

TRADITIONAL KNOWLEDGE SYSTEMS AND  
TRIBAL WATER GOVERNANCE ON FORT  
PECK INDIAN RESERVATION, MT

by

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## ABSTRACT

The Fort Peck Indian Reservation is located in northeast Montana and is home to the Assiniboine (Nakona) and Sioux (Dakota) Tribes. Conventional oil and gas development and the disposal of produced water has led to the contamination of 15-37 billion gallons of groundwater within the aquifer that had historically been the only source of drinking water for reservation community members. Although the tribes are aware of the contamination plume, exploiting newly accessible shale resources has become a viable option as the tribes continue to try to alleviate the high unemployment and poverty rates of tribal members. Even so, tribal members and authorities also understand the importance of ecological health in fostering a healthy community. A strong movement of cultural resurgence has been in motion, with tribal members looking to traditional stories and lessons in order to guide the future of the community and create community cohesion. Traditional knowledge systems (TKS) have been heralded throughout contemporary Indigenous governance literature as an important dynamic resource for indigenous communities that deal with difficult decisions involving resource management. Using a TKS framework and interviews with tribal members, this research seeks to answer the following questions: 1) What are the TKS that surrounds water and its use for the Nakona and Dakota tribes? 2) What are some of the opportunities and barriers that exist for the successful incorporation of TKS into tribal water governance structures at Fort Peck? Challenges to validity, process, and relevance due to political histories and power imbalances, as well as diverse intertribal knowledge systems, may impede the successful integration of Indigenous knowledge in collaborative water governance initiatives with outside interests. The internal knowledge sharing process has the potential to enhance cultural revitalization efforts on the reservation – which represent an organic solution that takes place from within the community itself. In addition, TKS-based tribal policies may uphold the expression of tribal self-determination, i.e. the “governance-value” of traditional knowledge systems.

## CHAPTER ONE

## INTRODUCTION

The Intersection of Tribal Water Governance and Traditional Knowledge within a  
Political Ecology Framework

In the early 1970s, Helen Ricker began to notice something strange coming out of her faucets. Her once “cold, clean and sweet” water had changed—its color now yellow, its taste somewhat unusual, its odor “like rotten eggs” (Conde, 2014, p. 2). Although she was one of the first Fort Peck Assiniboine and Sioux tribal members north of Poplar, Montana to notice the change in water quality, Ricker wasn’t imagining things. This bizarre manifestation would later be attributed to a massive contamination of groundwater resources originating from aging conventional oil and gas infrastructure. Over the next few decades, the contamination plumes would permeate 15-37 billion gallons of precious groundwater, slowly making its way south towards the city of Poplar and the Missouri River (Thamke, 2014). The water north of Poplar would never again be described as “clean”.

Similar examples of environmental contamination at the hands of industry are common among Indigenous Nations across North America (Jarding, 2011; MacDonald & Rang, 2007; Melmer, 2006; Sontag & McDonald, 2014). Most recently, similar issues were brought into the global spotlight with the events on the Standing Rock Sioux Reservation from 2016-2017, which sparked a parallel movement for the protection of water resources among tribal members on the Fort Peck. Many tribal members became involved in the protection efforts at Standing Rock, and residents as well as the Fort Peck

Tribal Executive Board agreed to send monetary aid and supplies to the Oceti Sakowin camp many times (Peterson, 2016; Sangha, 2016). This movement, in combination with current efforts to reroute the Keystone XL Pipeline away from tribal water resources, has brought discussions of traditional knowledge systems (TKS), tribal self-determination, and the future of tribal natural resource development to the forefront.

Responding to this movement, my research explores opportunities for collaboration between Tribal Nations and non-tribal entities in environmental governance through the lens of political ecology. According to Paul Robbins, political ecology is “a field of research predicated on the assumption that any tug on the strands of the global web of human-environment linkages reverberates throughout the system as a whole” (Robbins, 2012, p. 13). Political ecology explores relations of power embedded within environmental science and management, including questions of knowledge production, environmental policy, and material realities—especially how these power relations relate to global political economy. Specifically, there is a strong focus on power and knowledge present within postcolonial studies. In short, the postcolonial focus in political ecology “seeks to dethrone hegemonic discourses ... so that other possibilities and realities are made possible” (Robbins, 2012, p. 70). Political ecology allows us to explore notions of power within environmental policy, relating it to historical conflict as well as the neoliberalization of environmental management.

With a focus on power, knowledge, and management, my thesis discusses the inclusion of traditional knowledge systems (TKS) in tribal natural resource management as a possible answer to the call for the enhancement of tribal capacity, self-determination,

and cultural revitalization efforts present among many Tribal Nations. To help introduce these concepts, I will first explain the research framework, the research questions I address, and the methods used to approach these questions. I begin by addressing my positionality as a researcher and discuss how research and a researcher's positionality can affect the traditional knowledge research process. I then describe the overarching goals of my research and the organization of this thesis.

### Research and Positionality

Positionality refers to “aspects of social identity” and privilege that are “articulated as positions in a multidimensional geography of power relations” (Rose, 1997, p. 308). Positionalities embody researcher age, sexuality, income, education level, gender, race, and more. It has been argued that researchers' positionalities, including both power and privilege, have the potential to affect the entire research process. Therefore, personal reflection is critical in addressing these potential power imbalances (Muhammad et al., 2015). The idea that researcher identity, assumptions, and intentions can reinforce or reproduce existing inequalities in the research relationship and influence research outcomes has been extensively discussed by feminist theorists as well as Indigenous scholars the last several decades (Haraway, 1988; Smith, 2012; Wolf, 1993).

It has been widely acknowledged that it is impossible to completely and transparently situate oneself within one's research (Rose, 1997). Nevertheless, I believe it is important to attempt to situate myself within my research topic and among my research participants by addressing my own personal intersections of researcher identity and status. Following the recent examples of authors who have situated their work in this

way, I will first explain my own positionality as a researcher (von der Porten, de Loe, and McGregor, 2016).

Cažé mitawa Tašiyapoba Wiyą hįnkna Dionne Zoanni, wašįjubí emagíyabí. The name that was given to me is Meadowlark Woman, and my English name is Dionne Zoanni. I was born on the Fort Peck Indian Reservation in 1992. I am first and foremost an enrolled member of the Fort Peck Assiniboine and Sioux Tribes. I am Nakona (Assiniboine), Wadópana (Canoe Paddler) band. However, I am also a person of European descent on my father's side, and am thus approaching this research with a multi-racial perspective due to the various influences in my upbringing. My background has the potential to affect the way people interacted with me, including the trust they placed in me and their willingness to open up about the sensitive information I wish to discuss throughout my research.

To add to this complex identity, I am an Indigenous researcher doing research within my own Indigenous community. I am what has been termed an “insider-outsider” (Muhammad et al., 2015; Wolf, 1993; Zinn, 1979). While being an insider may hold such advantages as being able to potentially ask more relevant questions, being able to form more trusting relationships, and being familiar with local history and culture, it can also complicate the research process due to additional responsibilities, assumptions, and accountabilities with one's own community (Smith, 2012). While working with my home community and remaining accountable to them through data sharing and discussion, I am also navigating through my own space in academia as a graduate student, and am required to answer to the demands and rigor of conducting research in such a space. The

need to walk in the two worlds of academia and my own community complicates the research process immensely, as they tend to be two very different worlds with different approaches to knowledge and different expectations of research priorities.

In summary, my own identity and status has the potential to affect the research process, and consequently the outcomes of this research. Nevertheless, my researcher identity has also helped to foster my interests in my culture, water quality, and the future of environmental governance at Fort Peck.

### Overview of Thesis

This thesis is organized as follows. Chapter One situates this research within the social, political and historical context of Fort Peck by providing a thorough background on both the Nakona (Assiniboine) and Dakota (Sioux) tribes' recent histories, the reservation's history of colonialism, and the history of economic development, particularly natural resource development and its environmental impacts. Chapter Two introduces the concept of tribal environmental governance with a discussion of federal Indian policy and its lasting effects on tribal self-determination, capacity, and development, as well as a discussion on the current governance structures present at Fort Peck. Chapter Three focuses on the concept of traditional knowledge systems (TKS) and their application to tribal water governance by discussing the latent power relations and assumptions involved in TKS research and application. Following these introductions, Chapter Four fuses the concepts of TKS and tribal water governance by providing a detailed case study—in manuscript format—involving the sharing of TKS by tribal elders and leaders, as well as their views of the incorporation of TKS into the current water

governance structures at Fort Peck. The final chapter closes by revisiting the historical context of tribal social and environmental policy and the results found throughout the research process in order to suggest potential future directions for water governance and knowledge incorporation opportunities at Fort Peck.

### A General Introduction to the Fort Peck Assiniboine and Sioux Indian Reservation

The Fort Peck Indian Reservation is one of seven reservations in the state of Montana. It is located in the Northeast corner of the state, and is home to both the Nakona/Nakona (Assiniboine) and Dakota (Sioux) tribes (fig. 1). The intersection of federal, state, tribal, county, and city politics creates complex issues of jurisdiction on the reservation. The reservation has a total land area of 2,093,318 acres, of which about 926,000 are Native- or tribally-owned land. The reservation spans four separate counties in northeastern Montana: Roosevelt, Sheridan, Valley, and Daniels.



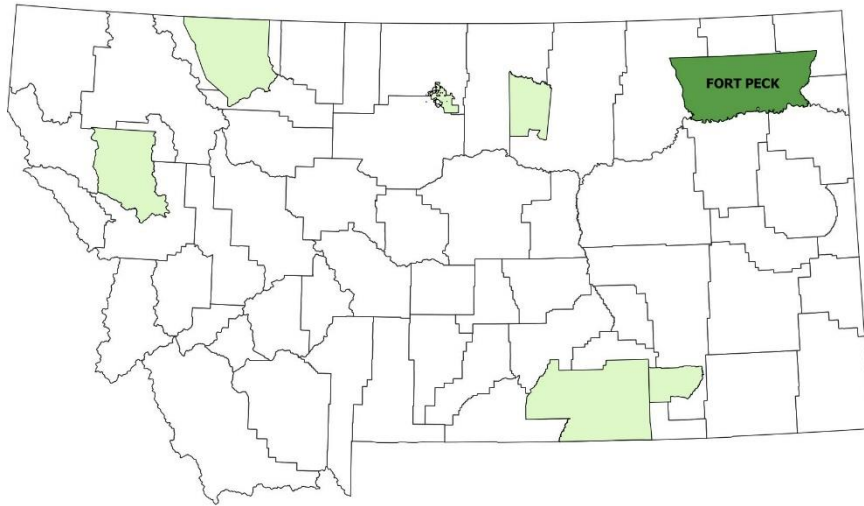


Figure 1. The Fort Peck Indian Reservation, shown in dark green. Other Indian reservations in Montana are shown in light green.

The Southern boundaries of the reservation border Miníšoše, the Missouri River, whose local tributaries include the Milk River, the Poplar River, the Big Muddy River, and other smaller creeks. These tributaries run north to south along the reservation's interiors, which consist mostly of high plains grasslands, rolling hills, and wide river valleys. The climate is semi-arid, receiving on average less than 15 inches of precipitation annually (Fort Peck Assiniboine and Sioux Tribes, 2013, 2016).

#### History, Colonization, and the Establishment of the Fort Peck Assiniboine (Nakona/Nakoda) and Sioux (Dakota) Indian Reservation

According to Miller et al.'s (2012) extensive history of the Assiniboine and Sioux Tribes of Fort Peck, both tribes were first described by outsiders in the 1640 *Jesuit Relations* annual report of the French in “New France” (Thwaites, 1898). The in-depth analysis of primary historical resources by Miller et al. (2012), as well as oral history of the Assiniboine people as told by Wamakashka Doba Inazhi (2003), suggest that the

Assiniboine people did not originate in the northern plains of the United States, but rather migrated west from their original roaming grounds, which ranged from the woodlands of northwestern Ontario to grasslands of Saskatchewan, from the 17<sup>th</sup> to the early 19<sup>th</sup> centuries. This westward migration was most likely associated with the westward expansion of settler colonials and the search for larger game.

