge of people of any ethnicity inhabiting a place. However, to the people I talked to, these observational ways of knowing hold special cultural relevance as having come from previous generations. They have taken ownership of them as somehow unique and special to them. Some of the observations made by my collaborators, or the insights gleaned from them, may indeed be particular to southwestern Oklahoma or have a unique cultural situatedness. This might include the observations of the thickness and condition of pecan shells along the Washita River, a place inhabited by the Kiowa-Comanche-Apache and Wichita-Caddo-Delaware for over 100 years. The point to be made here is the continued value that the people I talked to place in their observational indicators, the ownership they have taken of them, and their continued practice and use of them on a regular basis, which might not be the case for land users of other ethnicities in the area who may place more value in scientific conceptualizations of weather and climate for

their agricultural activities. However, this is speculation. This cultural situatedness speaks to the broader concept of Native American identity in which "Indianness" and the importance of saving sacred traditions and places, and preserving and perpetuating shared knowledge and history, is viewed as crucial to continued cultural preservation (e.g., Peroff 1997). This concept is discussed further in suggestions for future research below.

The knowledge revealed to me is nested within a belief system that suggests humans should possess a closeness and intimacy with the non-human world and should exercise respect and reciprocity when engaging with it – there is no separation between the human and non-human world. Others have described this as a holistic and sacred interaction (e.g., Caduto and Bruchac 1988; Suzuki and Knudtson 1992; Merculieff 1992; Lake-Thom 1997; Maurial 1999; Semali and Kinchloe 1999; Menzies and Butler 2006), an interaction that in some cases prominently involves ritual (e.g. Rappaport 1967). Some of my collaborators suggested that recent extremes of weather and climate are signs from the non-human world that it is unhappy with our treatment of it, and that we need to mend our ways. They believe strongly in being good stewards of the natural environment and in the ethic of giving back in some way whenever something is taken; it is especially wrong to exercise control over it (e.g., Caduto and Bruchac 1988). As was told to me repeatedly, if you treat "nature" well, it will give back to you in a positive way (such as through a bountiful crop), and if you do not treat it well, there could be consequences (such as severe weather like hail or tornadoes occurring out of season). I believe this philosophy plays strongly into my collaborators' desires to maintain the ways of their ancestors (including their weather and climate knowledge), who they believe had a more copacetic relationship with the non-human world that we now should go back to.

The knowledge told to me is a local, place-based, long-term, factual observational and experiential insight based on recognized patterns and cycles of animal, plant, meteorological, and celestial behavior. It is generated and regenerated through their regular observation and practice (e.g., UNESCO LINKS 2003; UNFCCC 2011; Antweiler 1998, 2004; Berkes 1999; Maurial 1999; Orlove et al. 2002; Roncoli et al. 2002; Pennesi 2007a; Orlove et al. 2010; Speranza et al. 2010; Lefale 2010). For the people I talked to, these observations and experiences create within them a situational awareness about where they live and work, and produce an intuition needed for recognizing what to look for and how to react to it. Their factual knowledge also gives them a sense of pride. This results in an environmental wisdom possessing local relevance that they claim cannot be obtained from other sources of weather and climate information created by people in other places; indeed, many of the people I talked to, as described in Chapter Six, favor the local relevance of their own insights, intuition, and awareness. It is knowledge that would be difficult if not impossible to separate from the places that give it meaning (e.g., Basso 1996; Cajete 2000; Semken and Butler Freeman 2008; Preston 2009). Indeed, past research has shown that this knowledge is developed through experience of specific conditions in a particular place (e.g., Steward 1955; Grenier 1998) and is generated and regenerated in the long-term observations and practices of inhabiting that place (Nietschmann 1972; Ingold and Kurttila 2000; Huber and Petersen 1997). It has a situated localness (Nazarea 1999b) that is formed in part through situated practices (Ingold and Kurttila 2000; Lauer and Aswani 2009).

As alluded above, a characteristic of the regenerative nature of my collaborators' knowledge is its maintenance through regular observation and experience, and its

application in their agricultural practice and decision-making. This knowledge evolves dynamically and takes on the characteristics of being cumulative, experimental, and ultimately adaptive (e.g., Turnbull 1993; Grenier 1998; Huber and Petersen 1997; Berkes 1999; Ingold and Kurttila 2000; Menzies and Butler 2006; Lauer and Aswani 2009). It must remain dynamic if it is to maintain its viability as part of a practical adaptation to environmental conditions (e.g., Orlove 1980; Butzer 1989; Turner 1999; Batterbury and Forsyth 1999; Anderson 2002). I found that my collaborators' weather and climate knowledge is indeed not static, but evolves through continued practice and conforms to one's particular needs for it, and in some cases is modified or even less confidently relied upon due to what is perceived as changing or less reliable climatic conditions (e.g., Turner and Clifton 2009). Some told me, "The animals are confused" – for example, birds do not move with the seasons like they used to, rendering observations of their movements less informative. Others told me that the pecans along the Washita River are not producing like they used to, making observation of their shells and what they say about moisture conditions more difficult. Nevertheless, the people I spoke to who use such indicators still make their observations and adjust their insights based on them in light of these changes. The more performative elements of the knowledge told to me, such as speaking to tornadoes to pass over, also are fostered and perpetuated during times of need, and as such are maintained through as-needed practice.

The knowledge of my collaborators is mediated socially in complex ways I can only touch upon here based on my fieldwork. As described by others, the place-based and culturally-situated contexts of Indigenous knowledge are best understood as a product of the social relations among humans and between the human and non-human

worlds (e.g., Rundstrom 1995; Antweiler 1998, 2004; Cruikshank 2001; Jennings 2002; Ford et al. 2006a, b; Crane et al. 2010). From what I was told and what I observed, I can say that this happens in several ways for my farmers and ranchers. Most of them start their day reading the newspaper, watching weather and farm programs on television, and/or consulting information on the Internet (if they have access) to see what these sources are saying about the day's upcoming weather and the farming world. Even though some of them place more trust in their own observations, they balance what they know with what they learn from these sources to form an initial idea of what the day will bring in order to plan their activities. Most then engage in morning social contact with others over coffee or at other places they might gather. As explained to me, they compare notes about the weather and what sorts of activities they are planning for the day, and ultimately modify their thoughts and plans based on some consensus that forms. This consensus building includes observation of what others are already doing out on the land that particular day – I was told that if someone else is already doing something, there must be a good reason for it, so maybe I should be doing, too. Knowledge may be augmented and impacted by attendance at agricultural-related meetings, such as the Langston Small Farmers Conferences and Beginning Farmer training programs, where other ways of knowing about weather and climate, and training and information about agriculture, are introduced. The farmers and ranchers may add what they learn at these events to their repertoire of knowledge, and may adjust their activities as a result.