Following a smallpox outbreak from 1781-82 that killed half the population, and perhaps influenced by the possibility of trade with other Plains Native Americans, the Assiniboine moved further south into northern North Dakota at the end of the 18<sup>th</sup> Century. The tribe then split into two distinct groups, the Northern Assiniboine (also called the Stoney Nakona) and the Southern Assiniboine. The Stoney Nakona remained in the north as the Southern Assiniboine continued to move further south. This southwestern expansion influenced the lives of the Assiniboine as they continued to adapt to a plains-centered lifestyle (Miller et al., 2012). Populations were again decimated by two additional smallpox epidemics, one in 1837-38 in which two thirds of the population perished, and another in 1869. The staggering loss of tribal members influenced the Assiniboine's relations with the federal government, settlers, and other Native peoples (Miller et al., 2012; Wamakashka Doba Inazhi, 2003).

In early days of settler contact, the Sioux were described as the Eastern Sioux and the Western Sioux, which were further divided into seven main tribes. The Eastern Sioux group (Dakota proper) was comprised of the Mdewakanton, Wahpekute, Sisseton, and Wahpeton, whereas the Western Sioux group included the Yankton, Yanktonais, and Ti'tu'wa (Teton, later Lakota) divisions. Like the Assiniboine, the early Eastern Sioux

had a lifestyle based around life in the northern woodlands east of the Great Lakes region, but eventually they, and the Western Sioux, migrated west due to population pressures from settler colonialists and the search for bison. By the late 1700s, the Sissetons, Wahpetons, Yanktons and Yanktonais had all adapted to a plains lifestyle. The Teton, or Lakota, had already migrated further west to the valleys of the Missouri River, and had split into seven distinct groups themselves (Miller et al., 2012).

In the late 1860s, the southern group of Assiniboine moved onto the newly-created Milk River Agency, near present day Fort Belknap, Montana. There, they lived among the Gros Ventre and the River Crow tribes, although they did not initially get along with the Gros Ventre. The Sioux were historical enemies of the Gros Ventre and their arrival in the area in the 1870s created tensions between other tribes as well as with the federal army. Among the first arrivals were the Sisseton-Wahpeton Sioux and the Yanktonai. The Hunkpapa Lakota, led by the great Sitting Bull, were also known to camp along the Milk River where some of the last bison hunting grounds remained. In 1872, the Milk River Agency was relocated to the Fort Peck Trading Post near present day Fort Peck, Montana. A group of Assiniboine at the Milk River Agency, referred to as the Upper Assiniboine, refused to leave due to tensions with the Sioux at Fort Peck. They decided to stay at Milk River, where many live to this day, while a group of Lower Assiniboine relocated to Fort Peck. Three years later, the Lower Assiniboine relocated to present-day Wolf Point, along the banks of Wolf Creek, where crops were first planted. Finally, in 1877, the Fort Peck Agency headquarters was relocated to the mouth of the Poplar River near present-day Poplar, Montana, the current site of tribal headquarters.

Most Assiniboine stayed in the Wolf Creek area, while the Sioux mostly relocated to the Poplar site (Fort Peck Tribes, 2016; Miller et al., 2012).

By 1883, largely due to the arrival of white traders, the bison population had been all but exterminated. Consequently, that decade became known as the “Starving Years” in Fort Peck tribal history (Miller et al., 2012). On May 1<sup>st</sup>, 1888, the Fort Peck Indian Reservation and its modern-day boundaries were established. As part of agreements negotiated with the Northwest Treaty Commission, the Assiniboine and Sioux tribes, including the Assiniboine at Fort Belknap, ceded over 17 million acres of land to the federal government in exchange for the promise of \$165,000 10-year annual payments (Fort Peck Tribes, 2016). While federal Indian policy changed drastically every other decade over the following century, it maintained a primary focus on the assimilation of Native Americans up until the latter part of the 20<sup>th</sup> century.

### Demographic and Economic Background

Population. Today, the reservation is home to around 10,000 people, with 7,000 residents identifying as Native American. Over 12,000 people are enrolled as members of the Tribes, consists of members of the Ihańktońwańńa, Sisitońwań, Wańpetoń, and Titońwań bands of Dakota, as well the Wadópana, Hudu’shabina, Iyatuwambi, Shahiya Iyeskabi, and Waziyam Winchashtabi bands of Nakona (MILPP, 2014). The reservation itself is very rural and isolated from large population centers. Most residents live in and around the communities of Wolf Point and Poplar, while others live in or near the smaller communities of Brockton, Riverside, Fort Kipp, Oswego, and Frazer (Fort Peck Tribes, 2013, 2016).

Economy. According to a report published by the Bureau of Indian Affairs in April 2010, the reservation has an unemployment rate of 56.5% among tribal members, and approximately one of every two Native Americans living on the reservation live in poverty status (Fort Peck Tribes, 2014; US Census Bureau, 2010). The government is the largest employer, with over 1300 residents employed in local government and almost 300 residents working for either the state or federal government. Agriculture is widespread on the reservation, with farmers participating mostly in wheat, corn, barley and oats production. Livestock inventory throughout the region consists mostly of cattle, sheep, and a very small number of pigs or hogs. The retail trade and the health care/social assistance sectors currently make up a majority of other employment sectors (Fort Peck Tribes, 2013). According to a 2014 Annual Workforce Development Report, the Tribes expressed concern that the tribal economy is still “largely sustained by U.S. Government transfer payments,” due to its isolation, stagnant economy, and socio-economic conditions (Fort Peck Tribes, 2014, p. 13).

Tribal Industry. In 1968, the Tribes’ agreed to address the economic needs on the reservation by seeking funding to build a large tribally-owned industrial park. The next year, the project was funded and Fort Peck Tribal Industries (later Assiniboine and Sioux Tribal Industries [ASTI]), was incorporated. ASTI entered into a joint ownership agreement with Brunswick, and began taking in government contracts from the Department of Defense (DOD). The contracts involved the construction of camouflage net modules, and the Tribes also operated a rifle repair operation for the DOD as well. ASTI became the lead employer in Eastern Montana, and unemployment dropped 40%

on the reservation. Government contracts from the DOD rescinded as the country entered the 1990s, and employment at ASTI dropped from over 100 employees to less than 10 (Miller et al., 2012). The Tribes also created the Fort Peck Manufacturing Company through joint ownership negotiations in 1975, and Multiplex West (West Electronics) in 1970. To date, West Electronics is the longest-living tribal enterprise. In recent years, the company has experienced a decline in economic opportunity, but has recently worked on transporting hydrocarbon-based piping for exploration and production in the Bakken area (Fort Peck Tribes, 2014).

Fort Peck Tech Services, Inc. was created in 2001 as a successor to the former A and S Diversified, Inc. (formally ASTI). The company's purpose, much like ASTI's, was to "function as a quality product contractor to complete precise machine oriented fabrication of products and components for targeted enterprises operating within the economic sector and the US Government" (Fort Peck Tribes, 2014, p. 6). During the recent oilfield boom, the company sought contracting work for production materials used by companies drilling in and around the Bakken oilfields. However, they had trouble procuring additional production contracts once the original agreements came to an end (Fort Peck Tribes, 2014).

Oil Production. Of importance to the discussion on oil production is the "goods producing" employment sector reported in a 2009-2011 U.S. Bureau of Labor Statistics Report, which stated that about 50 employees were working in natural resources and mining during this period (Fort Peck Tribes, 2013). Although that number may seem low, oil development has historically been a large source of revenue for both the Tribes and

individual tribal members on the reservation as a result of land leasing rather than employment opportunities. Figure 2 shows the breakdown of mineral ownership of tribally-owned, allotted, and fee land on the reservation as of June 2013. The figure is a spatial visualization of the checkerboarded nature of tribal mineral ownership and jurisdiction, with the connectivity of tribal lands (red) and allotted lands (blue) interrupted by dispersed fee lands (white). The breakdown of land ownership looks much the same. In addition, allotted land—the land originally allotted to individual tribal members during the early 20<sup>th</sup> Century—has continued to become divided among several individuals as it has passed down from original owners through generations of heirs, a process called “fractionation”. Fractionated land interests, in which oftentimes dozens of heirs share an interest in the same parcel of land, has plagued efforts of beneficial land use due to the difficulty of collaboration among interest holders (U.S. Department of Interior, 2017).

However, it is important to note that due to the U.S. Department of Interior’s (DOI) Land Buy-Back Program for Tribal Nations and the efforts of land ownership consolidation at Fort Peck, the areas in red (tribal ownership) have especially increased over the past several years. The Land Buy-Back Program was established by the Secretary of the Interior to address the fractionation problem. The program was established as a response to the Cobell Settlement, which provided the DOI \$1.9 billion to consolidate fractionated interests and return the newly consolidated land to tribal ownership (*Cobell v. Salazar*, 2009). As of 2016, the Land Buy Back program has allowed the purchase of over 200,000 acres of fractionated land interests on Fort Peck

Reservation, which has been transferred to the Tribes and is held in trust (U.S. Department of Interior, 2016).

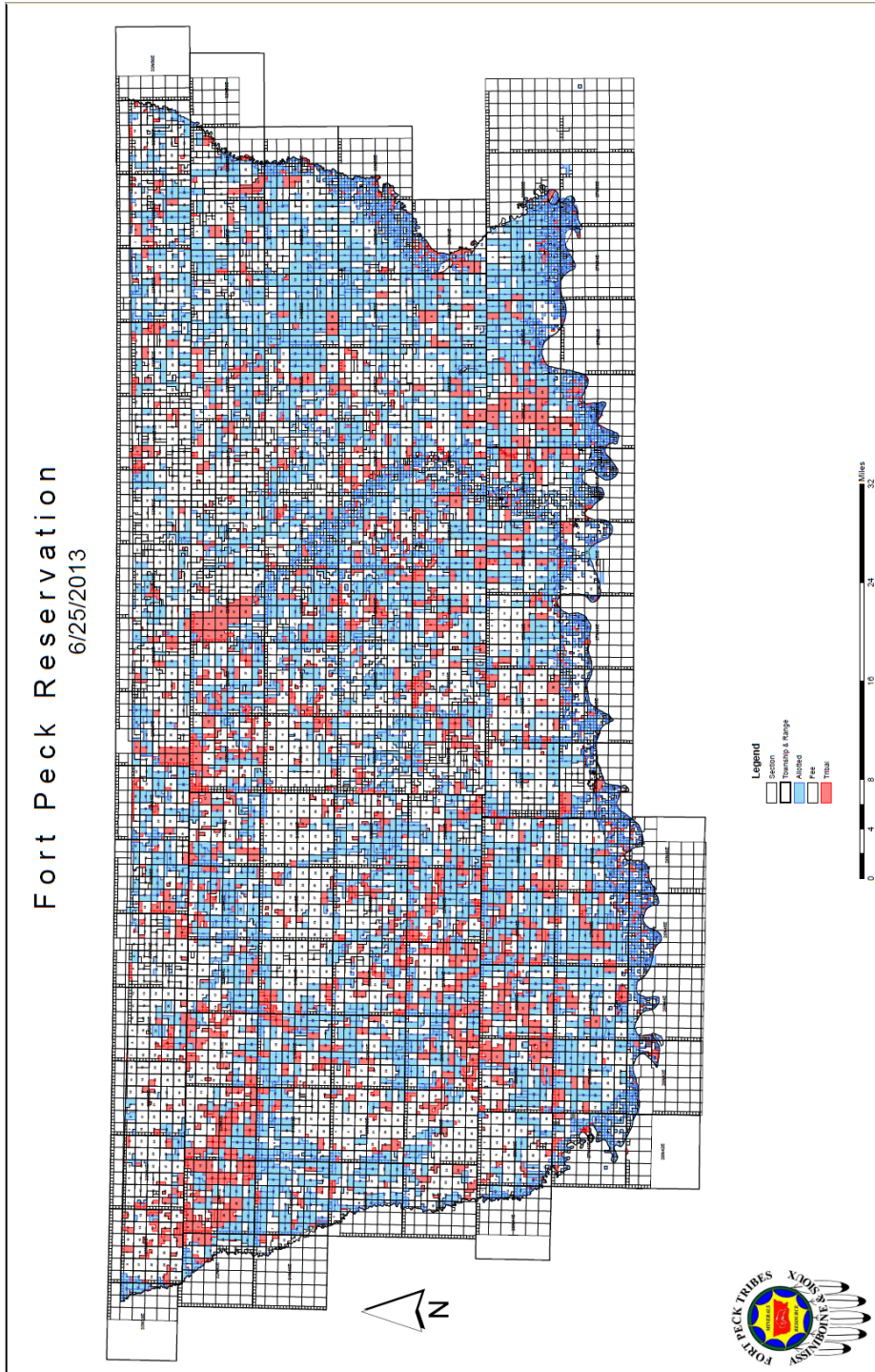


Figure 2. Mineral Ownership among tribal, allotted, and fee lands on Fort Peck Reservation, 2013 (Fort Peck Tribes Minerals Office, 2013)



The topic of oil was first publicly discussed at Fort Peck in a General Council in 1927, when constituents expressed the desire to use tribal trust funds to explore mineral resources on the reservation. However, nothing came from the request until much later (Miller et al., 2012). The earliest oil leases on the Fort Peck Indian Reservation were sold on December 10, 1949. Some of the first bidders were C.H. Murphy, Jr. from El Dorado, Arkansas (Murphy Oil), Carter Oil Company, and Phillips Petroleum Company (Fort Peck Tribes Executive Board, 1949; Miller et al., 2012). Murphy Oil had completed drilling their first well by March 1952 and began production in the East Poplar Oil Field. This marked the beginning of the first “oil boom” on Fort Peck. A subsequent boom occurred in the 1980s, with an average production of 600 barrels per day in 1985 (Thamke, 1997).

The “Oil Celebration”, an annual powwow celebrating the discovery of oil on the reservation, lasted from the 1950s through the 1980s. The celebration was originally funded by Murphy Oil and became a nationally recognized event. A 1962 newspaper article in *The Poplar Standard: Voice of the Oil City*, claimed that the Oil Celebration was expecting over 4,000 visitors, from “all over central and western United States and Canada”, and the celebration had been given the title of “North America’s largest Indian gathering” (The Poplar Standard, 1962).

In the 1980s, the Tribes took an important step towards natural resource sovereignty by drilling the Wenona, the first tribally-owned well in Northern Plains history. The Tribal Executive Board (TEB) established the Tribal Minerals Office soon after. At this time, the TEB also entered into negotiations with the Northern Border

Pipeline Company (NBPL) for a pipeline lease that provided many needed construction jobs for tribal members (Miller et al., 2012). The pipeline bisects the reservation from the northwestern corner to the southeastern corner, crossing several tributaries along the way (Fig. 3). The pipeline itself serves as a link between the United States Midwest and Western Canadian natural gas reserves, as well as a link between the natural gas in the Williston and Powder River Basins of North Dakota and the Dakota Gasification plant (The Northern Border Pipeline Company, 2017).

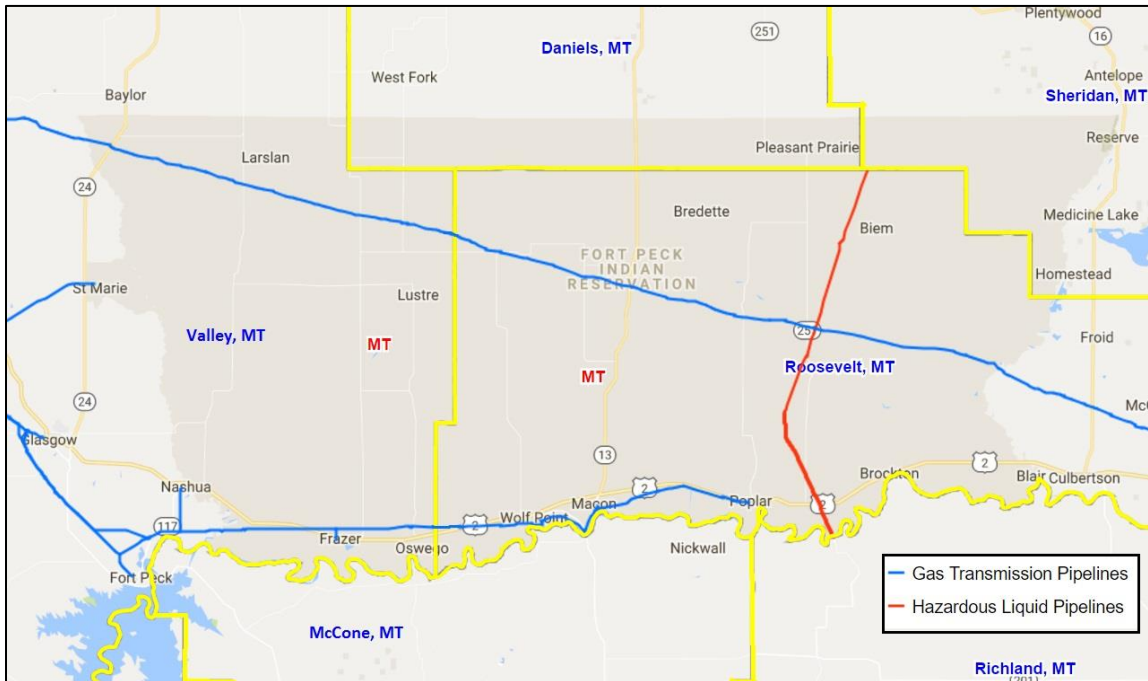


Figure 3. Gas transmission and hazardous liquid pipelines on the reservation, adapted from the National Pipeline Mapping System of the Pipeline and Hazardous Materials Safety Administration (PHMSA, 2017).

Perhaps following in the footsteps of Fort Berthold Reservation to the East, the Fort Peck Tribes entered into an agreement on March 25<sup>th</sup>, 2008, with the State of Montana to end dual taxation of oil and gas production on the reservation (State of

Montana, 2008). The following year, the Fort Peck Tribes partnered with Native American Resource Partners (NARP) to create the Fort Peck Energy Company (FPEC) and began leasing land to explore potential oil reserves among the westernmost fringes of the Bakken formation. Samson Oil and Gas Limited acquired 90,000 acres from FPEC, but two test wells failed to find profitable minerals. The FPEC dissolved in 2015, just a few years after it began (Frank, 2013; Samson Oil and Gas Limited, 2011).

The Bakken geologic formation—an oil-rich shale formation spanning parts of western North Dakota, eastern Montana, and southern Saskatchewan—was originally reported to have around 903 billion barrels of oil under its surface. However, it wasn't until the early 21<sup>st</sup> Century that production within the Bakken became feasible, with 36 billion barrels newly recoverable through advancements in hydraulic fracturing and horizontal drilling technologies (Crane-Murdoch, 2012; Horwath, 2013). This increase in shale oil and gas production resulted in the Bakken Boom, with oil production in North Dakota climbing to a peak of 1.2 million barrels of oil per day in October 2014, when prices began dropping and production steadily declined (Rapier, 2017).

While the level of oil and gas development experienced in North Dakota never hit the Fort Peck Reservation, many remain hopeful of the future of Tribal mineral exploration under the current tribal administration. Current tribally-owned natural resource plans continue to transition “from a passive to active approach” as the Tribes “desire to exercise legitimate control over development of its natural resource base” while still maintaining an active goal of attracting outside interest (Fort Peck Tribes, 2014, p. 12). A 2013 brochure produced by the Tribal Minerals Resource Office

proclaims: “Elimination of the dual production tax, a tax holiday, and joint venture opportunities make Fort Peck the place to be!” (Fort Peck Tribes Minerals Resource Office, 2013, p. 1).

### Oil and Gas Regulation, Water Contamination and Water Access on Fort Peck

During the oil drilling processes, a very saline water is brought to the surface from extremely deep geologic formations, along with oil and gas. This water, usually termed “brine”, “produced water”, “saltwater”, or “formation water”, is the largest volume waste associated with oil and gas exploration and production (Clark and Veil, 2009). A 1995 report showed that at the time, over 90% of produced water was managed through reinjection into the subsurface, 3% was discharged to surface water, 2% was reused, and 3% was placed in evaporation pits, percolation pits, or ran through publicly-owned treatment works (ICF Consulting, 2000).

Early regulation of the oilfields North of Poplar did not require oil companies to dispose of wastewater in lined pits to prevent the leaching of industrial waste into the groundwater system (Conde, 2014). In addition, a search of EPA and BLM records conducted by Thamke (1997) revealed that wastewater injection rates into deep-formation injection wells varied from 525 to 7,100 barrels per day from the mid-1950s to the 1990s. The leaching of produced water from unlined pits, combined with the massive contamination from faulty casings on production and injection wells (as discussed below), led to the contamination of 15-37 billion gallons of groundwater within the reservation’s shallow aquifer in the East Poplar Oilfield area. This aquifer had

historically been the only source of drinking water for reservation community members living in the area (Thamke, 2014).

### Poplar Contamination

In the 1970s, homeowners north of Poplar began noticing a difference in quality of their domestic well water, which had initially been described as “cold, clean and sweet” and was now turning oily and salty (Conde, 2014). In the late 1980s, after an initial study by a separate independent researcher, the U.S. Geological Survey began studying the extent of brine contamination present in the area (Thamke, 1997). This began a decades-long relationship between the USGS and the Fort Peck Tribes.

In the late 1990s the USGS found benzene, a known carcinogen, in the area’s groundwater (Thamke and Midtlyng, 2003). In September 1999, the Environmental Protection Agency (EPA) issued an emergency order under the Safe Water Drinking Act. The order required that the oil companies who were responsible for the contamination would be required to provide bottled drinking water for the residents until further notice (“Contamination may seep into Poplar River,” 2000).

### The Complex Matrix of Responsible Parties and Remediation Efforts

At the time of the plume’s discovery, Murphy Oil USA, Inc. operated most of the production wells within the area. Murphy Oil had started as CH Murphy and Co in 1944, and had been the first developer on the reservation in the 1950s (Miller et al., 2012). Other main players included Amarco Resource Corp, Samson Hydrocarbons, Mesa Petroleum Co., Phillips Petroleum Corp. Tenneco Oil Co., and more (Conde, 2014; Thamke, 1997). In the 1990s, Mesa Petroleum became Pioneer Natural Resources (PNR)

through a company merger. Directly following this merger, a federal lawsuit was filed against Murphy, PNR, and Samson. The lawsuit was filed by 14 families within the area, who demanded the companies provide safe drinking water and compensation for the loss to property the contamination had resulted in (Conde, 2014).

Currently, remediation of the southeast corner of the contamination plume is being conducted by PNR (discussed below) (M. Jacobs, Tyrrell, and Smith, 2009). Despite these remediation efforts, the majority of the plume remains in contact with groundwater resources (Thamke, 2014).

PNR and the Biere Plume. In 2001, the EPA issued another emergency order requiring PNR to stop leakage from its inherited production well, Biere 1-22, and to monitor the area. PNR had inherited the faulty production well when it merged with Mesa Petroleum in the 1990s. The Biere well was constructed in 1970 by Mesa, and was plugged in 1984. Its casing failed within nine months of being plugged and in 1985 Mesa drilled a relief well to inject additional cement into the casing and stop the leak. In 2000, PNR collected samples from the well and found known carcinogens and free oil components. Subsequently, they re-plugged the well (US Environmental Protection Agency, 2016).

After the initial 2001 emergency order, in 2008 PNR voluntarily established a multi-million-dollar remediation facility designed to pump much of its portion of the contamination plume away from the area. The contaminated wastewater, once pumped to the surface, is reinjected 7,800 feet into a contained geologic formation (M. A. Jacobs, Smith, Thamke, and Ball, 2015). In late 2016, the EPA issued an Administrative Order of

Consent on PNR, making remediation compliance of the Biere 1-22 plume legally binding under the Safe Water Drinking Act. In essence, the EPA is keeping tabs on the remediation process until PNR meets total dissolved solids (TDS) and benzene, toluene, ethylbenzene, and xylene (BTEX) standards in their monitoring wells, or until no more decreases in constituents are deemed possible and monitoring is completed. As of the date of the order, November 2016, PNR had pumped almost 11,000,000 barrels of liquid from the Biere plume area (US Environmental Protection Agency, 2016).