Everything up to this point then produces an actionable knowledge (e.g., Toledo 1992; Berkes 1999) that is put into practice on a daily basis and that adjusts as time passes to reflect changes in weather and climate conditions, new information, and new

practices. As they work during the day, they continue to observe their surroundings, such as Dixon watching for the movements of turtles when he is cutting hay, or consulting hand-held devices for weather information that can provide another check on how they perceive what is going on, making calls over their citizen band radios, or stopping somewhere for lunch to glimpse at a television. The entirety of the situational awareness they develop allows them to continue what they are doing, change what they are doing, or stop altogether – it results in mid-course corrections. This awareness also gives them some sense of what tomorrow might bring, and how today's weather has impacted what they may have to do the next day, so they begin planning for this in order to do the best possible job they can to create an opportunity for success. This may involve staging their planting and harvesting or cutting activities to take advantage of impending rainfall or freeze timing, or adjusting the amount of chemicals they intend to use. They may move animals out of harm's way based on impending changes. This is all part of their practical adaptation to what is presented to them on a daily basis and to ever-changing environmental conditions (e.g., Butzer 1989, Turner 1999; Menzies and Butler 2006; Crane et al. 2010). This adaptation includes their adoption of newer techniques that in their minds reflect their value system or environmental ethic of doing the least harm possible, such as employing no-till wheat practices that limit soil erosion, conserve water, and allow for less or more-targeted application of chemicals, or employing plasticulture for vegetable growing to preserve water and create natural fertilizer through the actions of earthworms.

CONTRIBUTIONS TO THE FIELD OF ETHNOCLIMATOLOGY IN THE U.S., AND PERFORMING CULTURAL GEOGRAPHY IN INDIAN COUNTRY

This work contributes to, encourages, and perhaps initiates scholarship on Indigenous weather and climate knowledge that focuses on peoples already well assimilated into modern society, which contrasts with the majority of previous inquiry I found under the heading of ethnoclimatology that has focused on how such knowledge informs subsistence activities in remote parts of the world. Hence, my work has implications for conducting such inquiry in the U.S. and also for engaging in cultural geography in Indian Country. My work may be the first to consider in depth the weather and climate knowledge amongst particular Native peoples in the continental United States *and* how it is formed, maintained, and used within land based activities such as agriculture, and also contributes to the field of ethnoecology described here in which an actionable knowledge framework is constructed based on this knowledge (subsection above).

In contrast to my research, most work involving weather and climate knowledge and its applications to land-based (and usually subsistence) activities as shown in the review of Chapter Two have occurred in the Arctic, Canada, Australia, Africa, and South America. Some of this is limited to the documentation of Indigenous weather and climate knowledge and ultimately is compiled in websites and reports through projects such as the UNESCO LINKS (2003) and UNFCCC (2011). Many other efforts have attempted to compare and contrast local ways of knowing with scientific information and prediction, or to augment scientific knowledge with local knowledge. Often times, that activity has sought ways to meld local and scientific ways of knowing to ensure the adaptability of the local people in subsistence agricultural economies under study, due to

the Western perception that these people will be unusually and catastrophically affected by climate change, and by inference are vulnerable, helpless victims needing the intervention of scientists, governments, and nongovernmental organizations in order to survive, sometimes in the name of sustainable development (e.g., UNESCO LINKS 2003; UNFCCC 2011). The fallacies of this approach were recognized by Howitt et al. (2011). Other past research has sought to determine why scientific ways of knowing are not accepted or properly interpreted by local peoples, and how government agencies try to recast their information to make it more understandable and usable (e.g., Pennesi's 2007b work revealing the disconnects between the forecasts of the rain prophets of northeastern Brazil and the predictions and guidance provided by the government climate service). And yet other previous research has sought to verify the local ways of knowing against scientifically researched natural processes (e.g., Orlove et al.'s 2002 comparison of the star observations of the Andean potato farmers to the different states of El Niño) in order to show how the different ways of knowing can become complimentary insight. A positive and perhaps unexpected result (to the researchers) of some of this research is that it has uncovered how local people are doing just fine (e.g., the Andean potato farmers) and are able to adapt to the vagaries of climate variability in sustainable ways without intervention in the form of scientific ways of knowing or technology, and it is the scientists and governments who end up learning as much or more about local weather and climate and the resultant sustainable local practices as the local people might have learned from official weather and climate forecasts (e.g., Lefale's 2010 description of the Samoan seasonal calendars).

That said, my work has potential to inform the above line of inquiry, and the meteorological community within which I am embedded, regarding how my collaborators use and accept (or do not) scientific weather and climate information. Although we discussed the other types of weather and climate information they consult, and how they meld this information with their own local observations, I did not explicitly compare the merits of Indigenous versus "Western" ways of knowing about weather and climate other than to indicate how they value one over the other or how the various ways of knowing come together to form an actionable insight (the cultural model above). Nevertheless, as Orlove et al. (2002) and others have suggested, "traditional" and "modern" systems of knowing about weather and climate may end up providing complimentary insight in addressing issues related to day-to-day weather variability and longer-term climate variability. In particular, there may be interest in how my collaborators do not always embrace weather information from sources such as television or Internet because it is perceived through experience as not being local or relevant enough to their particular location and situation (as described in Chapter Six), and how climate information that may be perfectly relevant to my collaborators' needs may be dismissed because of the "local/global" disconnect between climate as perceived as expected seasonal changes in a place and climate as constructed as a cumulative statistical expectation across a wide area (as described in Chapter Seven). My work then could provide further input to those who study how scientific weather and climate information is created for and distributed to the public.

Mainly, I was most interested in learning about how Native farmers and other traditionalists in southwestern Oklahoma conceptualize and know weather and climate in

their localities simply for the sake of learning about what and how they *know*, and how they are *using* their knowledge. I was intrigued at how they seemed to develop a greater sense of pride in or appreciation of their own weather and climate knowledge as we discussed the ways in which they use it – I think they see new opportunities for valuing the insights that their observations provide. I went into my field research under the premise that the people I would talk to would "know which way the wind blows" in their particular, local situations. But, I did not anticipate the high degree to which they would rely upon their own knowledge in their decision-making. As suggested by Berkes (1999), Suzuki and Knudtson (1992), and Pierotti and Wildcat (2000), I was able to learn about unexpected and non-intuitive insights about how the world works, knowledge that I believe might have broader implications beyond the local community. Therefore, since the people I worked with are land users, just like those studied in other places, and apply their weather and climate knowledge as part of a toolbox of insight like those in other places, there should be parallels with previous research that has studied how people form and use weather and climate knowledge in particular localities. My research may have potential, then, initiate a type of ethnoclimatological research in Native land-based agrarian livelihood situations (though not necessarily subsistence) in a First World setting. This effort should be viable given how my research uncovered the continued observation and valuation of local weather and climate insights, and how this knowledge still seems to be active in other places in the U.S. as demonstrated by anecdotal instances such as "James from Fort Belknap" in Montana. Work in this area would need to go beyond simple documentation of knowledge to uncover how it is used and valued. The knowledge I have been told, and presumably that of people in other places, has the

opportunity as indicated previously to further inform thinking and action regarding local climate change adaptation and mitigation and may help prevent actions that often end up being destructive. At the very least, it should provide a form of ground truth or a reality check in environmental development projects that utilized Indigenous knowledge – any such development efforts involving Indigenous knowledge should have as a prime motivator the co-production of new knowledge going forward.