In 2012, the EPA reached an agreement with Murphy, PNR, and Sampson that orders the companies to pay \$320,000 to the City of Poplar to reimburse “costs related to water infrastructure and relocating water wells” (Roberts and Mylott, 2012, p. 1). This order was issued the same year that a multi-million-dollar treatment facility was completed between Wolf Point and Poplar, as discussed below.

#### The Assiniboine and Sioux Rural Water Supply System (ASRWSS)

In the early 1990s, apprehension had been mounting among tribal leaders concerning poor water quality on the reservation due to the recent reports from the USGS on produced water contamination as well as contamination from agricultural runoff. As a result, the Fort Peck Dry Prairie Regional Water System was funded by the federal government at a total price of \$193 million. The project was approved and signed by President Clinton in late 2000 (*Fort Peck Reservation Rural Water System Act of 2000*, 2000; Montana DNRC, 2017b).

The water system is a joint effort between the Assiniboine and Sioux Rural Water Supply System and Dry Prairie Rural Water Association. The reservation portion of the

water pipeline is completely funded by the federal government, and will serve those living in and around the main reservation towns. In contrast, 76% of Dry Prairie's portion is funded by the federal government, with the rest being funded by a combination of State and Dry Prairie funds. The off-reservation portion will serve a large number of community members living in towns adjacent to the reservation (Montana DNRC, 2017b).

As part of the project, a new water intake plant was completed on the Missouri River East of Wolf Point in 2005, and the new water treatment facility along Highway 2 was completed in 2012 (Miller et al., 2012). In spring 2015, the Tribes officially entered into agreement with the Dry Prairie Rural Water Authority and the federal government in order to connect the two systems and provide water for over 700 of Dry Prairie's off-reservation customers. Eventually, the two systems will have a combined total of 3,000 miles of pipeline, serving around 30,000 residents in Northeast Montana, both on and off the reservation (Fort Peck Tribes, 2015). The pipeline system is currently under construction and completion is expected within the next two decades. However, the new water pipeline has risen to the forefront of tribal politics due to concerns about the proposed construction of the Keystone XL Pipeline, which if completed would bisect the Missouri River directly upstream from the newly finished treatment plant—the same plant that had been constructed in response to water quality concerns and past development.

Since 2008, the Keystone XL Pipeline has been opposed by various Indigenous groups on its pathway to construction (Fontaine, 2017). The proposed pipeline would



carry crude oil from the tar sands of Alberta and the shale formations of the Bakken down to Nebraska. The portion that lies within US boundaries is 875 miles long, and would carry up to 830,000 barrels of crude oil per day (United States Department of State, 2014).

TransCanada, the company in charge of the pipeline, has proposed the XL to be constructed just off the western border of the reservation, cutting across the Missouri River just 40 miles upstream of the new treatment plant (Peterson, 2017). However, many tribal members and residents have expressed concern for water resources—both in terms of the sacredness of water and the health of environmental resources—in the event of a pipeline leak or break. Those opposed have urged the Tribal Executive Board to insist that the pipeline be built to the east of the reservation, downstream from tribal water resources and the reservation’s new intake plant on the Missouri River. Proponents of the planned route have insisted that the pipeline would bring much-needed construction jobs to the region, and urged the Tribes to cooperate with developers. In sum, the community has become divided over what a local newspaper commentary referred to as the development of “black gold” versus the protection of “blue gold” (Montclair, 2017).

In early 2017, TransCanada was authorized by U.S. Executive Order to begin development on the Keystone XL Pipeline, after the previous U.S. Administration had initially blocked the effort (Peterson, 2017). In late July 2017, the Tribal Executive Board traveled to Miles City, Montana to meet with representatives from the state of Montana and TransCanada. Upon stating that the Tribes were opposed to the construction of the pipeline in its current proposed location, and reiterating that the reservation’s water

quality had “suffered twice from the aftermath of the energy industry”, the TEB’s requests and concerns fell on deaf ears. As the tribal Chairman wrote in an editorial several days later, “So yet again we as Native Americans are taking a back seat to everyone else’s needs and wants. It’s all about the American dollar and people mean nothing,” (Azure, 2017, p.1). This perception, that outside entities wishing to engage in collaborative efforts with tribal entities do not respect the idea of full partnership with the Tribes, is shared by many residents and professionals on the reservation. However, in order to understand why, it is critical to understand the political, historical, and social framework within which environmental decisions are made on the reservation.

## CHAPTER TWO

## AN INTRODUCTION TO TRIBAL ENVIRONMENTAL GOVERNANCE

Environmental Governance and Tribal Nations

The term “environmental governance” is used to describe a dramatic change in the way decisions about nature and natural resource use are made. In summary, these changes include a blurring of authority between the public and private realms, with greater focus on third party actors such as nongovernment organizations or actors on smaller local levels (Stoker, 1998). Research has focused on the interactions between “new” and “traditional” actors involved in environmental governance, and how new governing styles influence the decision making process (Bridge and Perreault, 2009).

However, global literature on collaborative environmental governance involving Indigenous Nations and their knowledge systems has arguably excluded important discussions of Indigenous self-determination, sovereignty, and inherent rights, treating Nations as mere stakeholders or interest groups rather than sovereign entities (von der Porten and de Loë, 2014). Therefore, it is critical in this discussion of environmental governance to address the political and historical realities of nationhood and inherent rights and sovereignty of Tribal Nations such as Fort Peck.

Indigenous Self-Determination

Federal Indian policy in the United States has undergone many changes (some structural and others arguably surficial) within the past two centuries. From the introduction of settlers on Indigenous North American land until the mid-1800s, the

federal government shaped Indian policy in a way that viewed Indigenous peoples as “childlike”—or as people that needed to be protected through geographic isolation (Brosnan, 1996). The Homestead Act of 1863 opened up western land for settlement by “able citizens” pursuing agriculture, but excluded Native Americans by requiring citizenship. This was the pinnacle of Manifest Destiny—the belief that Anglo settlers had a divine right to “discover” and occupy Indigenous lands in the name of “progress” (Flanders, 1998). Furthermore, as settlement pushed west, the Anglo view of land as a commodity dominated over Indigenous culture. U.S. federal policy shifted towards protecting the interests of westward expansion, and away from the protection of Indigenous Nations. In the process, the Supreme Court established Indigenous peoples as “domestic dependent peoples”, with a trust responsibility provided by the federal government. This trust responsibility is imposed upon all federal agencies (not just the Bureau of Indian Affairs [BIA]) and applies to individuals as well as Tribal Nations.

From the years following the civil war until the 1930s, Assimilation/Allotment Era aimed to assimilate Indigenous Nations into a settler-society and gain control over Native land. This was followed by a shift in policy towards “empowering” Tribal Nations by stopping the allotment of Indigenous lands and passing the Indian Reorganization Act (IRA) of 1934 (Allen, 1989). However, the IRA perpetuated assimilationist ideals by suggesting each tribe adopt a tribal constitution through negotiation with state and federal government, as well as establish a governing tribal council. These imposed western governance structures completely ignored traditional Indigenous notions of governance and culture.

With the civil rights movement, the growing recognition of Indigenous culture, and the country's need for additional sources of energy throughout the 1960s-70s, federal policy shifted again, in this case towards increasing the power of Tribal Nations through policies of self-determination. Early manifestations of this policy approach include the 1961 Declaration of Indian Purpose, in which dozens of Tribal Nations demonstrated a desire to reduce U.S. federal authority in tribal matters, and the 1968 Indian Civil Rights Act that established Native American self-determination as a federal priority (Allen, 1989; Getches et al., 2011). In 1974, the Indian Financing Act was passed, and the following year the Indian Self-Determination and Education Act was passed, giving Tribal Nations an increased say in affairs involving the development of natural resources (Royster, 2008). Tribal Nations were now able to set up their own law enforcement programs, and later on, their own environmental programs with the right to criminalize practices that didn't adhere to tribal environmental standards. For example, with Treatment-as-State (TAS) status, a Tribal Nation may develop its own water quality regulations and enforce them not only on tribal members, but also on nontribal members living within tribal jurisdiction (Krakoff, 2002; The EPA, 1991). In summary, since the 1800s, Tribal Nations in the United States have had *political* sovereignty—the status of a sovereign entity from the U.S. federal government. However, Tribal Nations have been increasingly expressing *practical* sovereignty by using their sovereign status in decision-making processes to conform programs (such as environmental regulation) to tribal needs and desires (Royster, 2008).

### Tribal Government

The first Tribal Constitution for Fort Peck Reservation was adopted by the General Council in November 1927. That same fall, the first Tribal Executive Board was elected, with twelve members total (Miller et al., 2012). The first constitution split the reservation into six districts: Poplar, Wolf Point, Fort Kipp, Brockton, Burshia (no longer applicable), and Frazer. In December of 1934, with mounting concerns about the allotment process on the reservation, the Tribes voted against accepting the provisions of the Indian Reorganization Act, making it only one of two tribes in Montana, along with the Apsaalooke (Crow), to do so. By the 1950s, the desire for a revised constitution was overwhelming due to several fundamental issues revolving around the distribution of decision-making power and clarity present in the original (Miller et al., 2012).

The second and current constitution was adopted by vote in the fall of 1960. Under the 1960 Tribal Constitution, the official governing body of the Tribes is the Tribal Executive Board (TEB), which includes a Tribal Chairman, Vice-Chairman, Secretary-Accountant, a Sergeant-at-Arms, and 12 Board members. All are elected at large, except for the Secretary-Accountant, who is appointed by the Board and can be appointed from within or outside of the Board membership. Terms of service are two years for each position, and voting is done by individual reservation districts (Fort Peck Tribes, 1960; Miller et al., 2012).

The TEB is subject to the will of the people at large through General Councils, which can be called by the Chairman once an interested party presents to him/her a petition consisting of signatures from no less than 10% of the tribal voting population.

Each General Council must consist of a quorum of at least 100 eligible voters, and once in session has the ability to initiate ordinances or reject any action of the TEB, as long as the rejection takes place within 90 days of enactment. The TEB is imbued with many powers, including but not limited to the power to negotiate with outside governmental and business entities on behalf of the Tribes, the ability to employ legal counsel, the ability to levy taxes and license fees, the right to promote services that “may contribute to the social advancement of the members of the Tribes”, and the ability to establish tribal courts and a police force and establish criminal and civil codes governing all Native Americans residing on the reservation (Fort Peck Tribes, 1960, p. 6).

In addition, the governance structure includes both the Assiniboine and Sioux Councils, which were created in during a General Council in the spring of 1927 in order to address the concerns of each tribe. The Executive Board members of the Assiniboine Council are elected yearly at General Council. The Sisseton-Wahpeton Sioux Council (SWSC) officially adopted a constitution in February 2001, and are formally recognized by the TEB as being authorized to speak on behalf of all Sisseton-Wahpeton Sioux on the reservation (Miller et al., 2012).

### Tribal Water Governance and Water Rights

As part of the formal governing body, the Fort Peck Tribes have their own environmental protection office, the Fort Peck Tribes Office of Environmental Protection (OEP), which has been in operation since 1981. The OEP has been successful in many areas, including establishing its own non-point source pollution program, as well as being the first tribe to receive Treatment-as-State (TAS) status within the general area (FPOEP,

2017). The intersection of federal, state, tribal, county, and city politics and environmental policy, as well as the checkerboard nature of reservation land ownership, creates unique challenges of jurisdiction and environmental governance on the reservation.

In the context of U.S. water laws, formally-recognized tribal entities hold water rights under the Winter's Doctrine, which states that tribes have a vested water right that goes back to the creation of the reservation itself, and that this right is to be used "to fill the purposes for which the reservation was set aside," (Royster, 2013, p. 203; *Winters v. United States*, 1908). In order to mitigate conflict between white land owners and tribal members as a result of the claims made by the federal government, the reserved water rights of each tribe had to be quantified and clarified. In 1952, Congress enacted the McCarran Amendment, which allowed states the authority to determine water rights within its boundaries via a lawsuit within state courts, with the federal government representing tribal interests (Getches et al., 2011; Royster, 2013).

However, judicial adjudication was messy and largely unsuccessful. Montana eventually moved towards negotiating water rights in a more collaborative process by amending the 1973 Montana Water Use Act and creating a Reserved Water Rights Compact Commission composed of appointed members of the House of Representatives and the Senate, as well as members appointed by the governor and attorney general (Cosens, 2006; McNally, 1993). In addition, the Commission is staffed by professionals trained in varying environmental and spatial sciences, in order to ensure beneficial outcomes for both the tribes and state. Upon negotiation, the resulting water compact is



sent to the state legislature to be ratified, as well as the Montana Water Court for consideration (Cosens, 2006).

The Fort Peck Tribes were the first tribe in Montana to submit a tribal water compact for ratification, setting a precedent for other tribes around the country. The Fort Peck compact process lasted five long years, with many setbacks and conflicts along the way. The first meeting took place in 1980, yet the first draft was not negotiated until late 1983 (McNally, 1993). The Tribes eventually agreed to lower the water right to 950,000 ac/ft. per year, promising to develop the infrastructure necessary to source 100,000 ac/ft. of their right from groundwater resources, as long as they were granted the right to market a portion of these water rights to non-tribal entities. Even by agreeing to reduce their water right, the Tribes' water right remains one of the largest amounts of water ever adjudicated to a tribal entity (McNally, 1993; Montana DNRC, 2017a).

In sum, this chapter has outlined the complex nature of Indian environmental policy, the management of natural resources, and tribal water rights within the complicated jurisdictional boundaries of the reservation. The next chapter will introduce the concept of traditional knowledge systems (TKS) and discuss the opportunities and challenges of incorporating these into tribal governance systems.

## CHAPTER THREE

TRADITIONAL KNOWLEDGE SYSTEMS: DEFINITIONS, PRACTICES AND USE  
IN ENVIRONMENTAL GOVERNANCEIntroduction

“Somewhere between the teachings of western science and those of the Native community there is some agreement on the state of the world.”

-Winona LaDuke, Anishinaabeg (LaDuke, 1999, p. 197)

Over the years, scientists and resource managers have found many ways to refer to the local and and/or Indigenous knowledge of the original inhabitants of their study areas. This knowledge has been referred to as ethnoscience, Indigenous science, folk science, rural peoples’/farmers’ knowledge, *metis*, Indigenous knowledge (IK), local knowledge, traditional knowledge (TK), indigenous ways of living in nature (IWLN), Indigenous knowledge systems (IKS) or traditional knowledge systems (TKS), and finally traditional ecological knowledge (TEK) (Aikenhead and Mitchell, 2011; Latulippe, 2015; Scott, 1999; “What is Local Knowledge?,” 2016). The field of Indigenous knowledge research has its murky beginnings within the field of ethnoscience, where much of the early work of the twentieth century focused on the “folk taxonomies” shared by Indigenous peoples. The study of Indigenous knowledges then made its way into human ecology, where questions about the relationship between Indigenous peoples and their environment, especially in terms of their understanding of ecological processes as observed through the lens of cultural ecology, became central (Berkes, 2012). Finally, in the 1980s and early 1990s and especially with the proceedings

of the 1992 Rio Earth Summit, the insights of Indigenous peoples drew the attention of those interested in sustainable development and sustainable environmental knowledge in an age where climate change and excess consumption had become a threat to the world's ecosystems (Berkes, 2012; McGregor, 2004; Valderrama and Arico, 2010).

In the early 1990s, researchers and policy makers began to call for the incorporation of Indigenous knowledges into environmental management and assessment. With the shift to ecosystem-based management, interest in Indigenous knowledges expanded (Freeman, 1992; Menzies, 2006). The interest in alternative knowledges overlapped with interests in questions of territoriality, property rights and common pool resources as the field of human ecology progressed (Berkes, 2012; Ostrom et al., 1999). Yet, throughout the decades, a formal explanation of what "Indigenous knowledges" research entails has yet to be agreed upon by the interdisciplinary assembly of researchers and resource managers interested in the field.

This review will explore Indigenous knowledge systems by first deconstructing the terminology and definitions of "traditional ecological knowledge" (TEK), the term arguably used most often in the field, while drawing attention to the latent assumptions and stereotypes involved in defining something that is not situated within the framework of Western knowledge. TEK will then be reconstructed with a discussion of the nomenclature that will thereafter be used throughout this thesis, and the nature of Indigenous knowledge systems and their concepts will be explored using a process of knowledge comparison. This discussion will include the implications of knowledge comparison itself and how this process informs collaboration between the realms of

Indigenous and Western knowledge. The discussion will then turn from the abstract to the practical, with considerations of the possible uses of Indigenous knowledge systems, especially in environmental governance. The chapter concludes with examples from the literature of both successful and unsuccessful efforts of incorporating Indigenous knowledge systems into tribal water governance structures.

### What is “Traditional Ecological Knowledge”?

#### Definitions of Traditional Ecological Knowledge

Definitions of traditional ecological knowledge (TEK) are diverse. Early studies described TEK as a body of “knowledge and insights”, or “the accumulated knowledge and understanding of the place of human beings in relation to the world in both an ecological and spiritual sense” (Hobson, 1992; Huntington, 2000). Article 8(j) of the Convention on Biodiversity (CBD) describes traditional knowledge as “knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity” (The Convention on Biological Diversity, 1994). Yet, besides the challenges that come with agreeing upon a formal definition of TEK, there is controversy over the nomenclature of the phrase “traditional ecological knowledge”, and how latent meanings and implications within the phrase can be used to enforce specific agendas (Nadasdy, 1999).

Nomenclature. Dr. Fikret Berkes, a distinguished professor at the University of Manitoba as well as an applied ecologist, states that the “term *traditional ecological knowledge* is by necessity, ambiguous since the terms *traditional* and *ecological* are

themselves ambiguous” [emphasis in original] (Berkes, 2012, p. 3). For instance, many scholars have argued that the term “traditional” can be used to imply that Indigenous cultures are static in nature, that their knowledge is unable to adapt to modern processes, or that Indigenous peoples simply prefer to “live in the past” without the influence of the market economy—a stereotype that Indigenous scholar Kimberly Tallbear calls “anti-technology scaremongering” (Nadasdy, 1999; TallBear, 2001, p. 5). In fact, Article 8(j) of the CBD has been criticized for including within its definition of traditional knowledge the condition that Indigenous knowledge come from societies “embodying traditional lifestyles”, with no mention of the ways Indigenous societies incorporate “modern” ways of living (The Convention on Biological Diversity, 1994; Valderrama and Arico, 2010). The depiction of Indigenous peoples as “anti-modern” exists in the realm of Indigenous scholarship as well as that of Western science. A few Indigenous scholars, including Winona LaDuke and Russel Means, have been accused of contributing to the hegemonic notion of “traditional” Indigeneity in the past (TallBear, 2001). However, as Pierotti and Wildcat (2000) explain, traditional knowledge systems inherently embody responses to long-term environmental changes and the survival of Indigenous peoples for millennia, therefore encouraging the adaptability of Indigenous responses “if environmental conditions so demand” (p. 1338). In addition, Berkes (2012) alludes to the case of climate change as a clear indication of traditional knowledge systems’ adaptability. While northern coastal communities are some of the first to be sought out for climate change research and insight, Berkes points out that rather than having previous “traditional”

knowledge of climate change, these communities have been observing climate-induced changes in their environment and therefore adapting their knowledge to these changes.

Because of the conflicts with the term “traditional”, many scholars have chosen to use term “Indigenous knowledge” in place of TEK. However, the term “Indigenous” has implications of its own, by implying that this knowledge is restricted to Indigenous people or that a body of knowledge could in any way be labeled strictly as Indigenous (Berkes, 2012). Huntington (2000) claims that “the holders of traditional ecological knowledge need not be Indigenous.” Yet others, such as esteemed geographer and Anishinaabe woman Dr. Deborah McGregor, state that Indigenous knowledge itself “is not an invention of non-Indigenous people” but rather a gift and a guide for all of earth from the Creator (McGregor, 2004, p. 389). Therefore, it might be helpful to think of

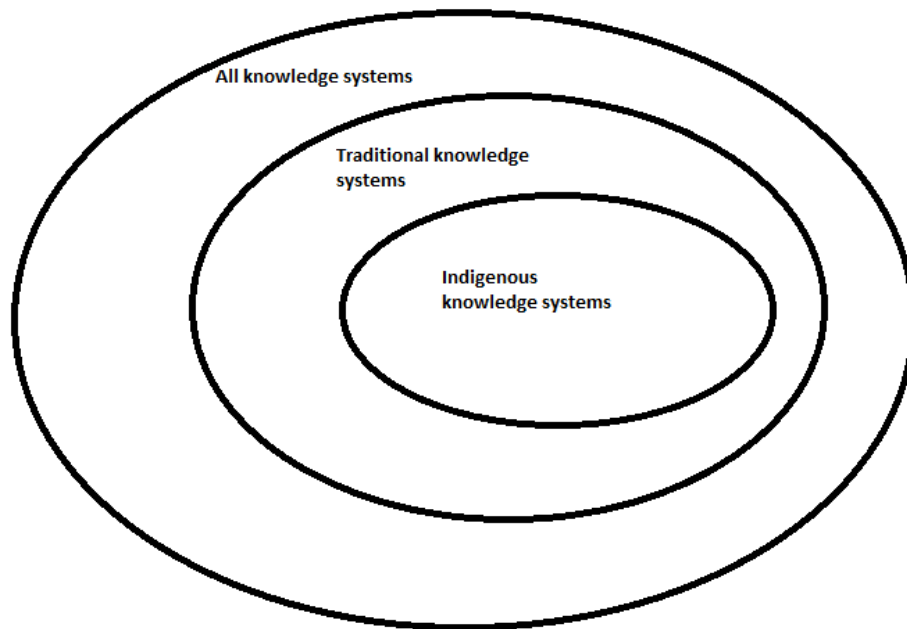


Figure 4. TEK as a set of situated knowledges, adapted from Castillo and Castillo (2010) and WIPO (2001).

Indigenous knowledge systems as situated within traditional knowledge systems, which are then situated within all knowledge systems (Fig. 4) (Castillo and Castillo, 2010).

There are many factors that influence if, and how, a community identifies as “Indigenous”. Indigeneity can come from the possession of a common culture, language, or land, from the act of colonization upon the community, or other factors. Mauro and Hardison (2000) explain that one or all of these factors could imply a community is “Indigenous”, but that the main factor that contributes to Indigeneity is one’s self-identification as Indigenous. However, the process of colonization has made self-identification as Indigenous difficult. The policies of the colonizer often includes preconceived notions of what it is to be “Native” to a land, including the use of blood quantum quotas and proposed DNA analyses in U.S. policy (D. Getches et al., 2011; TallBear, 2001)

Furthermore, the use of the word “ecological” to refer to Indigenous people’s perceptions and way of life pertaining to their environmental knowledge is problematic. The field of ecology has its roots in Western science<sup>1</sup>. Most Indigenous languages do not have a term for “ecology” or “biology”, making the term “traditional ecological knowledge” an oxymoron (Berkes, 2012; Whyte, 2013). In addition, many Indigenous cultures incorporate a non-dichotomous interpretation of nature and human life that do not adhere to the strict separation of society and nature indicative of traditional Western

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<sup>1</sup> It is important to note that the abilities to hold traditional knowledge and be educated in Western science are not mutually exclusive.

science. Without the separation of nature and society, Nadasdy (1999) questions how an Indigenous knowledge could be separated into “ecological” or “non-ecological”.