My intimate dealings within "Indian Country" suggest that anyone who goes about cultural research with Indigenous peoples in the proper way – with respect, with reciprocity in mind, and with shared vision – can enter into that world, engage with incredibly interesting people, learn a lot, and build enduring relationships of mutual understanding and even trust. Such work needs to be conducted in a considerate, meaningful, and ethical way that privileges the goals and needs of the local people as much or more than any needs the researcher may have in "mining" such knowledge (e.g., Pualani Louis 2007). It should include careful pre-research contact in which all relevant parties are seated at the table to discuss the research project and what might be in it for all parties (e.g., my initial February 2009 meeting). As Mihesuah (1998) suggests, if the Native people decide there is not much to be gained by their participation in the project, it should be abandoned. This may happen if they decide that their expression of culturally relevant knowledge to outsiders might thwart their efforts toward political sovereignty or in gaining greater control over local natural resources, or represents an abdication of their intellectual property (e.g., Menzies and Butler 2006). Researchers here need to make sure that Native insights, once provided, are not represented in settings or formats that could marginalize or strip them of their local and cultural contexts (e.g., Cajete 2001).

Through the compiling of the knowledge presented to me by my collaborators, one of my goals was to support their collective attempts to help restore the weather and climate part of their knowledge base and by inference help them recreate and revitalize themselves in culturally important ways that involve this knowledge (e.g., Cajete 2001). As an example of this and as stated above, conversations with my collaborators elicited a new appreciation in and pride for their own weather and climate observations and how they might be even better used as viable and valuable information in their decision-making.

FUTURE ACTIVITIES – REORIENTING THINKING WITHIN THE LOCAL RESEARCH COMMUNITY ON MEANINGFUL COLLABORATIVE INTERACTION WITH NATIVE COMMUNITIES

Based on the review in Chapter Two of efforts in other parts of the world seeking inclusion of Indigenous knowledge in environmental co-management efforts, there seems to be so much more that could be achieved regarding how the scientific community and governments attempt to entrain Indigenous thought into environmental research and development projects that impact the lands and resources where Indigenous people live. The literature reviewed on this topic provides stories of success and failure, and advice on how to do this in ways that will ensure some level of success for all involved – these intersect with two local efforts described below.

Reiterating from that review, any co-management projects that are conducted need to foster a meaningful dialogue that includes those directly involved in the local resource use (e.g., Pálsson 2006). Projects must hold the priorities and agendas of the Indigenous groups at least the same level as those, in this case, of the scientists (e.g., Tipa

et al. 2009) and must empower the local peoples (e.g., Nadasdy 2005). They must make sure that local knowledge is not stripped of its vital context nor is exploited as another research tool or piece of data (e.g., Nadasdy 1999). Any assemblies of knowledge that proceed from such endeavors need to represent all individual or group viewpoints. The "cultural triage" approach of Stoffle and Evans (1990), conducted at the beginning of a negotiation (similar to my first meeting with the Kiowa farmers in February 2009), offers promise for helping rank the importance of local needs, interests, and resources. Most co-management/co-production efforts described in Chapter Two have occurred in Canada, Alaska, and Australia, but could be expanded to places like Oklahoma. A recent *Nature* article on the "local perspective" in the Arctic (Huntington 2011) describes the increasing acceptance of Indigenous knowledge in co-management projects and co-research there.

In particular, I have been involved in or present at recent efforts to entrain Oklahoma tribal entities, particularly the Chickasaw and Choctaw Nations, into projects that seek either to initiate a discussion about an environmental topic (e.g., climate change) or to include their involvement in projects related to the management of a natural resource (e.g., water). What I have observed at these meetings in the way of proposed collaboration or involvement has been mixed with regard to the proposed ethic of co-management and co-production of new knowledge, or the use of local Native insights at all, and as such I believe I can make a useful impact in this regard based on my research southwestern Oklahoma and knowledge of what has been done in other parts of the world. In this section I present two recent examples of planned involvement or

collaboration – the first was initiated by an Indigenous person, while the second was initiated by local scientists.

What *to* Do? Oklahoma Inter-Tribal Meeting on Climate Variability and Change

With Absentee Shawnee Nation member Paulette Blanchard, a student at Haskell Indian Nations University of Daniel Wildcat, and Oklahoma Climatological Survey colleague Rachel Riley, I helped organize a meeting to be held at the University of Oklahoma on December 12, 2011. It is titled "Oklahoma Inter-Tribal Meeting on Climate Variability and Change." This idea was Blanchard's as part of her work at Haskell, and she was able to connect with Rachel and me on facilitating the meeting. The premise is to assemble representatives from all 39 tribal entities in Oklahoma to discuss climate change from both a tribal perspective and a scientific one.

The morning of the meeting (see agenda in Figure 17) will feature presentations from scientists on climate, and will culminate with a presentation by Bull Bennett (once president of the North Dakota Association of Tribal Colleges and now environmental consultant for Kiksapa Consulting in Bismarck, North Dakota) on "What does this mean for the tribes?" The afternoon will be made up of group discussions of local tribal issues related to climate change that will be gathered and summarized as recommendations and paths forward. The event will conclude with a presentation from Daniel Wildcat on "Where do we go from here? What actions need to take place?" I will be the afternoon moderator. The questions they each raise reflect the meeting's main emphasis on listening to the thoughts and needs of the tribes with respect to climate change.



Figure 17. Agenda for Inter-Tribal Climate Variability and Change meeting.

This meeting attempts to give tribal representatives an unprecedented voice in the 2013 National Climate Assessment (part of the U.S. Global Change Research Program), and represents a local effort to foster Indigenous involvement in the co-management of an environmental issue (climate change) and co-production of new knowledge of it going forward (discussion will include the stresses and impacts of climate change on cultural practices and by inference, self-determination, and proposed mitigations and adaptations, all from the point of view and priorities of the tribal participants). For the purposes of the local scientific climate community, this meeting will enhance and foster dialogue between tribal representatives and climate scientists and should co-create useful

knowledge about climate change by all involved – it will represent another opportunity for scientists to find out how an important sector of the public understands climate variability and how it is dealing with it, and how useful information about climate change can be jointly produced. For the purposes of the 2013 National Climate Assessment, this meeting will develop material to be included in the assessment report (previous assessment reports were written in 2000 and 2009) that Bull Bennett is helping to write, which will represent a tangible reporting out of the knowledge created at the meeting.

What *not to* Do? Water and Climate Initiatives in Oklahoma

The second example here describes an attempt by the Norman weather community to entrain Oklahoma tribes into funded research efforts involving topics such as water management and climate change. Similar attempts have taken a mostly top-down, bureaucratic planning approach, and have resulted in uncertain plans for how to involve the tribal entities other than in bureaucratic ways. The example here focuses on water resources.