Finally, the term “knowledge” has its own critiques, as is it describes TEK as a noun, rather than paying respect to the verb-based reality of traditional knowledge. As explained by many scholars, both Indigenous and non-Indigenous, traditional knowledge systems are not just “bodies of knowledge” but a complex set of practices, worldviews, and instructions. They are a “way of life”, something one “does”, not just the knowledge about Indigenous peoples’ relationship with their environment (Bavikatte et al., 2010; McGregor, 2004; Nadasdy, 1999; Pierotti and Wildcat, 2000; Whyte, 2013). Rather, TEK is the relationship itself’(McGregor, 2004, p. 394). Traditional knowledge systems embody the way a person relates to all of Creation, a “knowledge-practice-belief complex” that is unable to be separated from the people who possess and practice them (Berkes, 2012; McGregor, 2004). To avoid the use of the term “knowledge”, some authors have used terms like “Indigenous ways of living in nature”, or IWLN (Aikenhead and Mitchell, 2011).

### The Definition of Knowledge Systems: Revisited

Leading author Dr. Fikret Berkes defines TEK 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” (Berkes, 2012, p. 7, emphasis added).

This definition emphasizes the adaptive and process-driven nature of TEK.

However, the definition does not fully encompass the existence of Indigenous knowledge



systems as a place-based way of living. Indigenous scholars contend that TEK is not just a body knowledge to be archived or shared—it is an active process and a way of living that is highly specific to the community it comes from and is inseparable from its context (McGregor, 2004; Pierotti and Wildcat, 2000; Whyte, 2013).

In the context of Fort Peck and the contents of this thesis, traditional knowledge systems include the relationships and histories between ourselves and other living entities, taught in a way specific to our living histories. For some, this knowledge system is inseparable from other knowledge systems, such as those based in Western knowledges, as they interact and intertwine throughout life. Defining knowledge systems in this context-specific way shows that the term can mean different things to different people within a Tribal Nation itself. It is critical to take into consideration intratribal differences when defining the knowledge systems of a body of people. While keeping in mind the latent assumptions present in nomenclature, for the sake of capturing the context, spoken definitions, and worldviews of the participants in this study, I will use the term “traditional knowledge systems” (TKS) throughout the remainder of this thesis for reasons discussed in the next chapter.

### Ontologies and Epistemologies of TKS in Comparison with Western Knowledge Systems

The notion that “claims about nature” can “serve as instruments of power and domination” in environmental policy, especially when voices are marginalized by the hegemonic knowledge structure, is widely recognized in the field of political ecology (Castree, 2001, p. 9; Foucault, 1980; Robbins, 2012). Much of the current research on historical decision-making processes of the twentieth century revolves around the latent

power relations in these processes. Political ecologists are particularly interested in “how social actors at different scales contest the claims of other actors or resources in a particularly ecological context” (Rodríguez-Labajos & Martínez-Alier, 2015), as well as examining how water flows towards money and power (Linton & Budds, 2014).

The study of the management of water resources in the early and mid-twentieth century has been critiqued as being historically centered on the physical aspect of water as a resource, while the socio-political structures imbedded in these processes have been ignored (Swyngedouw, 2009). Research has emerged that focuses on what Linton and Budds (2014) call the “hydrosocial” cycle to draw attention to the historical inequities in hegemonic water management. Linton and Budds (2014) make the argument that the hydrologic cycle, instead of being used as a description of the actual physical properties of water and its circulation, was originally used as a tool in technocratic processes by the hydrologists involved in water resource management in order to protect and uphold vested interests. They call the use of the hydrologic knowledge “partial and situated” and urge those in water management, as well as those who research the topic, to consider the socio-political aspects of water management, rather than just the technical aspects they’re accustomed to.

The authors describe the hydrosocial cycle as a way of uncovering these unequal power dynamics in decision making by showing how “social and power relations ... shape the nature and dynamics of water and its circulation, and how water is influenced by social processes occurring at a wide variety of spatial and temporal scales beyond the basin unit” (Budds, Linton, and McDonnell, 2014, p. 168). In other words, how water and

society make and remake each other over space and time. Water policy-making and management gives rise to new definitions of water in specific contexts, and these realities of what constitutes “water” has the ability to affect social and cultural processes.

Similarly, Feldman and Ingram (2009) call for the recognition of what they call alternative “ways of knowing” water. A way of knowing (WOK) is “how one interprets the elements in a policy space and makes sense of the relationships among them” (p. 3). The authors discuss how the definition of water varies in how it is interpreted and utilized by an individual or peoples, i.e. the cultural, political, or economic values that are placed on it, or in some cases the lack, of such values. Yet, it is important to recognize the differences between *claims* about nature and the *reality* of relationships with it. To clarify, “While ontology attempts to account for what is in the world, epistemology asks how it is possible to know the world,” (Woodward, 2009, pg. 1).

Yates, Harris, and Wilson (2017) recently reviewed human-water relations and policy in British Columbia, arguing that the multiple ways-of-knowing water among Indigenous peoples do not consist of “different *perceptions* of or knowledge systems tied to water’s (singular) existence,” but rather the existence of “multiple water realities and ways of being-with-water” (p. 2, emphasis in original). In other words, Indigenous knowledge scholars are beginning to claim that TKS are knowledge systems based on Indigenous *ontologies*, which often view water and its materiality as being animate, and that these realities can be marginalized when seen as mere *perspectives*. As Aikenhead and Mitchell state, TKS emphasize “what nature is” whereas Eurocentric Sciences emphasize “how nature works” (p. 116).

With that understanding, and given the multiple contexts in which traditional knowledge exists, it is not possible to define a single ontology of TKS. There are thousands of Indigenous communities living their own realities throughout the world, and one definition or description of traditional knowledge systems does not encompass the frameworks of every society. Nevertheless, TKS scholars have come up with several characteristics of traditional knowledges and worldviews. In particular, this section will focus on the characteristics often attributed to TKS within Native American cultures.

It is important to first outline the different levels of analysis involved in TKS (Fig. 5). The lowest level of analysis is the local empirical knowledge of both animate and inanimate surroundings, followed by the management systems, social institutions, and finally the overarching worldview that guides everything else (Berkes, 2012). TKS research can be conducted at any of these levels.

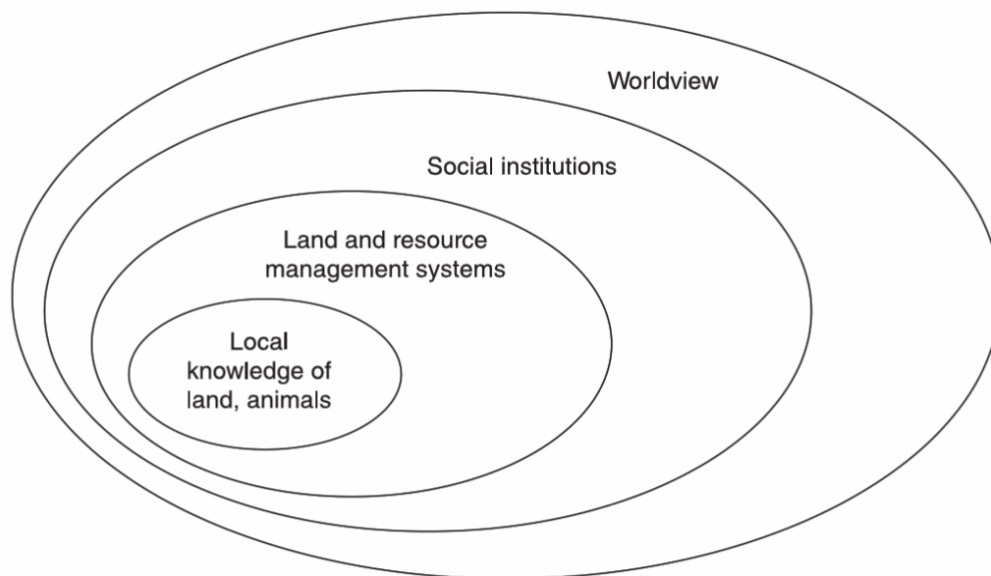


Figure 5. Levels of analysis of traditional knowledge and management systems, adapted from Berkes (2012).

As previously discussed, TKS have been described as dynamic and adaptive. However, TKS have also been described as holistic, embedded, qualitative, oral, intuitive, spiritual, empirical, cyclical, gendered, contextual and rational (Aikenhead and Mitchell, 2011; Castillo and Castillo, 2010; Menzies, 2006; Nadasdy, 1999). The ethics of TKS include those of spirituality, lessons of how to live within one's environment, and how to interact with both human and non-human relations. These ethics are place-based, with knowledge situated within the way one relates to space, not necessarily as concerned with temporal aspects as Western knowledges are (Nelson, 2006; Pierotti & Wildcat, 2000). To streamline the process of discovering the different dimensions of TKS, it may be helpful to explore the major proposed differences between concepts of TKS and those of Western science. However, it is important to remember that there are intra-system differences as well as differences between the two knowledge systems.

Each tribe's stories, history, and context is different, and could even differ at the individual band/clan level. In addition, both knowledge systems have likely influenced one another throughout the history of colonization and contact (Agrawal, 1995). These issues raise the question of the appropriateness of comparing two knowledge systems, and how this process can either aide or stall the process of collaboration between knowledge holders in academia and western policy. Before proceeding, it is important to understand the issues that arise when comparing different knowledge systems.

Whyte (2013) outlines three different ways of looking at the similarities and differences between TKS and Western knowledge. The first view assumes that there is not much overlap between concepts of TKS and concepts of Western knowledge and that

they are generally incompatible. The incompatibilities stem from the incorporation of spiritual values and social obligations in TKS. Additionally, issues with the recognition of the validity of TKS exists among Western science and management institutions.

McGregor (2004) herself notes major differences between these knowledge systems and accuses researchers and policy makers of crafting TKS into a form that is “scientifically palatable” to outside interests as they collect and interpret collections of TKS. McGregor argues that part of the challenge in comparing the two knowledges stems from the argument that the concept of “traditional ecological knowledges” is based on Western science and its fascination with breaking down knowledge into smaller units. In other words, TKS cannot be compartmentalized and understood without attention paid to the holistic nature of TKS. TKS does not consist of discrete components, and yet the assumptions with TKS discussed previously demonstrate the approach many take when studying TKS from a Western science perspective. LaDuke (1993) argued this same point when she pointed out that in an indigenous view, TKS are not something one studies—they are something one does.

The second view on the relationship between TKS and Western knowledge is that they are complementary. This view is very common among TKS scholars and resource managers (Berkes, 2012; Kambu, 2010; Massey & Kirk, 2015). This view considers the integration of knowledges as critical for co-management of natural resources, and argues that there is room for overlap. For example, Mazzocchi (2006) discusses contemporary hermeneutics, and says the combination of Indigenous knowledge and Western knowledge can “disclose a more complete picture of reality” as they are both situated

within the same ontology. In other words, the views may be different, but they are dealing with the same reality. Bridging the two knowledges can result in better participation, cooperation, and understanding between indigenous communities and those who seek their input. However, Nadasdy (1999) argues that the integration of these knowledges tends to hide power relations and agendas. Attempts to integrate these knowledges must give special attention to these concerns, as discussed below.

The third view is that the two knowledge systems should not be compared at all. This view is primarily concerned that comparing TKS concepts with Western knowledge systems obscures important points about the pursuit of knowledge itself (Whyte, 2013). According to Whyte (2013), proponents of this message argue that both knowledge systems are value-laden and that comparing them creates a dichotomy that eventually harms the process of cooperation instead of fostering a collaborative environment for knowledge sharing and environmental governance. For example, Nadasdy (1999) claims that “the very idea of such integration implicitly assumes that knowledge is an intellectual product which can be isolated from its social context” (p. 11). Nadasdy builds off of Latour's (1987) work on the social, physical, and conceptual networks involved in the production of scientific knowledge by adding that the extension of Western scientific networks into Indigenous communities is connected to power imbalances as the former renders the latter “limited and unreliable” (Nadasdy, 1999, p. 12).

Keeping these three views on the relationship between TKS and Western knowledge in mind, as well as the potential issues that can result with comparison, the next section outlines the comparisons that have been made in recent TKS literature.

Holism vs. Reductionism. As Berkes (2012) summarizes, Western science has, for the past four centuries, been influenced by positivism, a seemingly objective knowledge obtainment process of searching for the “true” ontological understanding of the world so as to predict and control it. As part of the positivist orientation, reductionism involves breaking down the complexity of nature into separate and distinct parts and analyzing them in a controlled environment in order to understand and incorporate findings into general principles and predictions about the world (Andersen, 2001). The result is a worldview in which humans are seen as separate from nature (Castree, 2001).

In contrast, TKS have a more holistic ontological understanding of how the world works and how Indigenous peoples have learned to work with – and as a part of - complex and dynamic environments (Berkes, 2012; Mazzocchi, 2006; McGregor, 2004). Pierotti and Wildcat (2000) state that TKS involve the concept that “all things are connected” (p. 1336). Rather than resting on romantic ideals, the authors describe how TKS incorporate the interrelationships between not only humans and animals, but all aspects of the environment, both animate and non-animate. To demonstrate this point, Nadasdy (1999) shares the insight of an aboriginal hunter, who told him that if you were to put an educated water or forest “expert” out into the wilderness alone, they wouldn’t survive because they would know nothing about the environment as a whole, only about their own field.

This holistic understanding is often interwoven with social obligations, ethics, spirituality, and historical understandings of the environment (Berkes, 2012; Haverkort & Reijntjes, 2010). The spirituality and ethical realms of TKS have challenged conventional



conservation and resource management approaches, which have been based on models of equilibrium and Western science. However, advancements in the field of Ecology in the past few decades have incorporated more holistic thinking and have given credibility to pluralist understandings of science as well as the social construction of science (Aikenhead & Mitchell, 2011; Freeman, 1992; Hacking, 2000; Nadasdy, 1999).

Dominion Over Nature. Whether Western industrial society's tendency to exploit nature stems from Christian ideals of dominion over nature or from the inherent contradictions of capitalism (or both), it is evident that this dominant human-environment relationship is different from those who practice TKS (Berkes, 2012; LaDuke, 1993; Tsosie, 1996). Rather than viewing humans as having dominion over nature, TKS view ourselves as part of the environment, rather than its sole beneficiary or proprietor (Pierotti and Wildcat, 2000).

Cyclical vs. Linear. While Western knowledge processes have been described as linear or based on a timeline, traditional knowledge systems are modeled on the "cyclical structure of nature" (LaDuke, 1993). It is a "process of regeneration and re-creation" in which humanity learns not only from each other but from the non-human world as well, both animate and non-animate (McGregor, 2004, p. 404). Things are not learned or shared within the sharp confinements of linearity. This is evident when observing Indigenous ceremonies or listening to the way Indigenous origin stories are shared. The cyclic and holistic understanding of life is incorporated into the seventh-generation ethic.

This ethic recognizes that future relatives will depend on the actions being taken now (Tsosie, 1996).

The Concept of Wilderness/Conservation. The dichotomy that exists between nature and society in Western knowledge and management systems has contributed to the development of the concept of “wilderness” as an area where humans do not, or should not, influence nature. Wilderness and its preservation is the basis of many environmental policies that seek to preserve the “wild” ideal of nature, such as the Wilderness Act of 1964, which states that wilderness is to be enjoyed as “an area where the earth and its community of life are untrammelled by man, where man himself is a visitor who does not remain” (The Wilderness Act, 1964, p. 2). In contrast, Pierotti and Wildcat (2000) state that “...native peoples do not think of nature as “wilderness,” but as home” (p. 1336) and that the concept of wilderness is deceitful, as humans have been a part of and have influenced nature for millennia. As previously discussed, TKS hold that humans and their culture are not separate from nature, and natural resources exist in their own right, not as something simply valued for what it could do for human beings (Berkes, 2012; Tsosie, 1996).

Knowledge Transmission. Compared to the written, formal, theoretical and systematic educational norms of Western knowledge systems, traditional knowledge transmission has been described as oral and based on kinship learning processes, where knowledge is passed down from one generation to the next (Battiste, 2010; Mazzocchi, 2006). Smylie et al. (2003) explains that knowledge transmission starts with stories,

proceeds to knowledge, and culminates in wisdom. Elders and other traditional leaders are respected for the wisdom they possess about living in and relating to the surrounding world, often acting as knowledge keepers for these processes, ceremonies and stories.

Similarities Between Knowledges. Cordell (1995) argues that “the philosophical differences between the two kinds of science are not sharply defined; rather, it is our reductionist analysis that tends to exaggerate the differences” (cited in Berkes, 2012, p. 13). Aikenhead and Mitchell (2011) argue that the two knowledge systems are complex, and while there are differences, there are also similarities. To illustrate these similarities, Aikenhead and Mitchell (2011) created a series of tables that compare traditional knowledge and Western knowledge (Table 1). The tables include a “common ground” slot in order to avoid pitting the two knowledges against each other. According to the authors, the similarities include dynamism, communal learning structures, rational and intuitive thinking, empirical bases, and the fact that both include cultural and contextual biases (both are value-laden). That is, Western science has claimed to be completely objective in the pursuit of knowledge.

However, it is worth mentioning again that scholars who take a social constructivists approach to science and knowledge have argued against the notion of a completely value and position-free research process in Western institutions (Foucault, 1980). Researcher positionalities, interests, external and internal power structures, and research methods can influence the research process, and the very outcomes of research projects themselves (Muhammad et al., 2015).

Table 1. Comparing Indigenous Ways of Living in Nature and Eurocentric Sciences.  
Adapted from Aikenhead and Michell (2011, p. 115-120).

<b>Themes</b>	<b>Indigenous Ways of Living in Nature</b>	<b>Common Ground</b>	<b>Eurocentric Sciences</b>
<b>General ideas about reality</b>		The impulse of humans to make sense of the world and to care for themselves	
	Anchored in Indigenous cultures	Anchored in culture	Anchored mostly in Eurocentric cultures, but open to anyone immersed in the culture of Eurocentric sciences
	Mother earth is mysterious and always in flux		Nature is knowable and is both constant and changing in consistent ways
	Unites physical and metaphysical worlds (monism)		Mostly limited to the physical world of Cartesian dualism
	Presupposes reality is spiritual		
	Everything is subjectively interrelated, and these relationships create responsibilities		Everything is assumed to be objectively related, but without associated responsibilities
	A pervasive belief that humans are equal to, or of less importance than, all other creations in Mother Earth		A pervasive belief that humans are the most important creation on the planet (anthropocentrism)

Table 1 Continued

Themes	Indigenous Ways of Living in Nature	Common Ground	Eurocentric Sciences
<b>Ideas about how to understand the world, and what those ideas are based on</b>		Rational, metaphorical, dynamic, tentative over time	
	Expresses a wisdom tradition of thinking, reflecting, living, and being		Expresses an intellectual tradition of thinking
	Emphasizes what nature <b>is</b>		Emphasizes <b>how</b> nature works
	Place-based		Generalizable
	Expresses a web of relationships in all creation		Expresses an objectivity in being unrelated to what is being described or explained
	Generally assumed to be truth—a rich integration of multiple viewpoints		Assumed to be the best representation of reality within a paradigm
	<i>Empirically Based</i>		
	Emphasizes holistic, monist, spiritual power		Usually emphasizes the power of reductionism and Cartesian duality
	Accumulated observations over many generations		Field studies or investigations into changes over great periods of time
	Based on subjectivity		Based on hypothesis and model building with the least subjectivity humanly possible
“experiments” rely on natural environmental changes over many generations and involve collective wisdom	Experimental	Experiments are undertaken by humans over relatively short periods of time	

Table 1 Continued

<b>Indigenous Ways of Living in Nature</b>	<b>Common Ground</b>	<b>Eurocentric Sciences</b>
Source: both material and non-material worlds	Observing	Source: material world only (dualism)
Relationship based		No relationship exists between the observer and the object
What is the world?	Questioning	How does the world work?
Who is that? How are they related? Who is doing that? What do they do?	Classifying	What grouping does that fit? What are similarities/patterns that can arbitrarily define a group?
To balance interrelationships in Mother Earth	Predicting	To explain and predict natural events
A myriad of representations of wisdom-in-action	Models	Mechanistic, often amendable to quantification, many are visual
Conducted by everyone, includes personal experience	Monitoring	Conducted by professionally trained experts and technicians
Appropriated tools and processes from modern technology; pre-contact tools and processes; “listening” to nature; preparing the mind and heart spiritually; and stories and art forms passed down in the oral tradition	Technological tools and processes to investigate nature	Advanced technologies and scientific processes approved in paradigms

Table 1 Continued

	<b>Indigenous Ways of Living in Nature</b>	<b>Common Ground</b>	<b>Eurocentric Sciences</b>
	Elders' collaborative discussions provide advice on what to do, based on experiences passed down and through one's own life	Communal	Scientists work in teams, invisible colleges, and paradigms to decide (via argumentation and consensus making) what to believe as "true"
	Wisdom-in-action for the survival of plants, animals, and humans	Social goals	An individual's scientific credibility; plus environmental issues, corporate profits, medical advances, national security, economic progress, and knowledge for its own sake, among other goals
	Coexistence with mystery through maintaining a host of interrelationships	Intellectual goals	Elucidation of mystery by describing and explaining nature in ways acceptable to a community of scientist

Table 1 Continued

	<b>Indigenous Ways of Living in Nature</b>	<b>Common Ground</b>	<b>Eurocentric Sciences</b>
	Content validity suggested by Aristotle's notion of intelligible essences, and supported by tens of thousands of years of survival based on that content	Validity	Predictive validity indicated by anticipating observations accurately; the cornerstone of natural philosophy and Eurocentric sciences for the last 400 years
	Local, oral Indigenous language, which is technically sophisticated, precise, and place-based	Dissemination of ideas (when appropriate)	Written text, which is technically sophisticated and precise, and which adheres to the vocabulary, syntax, and genre specific to a paradigm
	Cyclical, with no beginning and no ending	Time	Rectilinear
<b>What is valued within each knowledge system</b>	Flux	Honesty Perseverance Inquisitiveness Open-mindedness Logic Curiosity Aesthetic beauty Creativity Intuitiveness Precision Repeatability	Consistency



Table 1 Continued

	<b>Indigenous Ways of Living in Nature</b>	<b>Common Ground</b>	<b>Eurocentric Sciences</b>
	Intimate, subjective, moral, and ethical; related to human action with respect to seven generations back and seven generations yet to come	Human action	Formal and “objective;” does not deal with normative prescriptions of human action
	Relationships with, and responsibilities to, everything in creation; high subjectivity		“objective” disinterest between the observer and what is observed and interpreted, as far as is humanly possible; low subjectivity
	Harmony with Mother Earth for survival; stewardship		Power and dominion over nature for materialistic progress, political power, healthy well-being, and academic curiosities
	Sustainability		Either neutral to sustainability or an entitlement to progress
	Generosity		Profit, progress, and credibility motives
	Wisdom		Understanding, knowledge, and processes
	Collaborative		Competitive
<b>Power imbalance</b>	Subordinated by dominant/oppressive /colonizing cultures		Held in high esteem by dominant/oppressive/colonizing cultures
	A basis of self-identity, resilience and resistance by Indigenous peoples		A basis of professional identity

Issues in TKS Research

While keeping the similarities and differences between TKS and Western knowledge in mind, it is also important to understand the issues involved in conducting TKS research. Some indigenous scholars, such as LaDuke (1993), contend that TKS are “not an appropriate subject for a PhD dissertation”—or a Master’s thesis for that matter—not only because TKS are a process rather than a body of knowledge but also because they are more than just an exercise of academic rigor (p. 9). As McGregor (2004) states, one does not possess knowledge and wisdom of environmental processes just because they have written a dissertation on it. If a researcher decides to focus on TKS, they should use contextual and appropriate methods informed by the communities themselves, and use the knowledge to bolster Indigenous capacity and sovereignty in natural resource management from within.

Furthermore, methodologically unsound and biased research has plagued Indigenous communities for centuries. Latent power dynamics, colonialist policies, non-contextual methodologies, and stereotypes have contributed to an unbalanced environment between Western scholars/resource managers and Indigenous communities (Smith, 2012). The use of racial stereotypes, the ignorance of many researchers regarding the contemporary realities of Indigenous communities, the perpetuation of power dynamics and hidden agendas in TKS research, and the commodification of TKS are serious concerns.

While the following section does not provide an exhaustive discussion of all the issues that faces Indigenous communities involved in Western knowledge-based research, it discusses some of these issues.