A presentation was made on the University of Oklahoma campus on February 28, 2011 regarding comprehensive water planning for tribes in Oklahoma. This presentation was part of a larger meeting involving possible stakeholders in a U.S. Department of Interior South Central Climate Science Center that the University of Oklahoma competed for and ultimately secured in September 2011 in partnership with numerous university, public, and private entities, including the Chickasaw and Choctaw Nations. Representatives of the two nations were on hand at the meeting to describe their view of water planning, including what is to become of the waters of Sardis Lake in southeastern

Oklahoma and other area water resources, coveted both by the tribes and by municipalities like the City of Oklahoma City. Water rights have been a topic of much discussion in 2011, including the production of televised advocacy pieces by the Choctaw Nation.

The water planning perspectives and concerns of the two tribes were compelling and spoke to issues discussed in this dissertation, including environmental ethics, conservation, and self-determination. Duane Smith represented them, and is a figure of authority in such matters as the former executive director of the Oklahoma Water Resources Board. Smith described how both tribes have a "moral responsibility" to their people to ensure the sustainability of water resources in southeastern and southern Oklahoma, now and for future generations. Ongoing depletion of streamflow and reduction of reservoir levels are main concerns, which have been exacerbated by recent drought. Smith talked about the "Riparian Doctrine" – if you live on the stream, you have a right to its water. This conflicts with what he called the "Appropriations Doctrine" in which water can be apportioned to others. A definition of sustainability was put forth that requires meeting the needs of the present without compromising the needs of the future. Smith showed statistics on supply, demand, gap analyses, and potential strategies. While he said it seems as though there is a lot of water in southeastern Oklahoma, it is incorrect to call what is there a "surplus" as some apparently have – he then asked the question, "What will be available in the future?" He spoke of water sustainability in terms of social, environmental, and economic factors, and showed a projection to 2060 that indicated municipal water usage increasing sharply, industrial and steam electric usage dropping slightly, and irrigation usage dropping sharply. Smith

concluded, “Oklahoma is lagging behind in what’s happening in water planning.” Issues such as climate change and uncertainty were listed as wildcard factors that will affect future water supply.

The meeting at times seemed to involve parallel universes – the two tribes spoke about water resources in southeastern Oklahoma, while others discussed how the tribes might become involved in the Climate Science Center initiative, and it was not clear how the two would intersect. It appeared that the involvement of the two tribes would ultimately come down to senior partnership in planning and decision-making and to opportunities provided by the Center to give exposure to Native students or tribal liaisons to the work that will be done in the Center. The proposal that was accepted by the Department of Interior indicates that the new Chickasaw Nation Cultural Center, which houses artifacts, photo archives, a rare book collection, and historic documents, would be made available for background and ethnographic research.

A Choctaw leader in attendance at the meeting asked, “What can we get out of this that will achieve our vision?” This is the sort of comment I have heard echoed by the farmers I spoke to and have read in the literature on co-management efforts in other places. My view is that the participation of tribal peoples could be fostered more meaningfully on a local project scale. Based on my work in southwestern Oklahoma, I argue that the local knowledge of Chickasaw and Choctaw farmers, ranchers and land holders (along with hunters, fishermen and others), people who know the weather, and how the water runs and how the land works, in their part of Oklahoma, should be consulted and engaged with as both “decision support” and as a “reality check” for any potential water related projects conducted in conjunction with the Center. The two tribes

would presumably know whom to identify for involvement in such local efforts. Recall from Chapter Eight that several of the farmers I talked to described civil engineering projects in southwestern Oklahoma involving streams, rivers, and ponds that produced unintended, dangerous, and even fatal consequences regarding water flow, supply, flash flooding, and loss of farm land. It will be interesting to see how this collaboration manifests itself now that the Center has been funded.

FUTURE ACTIVITIES – CONTINUED INTERACTION WITH THE NATIVE COMMUNITY

The research described in this dissertation took me out of my comfort zone of computer-related desk work and forced me to interact with real people – incredibly interesting people who had stories to tell. It was a rewarding privilege to interact with them, and is something I would like to continue.

In addition to helping out at the environmental camps and vegetable judging contests, Randall has asked me to become part of his Beginning Farmer training sessions by showing the farmers and ranchers how they can use and leverage their own weather and climate knowledge, as well as other information, to benefit their agricultural activities. He feels that I could become another source of weather insight to them, and more broadly an advocate for bringing to light their agricultural issues. To that end, he has asked me to help write proposals for the Indian Country Agriculture and Resource Development Corporation tribal non-profit organization. Langston University also has asked me to conduct a field trip of the weather facilities in Norman as part of the 2012 Langston Small Farmers Conference. With regard to interaction with young people, I have been asked to speak at high school career days and other activities that can impact

Native youth, including career counseling in environmental academic majors. And, I am participating in the Norman Public Schools Indian Education Program Science Club by giving hands-on presentations to elementary and middle school children on Saturday mornings. To continue my presence in Indian Country, I asked the people with whom I have interacted to entrain me into their activities as they see fit. Maya told me recently (personal communication, November 24, 2011), "Thank you for sharing our culture with the world! Our traditions are so unique and precious. I'm glad you were the person to be the 'bridge'! I would love a copy (of the dissertation)! And I will keep you informed of community events!"

Perhaps the most important project I can involve myself in to help share and preserve the traditions she refers to is by creating a living repository of the weather and climate knowledge I started to compile in this dissertation. Randall once told me he thinks an archive should be established:

> These things need to be preserved. Some kind of archive of some sort needs to be preserved. I don't know if anybody has ever documented or created any kind of archive in that way for our beliefs and our cultural traditions, how it pertained to our everyday living back then. This is the reason why we are taking a stance. We see a need for it to be preserved. We are the group of people that it's going to die out with – there is a lot our children who need to know. There needs to be more teaching.

There were so many more people I could have spoken to for this research study that have insights to share and keep. One thought is to extract this knowledge from the dissertation and put it into a document that can be placed on display at tribal headquarter buildings in southwestern Oklahoma so that others may add to it as they wish. For example, the Kiowa Tribal Complex in Carnegie has an Elders Center at which many people congregate on a daily basis, and it

could represent a prime location to record more information. Other tribes in the area have similar centers or other places of social gathering at which knowledge could be contributed. I would initiate this activity by appearing at these places to introduce the project. Methods could be constructed to capture this knowledge through both inscription and spoken word.

SUGGESTIONS FOR FUTURE RESEARCH

Possible research efforts could come from the groundwork laid in this dissertation that are either beyond its immediate scope or are recently planned activities. These include: a participatory video project to learn more about how climate change and variability affect Indigenous peoples in Oklahoma; an inquiry within the subfield of First World political ecology to more fully investigate the struggles of the farmers and ranchers I talked to in their attempts to conduct agriculture on their own terms; and a more thorough effort to investigate the politics of identity that the Native peoples I have talked to seem to have constructed regarding the "Indianness" of their weather and climate knowledge.

Participatory Video Project on the Vulnerability to and Impacts of Climate Change and Variability

A proposed pilot effort involving two University of Oklahoma colleagues and an Indigenous video maker, titled "Experiencing Weather, Communicating Climate", would use video to document how climate change is impacting Indigenous communities in Oklahoma. This work would expand upon my discussions in southwestern Oklahoma on how climate variability is being noticed and how it is impacting observational indicators

and agricultural planning and activities. From the project's description, "All humans experience climate and weather, but the meanings we attribute to them and their variability in time and space are cultural and context specific, ensuring that there can be no single way to communicate risk or vulnerability." It continues, "To address this challenge, climate science needs to incorporate communication strategies that facilitate collaborative knowledge production. This project aims to contribute to this task by fostering pluricultural conversations about climate change and resilience."

During summer 2012, we will initiate a participatory video project focused on Indigenous communities' understandings and experiences of climate and weather. The project team will draw upon my contacts in the Native community, as well as those of the other project team members, plus take advantage of the aforementioned Chickasaw Nation and Choctaw Nation partnership within the new Department of the Interior South Central Climate Science Center, to identify people with whom to interact. The research team will travel to four cultural centers in Oklahoma accountable to different tribal communities. At each site, team members will host a four-hour event that is part educational outreach and part research development. In addition to introducing our work, we will inquire about community members' interest in collaborating on a video production (or a series of productions) that improves the identification, assessment, and communication of the risks associated with climate change. Through the relationships established or solidified during this pilot project, the research team will seek funding to further support digitally mediated climate change education.

Struggles of the Farmers and Ranchers on the Land

The efforts described in Chapter Nine on the farmers' and ranchers' (i.e., land users) power struggles with the government in obtaining funding, including particularly battles with the U.S. Department of Agriculture, and their efforts to decolonize their livelihoods by engaging in agriculture by creating their own business enterprises and food sovereignty initiatives, intersect with the inquiries of political ecology, which attempts to expose the differing and often conflicting positions and actions of variously situated actors. The attempts of the agriculturalists I interacted with to obtain government aid and loans have been at times thwarted by government officials and bankers hesitant or unwilling to provide them, and this has resulted in a landmark government settlement (Keepseagle v. Vilsack). Efforts to obtain fair prices in the marketplace have been mixed and have led to efforts to create Native farmers' markets and slaughter facilities. Efforts to maintain heirloom seed lines has been complicated by the actions of corporate agriculture to control seed lines and fears of resultant contamination of the heirloom varieties, leading to the creation of a food sovereignty initiative. This story, if extended to more fully consider these contestations in greater depth, including a more thorough examination of Native American land dispossession illustrated by the Kiowa example in Chapter Nine, has potential to contribute to the First World political ecology defined by McCarthy (2002, p. 1281) that asserts, "Many assumptions regarding state capacity, individual and collective identities and motivations, and economic and historical relations in advanced capitalist countries are mistaken or incomplete in ways that have led to important dimensions of environmental conflicts in such locales being overlooked."

From McCarthy (2002, p. 1283), such an inquiry should include study of: access to and control over resources; issues of marginality; the centrality of livelihood issues; ambiguities in property rights; the importance of local histories, meanings, culture, and politics in resource use; the disenfranchisement of legitimate local users and uses; and the overlapping of all these with colonial and postcolonial legacies and dynamics. All of these themes intersect in some way with the plights and activities of the agriculturalists I worked with; possible themes for study in Oklahoma could include: (1) the organized actions of local peoples – seen as acts of resistance by the local people to unencumber themselves from control and that help publicize their plights and gain support (e.g., formation of Native-owned entities); (2) livelihood dependence on the land and use of the natural resources where they live, with appeals to the value of local knowledge as an alternative to expert science, cultural identity, reinventions of community and traditions, and the right to self-determination (e.g., desire to be and stay on the land as a more sustainable way of life and as a to preserve and reinitiate knowledge and traditions); (3) loss of access or control, or basic denial of the ability to manipulate those lands and resources (e.g., history of land dispassion in southwestern Oklahoma and related denial of training and financial backing); and (4) decision-making and action from afar that thwarts activity (e.g., actions of the USDA and Bureau of Indian Affairs). Methodologies suggested by McCarthy (2002, p. 1297) to perform such an inquiry intersect with some of the ones I used, including ethnographic techniques (e.g., interviews, participant-observation) and intensive case studies (embedding within a community), along with in-depth consideration of historical geographies and comparative frameworks. More research could be done on the origins and activities of the new Native-run ventures

(Kiowa Native Farms LLC, Indian Country Agriculture and Resource Development Corporation) and food sovereignty initiatives (the Mvskoke Food Sovereignty Initiative in particular), and a broader survey of Native land dispossession and a more thorough historical tracing of discrimination and denial of access involving governmental agencies could be conducted.

"Native" Ways of Knowing – Identity Politics

In the cultural model presented above, the cultural situatedness of the knowledge of the people I spoke to, the community value they place in it, and the ownership they seem to have taken of it as "ways of the ancestors" or "Native ways of knowing" all speak to larger issues of Native American identity, including the preservation of sacred traditions (including knowledge) and places and the perpetuation of a shared history.

According to the Stanford Encyclopedia of Philosophy (Stanford Encyclopedia of Philosophy 2007, November 2), the phrase "identity politics" refers to "a wide range of political activity and theorizing founded in the shared experiences of injustice of members of certain social groups...members of that constituency assert or reclaim ways of understanding their distinctiveness that challenge dominant oppressive characterizations, with the goal of greater self-determination." According to Peroff (1997, p. 485), "the sustaining spark of contemporary Indian communities is a tribally-based Indian identity." Peroff suggests that the identity of "Indianness" is the key property that emerges from an Indian tribe and is the result of the interactions between tribal members, tribal resources, community organizations, tribal lands, and everything

else that makes up a tribe. Therefore, Peroff recommends that to truly understand this identity, an Indian tribe must be considered as a whole.

Since I was not able to study any one tribe represented by my collaborators in depth, it is difficult to delve into this topic here other than to say that the people I talked to embody and embrace this sense of identity when talking about their weather and climate knowledge, and to truly get at the roots of this ownership and desire to save and maintain it as a part of their tradition would require more in-depth conversation, particularly with elders and likely those in positions of power within tribes who are trying to promote tribal identity. A thorough literature review would be required as well. This effort would build upon the work I described in Chapter Nine to uncover grassroots efforts of self-determination and the broader concept of self-determination introduced there. The concept of identity may come into play if I go forward with attempts to create a living repository of tribal weather and climate knowledge if the results were to go beyond tribal boundaries (though this is not immediately anticipated).

CLOSING WORD: A CLOUD OF INSIGHTS

Figure 18 provides a word cloud of keyword prominence (frequency) from the compendium of interview quotations described throughout this dissertation. This provides a visual sense of the importance of the various things my collaborators told me.



Figure 18. Word cloud of key word prominence spoken by the collaborators.

Besides the word “weather”, our main topic of conversation, some of the most prominent words and phrases include “look”, “see”, “watch”, “animals”, “clouds”, and “water” and “rain”, illuminating the importance of looking at the observational signs and the universal importance of rain to agriculture, respectively. The work ethic of the people I spoke to is represented through words such as “plant”, “work”, and “grow.”

Perhaps the most interesting key phrase prominence is “used to” – many told me about the loss of past ways of knowing and doing, and lament that loss, and the keen desire they have to rekindle them. I had asked my collaborators if the ways of the past were still important and worth saving in a modern world. Everyone said “yes” and most regretted not listening closely enough to their parents and elders when growing up.

Richard Jr. said, "Those people back there, they paved the way." Milton discussed the importance of retaining knowledge for future generations. He said:

> It's a knowledge that you need to share and that you need to make sure doesn't get lost. We've lost a lot of knowledge from elders – I've got grandmothers and grandfathers and they could tell you a lot, but they're not here. They're gone, and every day I sit there thinking, 'Why didn't I listen to them?' Whatever tribe you are, if you don't believe in your culture and you don't believe in some of the tribal beliefs, then some of those things are going to be lost. You're not going to retain them, you're not going to pass them on, you're not going to believe in them to actually study them or see why they said that.

Maya expanded on the need to save and share knowledge, and even go back to what she termed "traditional ways":

> I think we are trying to get back to the way we were supposed to live. There's been a big interruption in the way I feel our Creator has placed us here to work in conjunction with Mother Earth – what she gives us and what is here. We were on that path, and then technology just got in the way. Competition and money. I think about that every day. How did we get like this? How did we get plastic, and speaking English, and all these different things? How did we get to this? And would we be happy now with what we had before, just living off of hunting the buffalo and moving with the heard, and (with) the small farms of potatoes and onions and getting berries – what a free life that must have been, and how wonderful. No fences, no worries of we're going to run out of this buffalo, we're going to run out of this food. We used every part of the buffalo for survival, even down to the gut, everything. We never thought we were going to run out of that until someone (came in and) told us we were wrong for it. At this point I think our Native people are getting stronger and we're having more opportunity. But we're getting to the point where so much is happening in this world with overconsumption and people not having enough. Our people are the ones who don't have enough. I think we are getting to the point where we can look back at our old ways and say, 'You know what, they were right about this.' People told us we were wrong. We know we've had ancestors and family members who have fought, whether that be through education or activism or through the law, somehow they have fought for our rights. We can continue that on, and that's what I try to teach my kids. And we can bring back our traditional ways through education, through legislation, and advocacy. So, we can use those non-traditional ways to bring back our traditions. And people want to hear those things. We're coming back. A lot of our traditional

> ways, people are looking at now. I hate to say 'I told you so', but, 'Finally!'

To close, the people I interacted with, much like their ancestors, are *still* trying to find their way in the world. But, the story told here is one of hope, and the people I have come to know most certainly do know which way the wind blows. I close with the words of Alan. He said:

> Our people have so much to lose (wisdom) because they don't see it. Some of those old people, I listened to them a lot, they taught us to just sit down and listen, providing their knowledge and wisdom. I believe it's a gift God gave us and we can continue to use that. The whole world is out here. Let our lands take care of us. I had a dream that I would inherit land. I see farming as a main way to survive now – my people and me can have a better living and live longer.

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APPENDIX A

Interview Guide
On Traditional Weather Knowledge and How it is Used to Farm

1. <u>Background information</u>

1.1 Name

1.2 Gender

1.3 Age (estimated by me)

1.4 Education level

1.5 Tribal affiliation(s)

1.6 Residence

- 1.6.1 Are you from around here?
- 1.6.2 If so, how many generations has your family lived here?
- 1.6.3 If not, where are you from, and when and why did you move here?
- 1.6.4 Do you feel a strong attachment to this place?

1.7 Are you a farmer, gardener, herbalist or rancher?

- 1.7.1 How many years have you been doing this?
- 1.7.2 How many generations has your family been doing this?
- 1.7.3 Do you do this full-time?
  - 1.7.3.1 If not, what else do you do?
- 1.7.4 Do you do this with someone else, like a family member or friend?
- 1.7.5 How many acres do you have?
- 1.7.6 How much of the land do you own?
- 1.7.7 How much of the land do you lease?

1.7.8 What crops do you have in this year or plan to have)?

1.8 Are you a part of any ag-related business or social groups?

1.8.1 If so, what are they?

1.8.2 To what extent do you participate in these groups? (e.g., do you attend their functions or meetings?)

1.9 What are the most important factors that impact your farming operations? [*See if they say weather. If they do, continue with this line of questioning.*]

1.10 What sources of weather information (other than your own knowledge) do you look at before making farming decisions?

1.10.1 On a typical day, how does this weather information affect your farming decisions?

2. <u>Your weather knowledge</u>

2.1 What kinds of signs or indicators in nature do you look at to tell you what might be happening with the weather or the seasons (e.g., the appearance of clouds, the visibility of the stars, sun and moon in the sky, the behavior of plants, birds, and animals on the ground)? ***Let them talk!*** *(this is the most important part of the interview!)*

[If interview done at a neutral location, see if I can get invited to the person's farm to see it, photograph it, and in doing so gain context for the answers I've just heard.]

2.2 Do you think these signs are unique to this place?

2.3 Does your weather knowledge give you a sense of pride?

2.4 Does anyone around here ask you about the weather based on your knowledge – that is, are you considered a "weather expert"?

2.5 Has this knowledge of weather been passed down to you?

2.5.1 If so, how and by whom?

2.6 Is your weather knowledge based in part on tribal beliefs or shaped by tribal customs or traditions such as ceremonies or dances?

2.6.1 If so, please describe.

2.7 What are your views on man's relationship with nature?

2.8 Do you think traditional knowledge is still important in a modern world?

3. Your own weather "intuition"

3.1 Do you trust your own weather knowledge more than from your other sources?

3.1.1 If so, why?

4. Traditional farming

4.1 Are there any things that you do farming-wise that might be considered traditional? [*If they ask what sorts of things these might be, mention no-till, maintaining seed varieties, conserving rain water, etc.*]

4.1.1 If so, please tell me about them.

4.2 Do you think these methods improve your yields or conserve your resources?

4.2.1 If so, how?

4.3 Has your traditional knowledge of weather made you more likely to farm traditionally or give you an interest in wanting to do so?

5. Networking

5.1 Do you talk to other farmers about weather and farming?

5.2 Do you share your special insight with others, or do you consider it your secret key to success?

5.3 Do you think visiting with other farmers influences how you farm?

6. Social institutions

6.1 Earlier I asked if you belong to farming, social, and tribal/cultural groups in which you interact with others for business or socially.

6.1.1 How involved are you in these groups?

6.1.2 Is weather discussed?

6.2 Do these groups influence how you farm?

6.3 Are these groups a hindrance or do they help you?

7. Climate change

7.1 People who study migration patterns of insects and birds say that spring is starting "earlier" by about 3 days every decade. "Green up" is said to be starting earlier, too.

> 7.1.1 Have you noticed changes like this in your seasons or in weather in general? How?

7.2 Have you had to change your farming practices or your planning based on these changes? How?

7.3 Are these changes, in your opinion, because of human influence on nature or do you think they are natural?

7.4 What do you think about the climate scientists who say global warming is taking place?

APPENDIX B

University of Oklahoma
Institutional Review Board
Informed Consent to Participate in a Research Study

Project Title: ***Knowing Which Way the Wind Blows: Weather Observation, Belief and Practice in Native Oklahoma***
Principal Investigator: **Randy A. Peppler**
Department: **Geography**

You are being asked to volunteer for this research study. This study is being conducted at a place of convenience for you. You were selected as a possible participant because you are participating in an agricultural program with Randall Ware, the Executive Director of the Native American Indian Farm and Ranch Cooperative (NAIF&RC).

Please read this form and ask any questions that you may have before agreeing to take part in this study.

Purpose of My Research Study

To learn about how you know the weather in ways other than through television or the Internet and how you might use this to farm, garden, ranch, or grow herbs. I am interested in your "local" and "traditional" ways of knowing the weather and if your knowledge is informed by tribal beliefs or stories and practices that have been passed down to you. I am also interested in knowing how social institutions like tribal or farming organizations influence how you know the weather and farm, and how you interact with other farmers – do you share "trade secrets" about weather and farming?

Number of Participants

About 25 to 100 people will take part in this study.

Procedures

If you agree to be in this study, you will be asked to do the following:

Participate in an interview that will be audio recorded; show me how you observe weather if you choose to do so, which may involve walking or seeing your property; filling out a weather observation sheet over a period of several months that documents your observations of weather and any farming decisions that resulted because of those observations; allow me to take pictures of you and things you observe. If all goes well I might like to set up a "network" of traditional weather observations that is updated (perhaps on the Internet) as people like you observe things in nature, something that might continue indefinitely – a first-cut name for this is the "Beaver Dam Network" based on one of the observations I've read about.

Length of Participation

One to two hours. I may ask to come back and visit you a second time.

This study has the following risks

There are no risks (physical, psychological, economical, or other) to your participation.

Benefits of being in the study are

My research results may be beneficial to your understanding of weather and your farming activities. My goal overall is to foster a greater appreciation of "non-scientific" ways of knowing weather and allow such knowledge to be used as "insight" for solving societal issues such as adaptation to drought and climate change.

Confidentiality

In published reports, there will be no way to identify you without your permission. Research records will be stored securely and only I will have access to the records.

Compensation

You will not be reimbursed for your time and participation in this study.

Voluntary Nature of the Study

Participation in this study is voluntary. If you decide to participate, you may decline to answer any question and may choose to withdraw at any time.

Waivers of Elements of Confidentiality

Your name will not be linked with your responses unless you specifically agree to be identified. Please select one of the following options

_____ I consent to being quoted directly

_____ I do not consent to being quoted directly

_____ I consent to having my name reported with quoted material

_____ I do not consent to having my name reported with quoted material

Audio Recording of Study Activities

To assist with accurate recording of participant responses, interviews will be recorded on an audio recording device. You have the right to refuse to allow such recording. Please select one of the following options.

I consent to audio recording. ___Yes ___No

Photographing of Study Participants/Activities

In order to preserve an image related to the research, photographs may be taken of participants. You have the right to refuse to allow photographs to be taken. Please select one of the following options.

I consent to photographs. ___Yes ___No

Contacts and Questions

If you have questions, concerns or complaints about the research, I can be contacted at 405-822-7636 (cell) and rpeppler@ou.edu or randy.peppler@gmail.com. My research advisor's name is Karl Offen – his office number is 405-325-3912 and his e-mail is koffen@ou.edu.

Contact the researcher(s) if you have questions or if you have experienced a research-related injury.

If you have any questions about your rights as a research participant, concerns, or complaints about the research and wish to talk to someone other than individuals on the research team or if you cannot reach the research team, you also may contact the University of Oklahoma – Norman Campus Institutional Review Board (OU-NC IRB) at 405-325-8110 or irb@ou.edu.

You will be given a copy of this information to keep for your records. If you are not given a copy of this consent form, please request one.

Statement of Consent

I have read the above information. I have asked questions and have received satisfactory answers. I consent to participate in the study.

Signature Date

APPENDIX C

University of Oklahoma – Norman Campus
Institutional Review Board
Description of Study Protocol

Submission of a copy of a grant application does not replace completion of this form. Please respond to each item. Incomplete submission forms will be returned to you.

1) Click below to describe the research design of the study.

My research project is to learn about local and traditional knowledge of weather and seasonal climate in Oklahoma and how it is used in farming, building on documents research I have performed to construct a historical- and place-based context for the current form and use of knowledge I might find in Oklahoma now. I propose to focus on Native American farmers, gardeners, herbalists and ranchers because they not only live close to the land and as such are keen observers of weather in order to ensure success, but also because traditional ways of knowing are likely to be important to them and may be informed both by traditional observations and by beliefs and worldviews both ancient and more recent to existence in Oklahoma. The work would seek to learn about how the important events and occurrences of one's lives, including what has been passed down as stories and practice, have contributed to this knowledge, and how social institutions within which these activities are situated affect it. I believe I can conduct this research through a combination of interviewing and conversations; observation of the farmers' weather observational methods, tribal ceremonial practices, and farming methods; and creation of seasonal calendars or "weather almanacs" that capture their weather observations and their farming actions in response to them.

2) In the input area below, describe the recruitment procedures. Attach a copy of any material used to recruit subjects (e.g., informed consent forms, advertisement, flyers, telephone scripts, verbal recruitment scripts, cover letters, etc.) Explain who will approach potential participants to request participation in the research study and what will be done to protect the individual's privacy in this process.

Recruitment is a multi-stage progress. I initially contacted Al Sutherland, the OSU Mesonet Agricultural Coordinator and Extension Specialist, housed in the National Weather Center on the OU campus, to help me identify Native farmers. He provided me with the names of four Extension Agents in Oklahoma that might be able to help: Rick Clovis, Creek Nation 4-H Educator; Doug Maxey, Okmulgee Ag Educator; David Nowlin, Caddo County Ag Educator, and Gage Milliman, Nowata County Ag Educator. I sent each an e-mail and received responses from all but Milliman. Nowlin

pointed me toward Randall Ware, the executive director for the Native American Indian Farm and Ranch Cooperative (NAIF&RC) based in Apache, OK, while Clovis and Maxey both pointed me to the Mvskoke Food Sovereignty Initiative based in Okmulgee, OK, and specifically to its co-directors Vicky Karhu and Ben Yahola. Ware works with 280 Native farmers, gardeners, herbalists and ranchers in southwestern Oklahoma comprising nine tribes (Kiowa, Comanche, Apache, Fort Sill Apache, Wichita, Caddo, Delaware, Cheyenne, and Arapaho) while the MFSI has board members not only from the Mvskoke (Creek) Nation but also the Kiowa and Cheyenne tribes. I will be working with Ware initially to identify farmers, and if all goes well in southwestern Oklahoma perhaps work with the MFSI at a later time (requiring a letter of support then). Identification most likely will consist of Ware contacting farmers to find out their interest in talking to me and us jointly setting up times to meet. I have met with Ware and he is quite excited to help me – he is extending farm programs to his people in order to promote farming as a way to get back to the land to improve physical vigor and better diets, while I can help connect the weather knowledge people already have to their farming activities. It is possible that I may need to make phone calls or send e-mails to potential participants to set up times. I will provide each participant with a copy of the Informed Consent form when I talk to them. Also, there is one other person (Pat Moss) I have been pointed to, via the author (Eddie Glenn) of a Tahlequah Daily Press newspaper article in fall 2006. Mr. Glenn said he would be willing to put me in contact with Moss, who was the informant for the article. This contact would be by e-mail, letter, or phone. The first part of my field effort will concentrate on southwestern Oklahoma with Mr. Ware's guidance.

3) Below, list and describe the tasks that participants will be asked to perform, including a step-by-step description for each procedure you plan to use with your subjects. Provide the approximate duration of subject participation for each procedure.

Participants will be asked to (1) participate in a semi-structured interview, (2) demonstrate their weather observational and farming methods if applicable, including if appropriate and feasible walking parts of their farm property (e.g., I would like to see the beaver dams that have been built in anticipation of lack of water!); and (3) keep a seasonal calendar. The combination of (1) and (2) should take 1-3 hours. Task (3) is anticipated to last about a year and will be done at the participant's leisure as weather observations are made and weather events occur, and as they take farming-related action in their wake. Any attendance of mine at social events or meetings would be observational and conversational. If all goes well I might like to set up an informal "network" of traditional weather observations that is updated (perhaps on the web) as people observe things, something that might continue indefinitely – a first-cut name for this

is the “Beaver Dam Network” based on one of the observations I’ve read about.

4) Describe your data collection procedures. If data collection instruments will be used, indicate the time necessary to complete them, the frequency of administration, and the setting in which they will be administered, such as telephone, mail, or face-to-face interview. (You must submit a copy of each study instrument, including all questionnaires, surveys, protocols for interviews, etc.)

(1) Face-to-face semi-structured interview, conducted once, of no more than an hour. An interview guide is part of this proposal package. (2) Observation of weather observational and farming methods if applicable, including if appropriate and feasible walking parts of their farm property, of 1-2 hours duration. I may want to revisit with some participants at different times of the year to look at different observational methods and engage in conversation. (3) Seasonal calendars, filled out over the course of a year. A template is included as part of this proposal package. (4) Possible subsequent collection of traditional observations as part of a web-based weather network.

5) Click below and provide background information for the study including the objective of the proposed research, purpose, research question, hypothesis and other information deemed relevant. Include up to 5 references from the literature.

Knowing which way the wind blows is to understand what is happening around you and to anticipate changes, and it is synonymous with skill. I intend to learn about local and traditional weather knowledge in Oklahoma and how it is used. Field work would build on the documents research I conducted during 2008 that constructed a historical- and place-based context for the current form and use of such knowledge in Oklahoma. I intend to talk to Native American farmers, gardeners, herbalists, and ranchers about how they “know” the weather in non-scientific ways, variously termed by researchers and others as “traditional”, “indigenous”, “local”, and “non-scientific” knowledge, and closer to home as “sacred wisdom”, and how they use it as part of a production strategy or resource management system. This would include traditional farming methods such as agro-biodiversity (maintaining seed varieties) and water conservation (saving and storing rainwater). I will be interested in not only how farmers observe weather and seasonal climate but also how their knowledge is informed by tribal beliefs, stories, and practices passed down to them and learned, and how social institutions constrain or enhance what they know and how they farm. Initial contacts made with agricultural extension staff in Oklahoma have pointed me

toward individuals and groups that can introduce me to Native farmers initially in southwestern and possibly later in east-central Oklahoma. I will visit with people over the length of an agricultural cycle beginning in spring 2009. This work would represent a cultural ecology seeking a humanistic (individual) description and interpretation of a knowledge system based on weather and farming practices. The study of cultural ecology in its most basic terms is described by Butzer (1989) as learning about "how people live, doing what, how well, for how long, and with what environmental and social constraints."

Why should we study non-scientific knowledge? Berkes (1999) said interest in such knowledge should not be "merely academic" – its lessons have practical significance for everyone in solving problems related to human/environmental interactions. Pierotti and Wildcat (2000) believe such knowledge can yield "unexpected" and "non-intuitive" insights on how nature works. According to Berkes and colleagues (2000) this knowledge has been used by people for centuries to "even out" variations in agricultural livelihood activities as caused by persistent or abruptly changing environmental conditions like drought or erratic rainfall, and has been found to contain a range of components from spiritual to observational to practical. It has been described as a holistic adaptation strategy or coping mechanism gathered over long periods of time by people whose lives depended on it for survival. Minnis and Elisens (2000) call it "indigenous science" and believe it has revealed ecological relationships unknown to Western science; people that have lived on the land for a long time have a detailed relationship with their physical environment. Real-world examples within which non-scientific knowledge may be thought to have potential for contributing to overall environmental understanding include adaptation to drought and climate change.

All of us are producers of knowledge using various methods of discovery that are situated within different worldviews. As a trained and practicing meteorologist I believe I should better understand how people not trained like me know about the same things I know about since I help produce information they are expected to understand. We speak different "languages" and because of this communication can be problematic – this has been the subject of countless workshops I have attended. I would like to better educate my professional colleagues about the weather knowledge of those they seek to serve. At one workshop recently I heard a Tulsa television weather forecasting personality call her viewing public "stupid" because she feels they are unable to understand what she is saying and often do not act appropriately after she has provided them with information. I would counter that she does not understand how her audience thinks or comprehend its needs, but needs to, since it has been said that the most contact the general public has with a scientist is while watching its local weather broadcast or The Weather Channel. What I learn in the field about how people close to the land know weather may be helpful in these regards.

Also, as heard in December 2008 on the call-in radio program *Native America Calling* (http://www.nativeamericacalling.com/), traditional knowledge is still very important within the Native American community. On this particular night the show called "The Moon, the Stars and the Sun" had the tagline "Native communities have always looked to the skies above when determining the best time for ceremony, planting and harvesting. The close connection to the vastness of the skies is still present in many indigenous communities." The first caller, James from Fort Belknap in Montana, described the same things written 60 years ago from Fort Belknap in response to Senator Robert S. Kerr's winter forecast query that I uncovered during my documents research. This tells me that Native ways of knowing are still a vital part of Native discourse.

As a result of my dissertation work and the scientific and non-scientific worlds I will have inhabited, I may be in a unique position to suggest an alternate, non-colonial weather-information model for scientifically-trained meteorologists within both the academic and operational communities I am a part of. This could promote the information I am provided as "insight" and "enlightenment" to the science of meteorology, weather prediction, and climate change. In my proposal I documented the modernist and colonial pitfalls of the research that has been conducted on non-scientific knowledge and how academics and the sciences have commonly subordinated this knowledge. Such a model could redraw the disciplinary boundaries around the study of weather and climate so that the study, understanding and teaching of the topic is not confined, for example, to a meteorology department. This could even lead to an academic major that integrates knowledge into a holistic, enlightened, comprehensive understanding.

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