### Racial Stereotypes: The Issue of “The Ecological Indian”

The use of racial stereotypes has impacted many aspects of Indigenous society. One of these stereotypes, the “Ecological Indian” stereotype, is perpetuated by three myths: 1) the “ecologically noble savage”, 2) the “ecologically ignoble savage”, and 3) the “primitive fallen angel” (Berkes, 2012; Nelson, 2006). These stereotypes have had countless impacts on the social, political, and economic realities of Indigenous peoples around the globe.

The myth of the “ecologically noble savage” has a long history in Western literature and popular culture. This myth itself is usually attributed to Jean Jacques Rousseau, a French political theorist writing at the time of the Enlightenment (Rousseau, 1985). The myth suggests there exists a “noble savage” who is innately in tune with nature, uncorrupted by the outside world yet unable to partake in modern technology without being corrupted himself.

Although this myth was created long ago, Smithers (2015) points out that the image of an “ecological Indian” persists in the minds of non-Indigenous Americans, creating a hindrance to tribal sovereignty and self-sufficiency by providing Anglo society with stereotypical notions of what it means to be “Indian”. In other words, Anglo society has an idea about what Native Americans should or should not do with the land they possess. These ideas are based on the notion that Native Americans have a magical,

unempirical, race-based connection to nature that makes them innocent and wise (Nelson, 2006). In reality, the environmental knowledges and practices that Native American communities hold are based on millennia-old social codes and institutions, rather than conceptualizations of “noble savagery” (Pierotti and Wildcat, 2000). The myth wildly undermines Indigenous sovereignty and economic prosperity. It is critical that scholars refrain from employing romantic and stereotypical notions of Indigenous environmental knowledge and capacity.

In contrast to the first myth, the second myth casts Indigenous peoples as “ecologically ignoble savages” replete with images of a destructive, primitive, and environmentally detached people. The myth clings to the belief that Indigenous people, rather than being in tune with nature, actually aided in the destruction of it with their sometimes “backwards” practices (Berkes, 2012; Nelson, 2006). This belief recently regained attention when Shepard Krech III, an anthropologist at Brown University, wrote his infamous book, *The Ecological Indian* in 1999 (Krech, 1999). Krech argued that Native Americans weren’t conservationists at all; the only reasons they didn’t cause greater levels of environmental destruction is because their population numbers were low. He also argued that perpetuating the idea of an “ecological Indian” in essence allows Native Americans to do whatever they want with natural resources while avoiding critique from broader society. By making these observations, Krech hoped to “free” the Native American from the image of an “ecological Indian” (Krech, 2007).

However, Krech has received a great deal of criticism from both Indigenous and non-Indigenous scholars and activists (Harkin & Lewis, 2007; Nelson, 2006; Smithers,

2015). For example, in response to Krech's original book, Ranco (2007) argues that Krech ignores the politics of colonization and undermines Native American self-determination/sovereignty. Ranco also points out that Krech did not actually conduct any of his research *within* a Native American community, practicing instead a sort of "armchair anthropology" and contributing to unethical research practices that Native American communities have dealt with for decades.

The third myth is essentially a blend of the first two. Berkes (2012) explains the assumed dilemma that is placed on Indigenous communities: either they continue/return to their traditional and "primitive" ways lest the market economy "taint" them, or they conform to assimilationist ideals and join hegemonic community. As Nelson (2006) points out, Native Americans can barely put a landfill on their own land or own a gun without being attacked by environmentalists and opinion-touting Anglo-Americans for not being "authentic" Indians. Yet, as stated previously, Indigenous peoples have been accused of "anti-technology scaremongering" (TallBear, 2001). Historically, there has not been much talk of combining the "old" and "new", when in reality many Indigenous peoples wish to retain their traditional beliefs and practices while also practicing economic self-sufficiency and upholding the dynamic nature of TEK (Berkes, 2012). Many Indigenous communities have been doing just that. As Tsosie (1996) explains, "Exercises of tribal sovereignty will not always result in adherence to traditional norms of economic or environmental conduct" (p. 311), especially as tribes respond to competing values from both the federal government and from within their community, shifting policies, cultural loss, and economic need. Because of these realities, Butler

(2006) suggests that Indigenous knowledge and practices be “historicized”, or “understood in light of the forces of change acting upon Indigenous resource activities since contact” (p. 126). Each community must be placed within the social, political, and cultural context of its own specific history of policy change, contact, and practice. She argues that, due to its constructed nature, we must also link knowledge to the experience and position of those who share it with us.

For individuals participating in the TKS sharing processes, it is vital to understand how the three myths surrounding the “ecological Indian” seep their way into stereotypes, policies, research, and assumptions about modern Indigenous communities. It is also important for researchers to critically reflect on the power relations that are ever-present in TKS research.

#### Power Relations in TKS Research and Implementation

As previously discussed, breaking down the definitions and terminology of TKS can uncover latent assumptions that may contribute to power imbalances that are ever-present in literature, policy, and management. Furthermore, Nadasdy (1999) argues that the research process itself may also contribute to these imbalances. This, as Berkes (2012) reasons, makes the use of TKS inherently political, because it “threatens to change power relations between Indigenous groups and the dominant society”, making it an interesting application of political ecology indeed.

Beyond the skepticism that exists on both sides of the TKS research spectrum, both Nadasdy (1999) and Menzies (2006) contend that TKS research is muddled because researchers often compartmentalize and distill TKS for their own or someone else’s

benefit. In terms of compartmentalization, Nadasdy argues that the specific categories of resource management so evident to non-indigenous scientists and managers, such as resource extraction, do not always fit with the holistic nature of Indigenous knowledge. The holistic nature of TKS is degraded as it becomes “compartmentalized” into discrete groups in order to be more palatable and useable in Western science and management. Ellis (2005) agrees that this process runs rampant in resource management, and claims that TKS “threatens the stability of conventional power structures rooted in the Western industrial complex” (p. 75).

In addition, anything that isn’t presented neatly and quantitatively, such as social institutions and spiritual aspects, is in danger of being left out of the final product that is presented to outside interests. If it is not left out, it is validated against Western scientific standards (Agrawal, 1995). When Indigenous elders or other traditional leaders *are* involved in knowledge sharing, it is often in a setting that is unfamiliar to them, such as a conference room filled with conversations abundant with scientific jargon. This experience adds to possible language barriers that may already be present (Aikenhead and Mitchell, 2011). What ends up happening is that “the very people who know the least about “traditional knowledge” are the ones who set the standards of relevance by which it is distilled” (Nadasdy, 1999, p. 10).

McGregor (2004) calls these distillation and compartmentalization processes “a process of colonizing Indigenous knowledge” (p. 400). By taking just the “environmental” aspect out of Indigenous knowledges, one is removing it from its context, a dangerous and unethical practice that contributes to generalizations and

improper applications. Agrawal (1995) elaborates by stating that Indigenous knowledge, when taken out of context and isolated, essentially makes static something that is inherently dynamic. Nelson (2006) adds that researchers may not have actual permission to share the knowledge they learn—let alone have it shared with them in the first place—especially when they take it out of its cultural context. By doing so, researchers show a disregard for cultural privacy. Agrawal (1995) also points out that using Western methods of dissemination and storage, such as simply collecting traditional knowledge and archiving the research in outside institutions, privileges everyone but those from whom it was extracted. In essence, Agrawal states that *in situ* preservation is better than *ex situ* preservation, and that to overthrow the political imbalances active in TKS research, the promotion of indigenous self-determination and revitalization is critical. The revitalization of Indigenous knowledge must come from *within*.

Again, Indigenous scholars contend that these issues of TKS sharing and implementation can be further disarrayed because TKS are not just bodies of knowledge to be archived or shared—they include a process that is highly specific to the community it comes from and is inseparable from its context (McGregor, 2004; Pierotti and Wildcat, 2000; Whyte, 2013). This can be a problem for researchers who wish to, or rather are required to, apply their TKS research to broader contexts.

### The Commodification of TKS

Many researchers who have applied their TKS research to broader contexts have done so under the assumption they were doing it for the benefit of all of society.

However, this often comes at the expense of the Indigenous communities that had



provided the knowledge. Unfortunately, broader applications of TKS have resulted in what has been called the “commodification of traditional knowledge” (Bavikatte et al., 2010; Mauro & Hardison, 2000; Schroder, 2010). In other words, TKS were regarded as a commodity to be bought and sold while the methods of production and implementation of TKS and the context it arose were ignored. This results in what Karl Marx termed “commodity fetishism” (Bavikatte et al., 2010; Marx, 1867). Of course, as Nelson (2006) reminds us, TKS are not a commodity, they include processes embedded with sacred responsibilities.

Historically, the commodification of TKS resulted in a large imbalance of costs and benefits, with benefits accruing to outside interests (such as pharmaceutical companies) who exploited Indigenous peoples for access to valuable plants, animals, and insight. In response, the Convention on Biological Diversity was adopted in 1992, putting in place ethical requirements in terms of the protection of TKS and the equal distribution of benefits from the process of knowledge sharing (Schroder, 2010). Although this may have dissuaded outside industry from exploiting TKS without consequences, the exploitation of TKS continues in academic research.

### TKS in Research and Application

Winona LaDuke once said, “I suggest to you that Indigenous ways of living are the only sustainable ways of living” (LaDuke, 1993, p. 3). This sentiment—that Indigenous knowledges can provide helpful and necessary insights to environmental change and sustainability—is echoed in many ways throughout the literature and policy that incorporate TKS. Although there is danger in generalizing TKS and taking them out

of their context, Berkes (2012) suggests that TKS are more than just locally relevant. He argues that many TKS practices, such as rotation with land use, can be called common principles and can be applied across diverse ecosystems. Especially in the field of human ecology, attention has been given to the integration of natural and the social sciences in order to shed light on alternative knowledges and resource management systems that incorporate adaptive responses and holistic approaches.

Ellis (2005) outlines two benefits of incorporating TKS in environmental policy: 1) TKS can be used to prevent and predict environmental degradation as well as inform environmental management and 2) the protection and promotion of TKS builds tribal capacity and promotes the use of TKS in environmental governance. Following these benefits, professionals have used TKS to inform resource management, environmental ethics, monitoring, disaster planning, climate change adaptation strategies, and development (Berkes, 2012). This review focuses on the use of TKS in environmental governance and policy.

### Implications for TKS Use in Environmental Policy

One of the most common applications of TKS to Western environmental management is through climate change adaptation research (Boedhihartono, 2010). With increased attention to climate in recent decades, interest in TKS has experienced a renewal (Whyte, 2013). Rural coastal Indigenous communities, especially in the northern hemisphere, have been among the first to experience and document the impacts of climate change in their communities. Their insights and observations of climate change have been used in both local and global climate change models (Berkes, 2012).

A second reason TKS are so highly valued is that they can be used to supplement and guide sustainable development and natural resource management as well as serve as a tool to assert natural resource rights, especially in rural areas (Butler, 2006; Valderrama and Arico, 2010). For example, Haverkort and Reijntjes (2010) draw attention to the use of TKS in endogenous development or development that is partially based on local knowledge and skills. This type of development requires the use of joint or collaborative management practices, where TKS are recognized as legitimate and the collaboration is a partnership rather than a mere consultation (Berkes & Henley, 1997). Often, this involves a bottom-up approach that works to increase community involvement and the recognition of TKS (Ellis, 2005). Gadgil, Berkes, and Folke (1993) argue that if the collaboration is done right, TKS can be viewed as a sort of “cultural capital” that can be used both in community resource management as well as in efforts to conserve biodiversity.

However, there are many barriers to the implementation of TKS in resource management, including a resistance to change on the part of resource scientists and managers, a skepticism about the validity of TKS among some professionals, and/or a lack of interest in working with and in Indigenous communities (Huntington, 2000). Furthermore, the entire framework that resource management rests upon is a framework created within Western institutions of governance and ethics. This framework, as McGregor (2004) explains, can work against the incorporation of TKS, making it into a knowledge extraction process rather than a process of inclusion and collaboration.

As a response to these issues, alternative frameworks have been proposed to inform and guide co-management practices. For instance, Houde (2007) created a six-

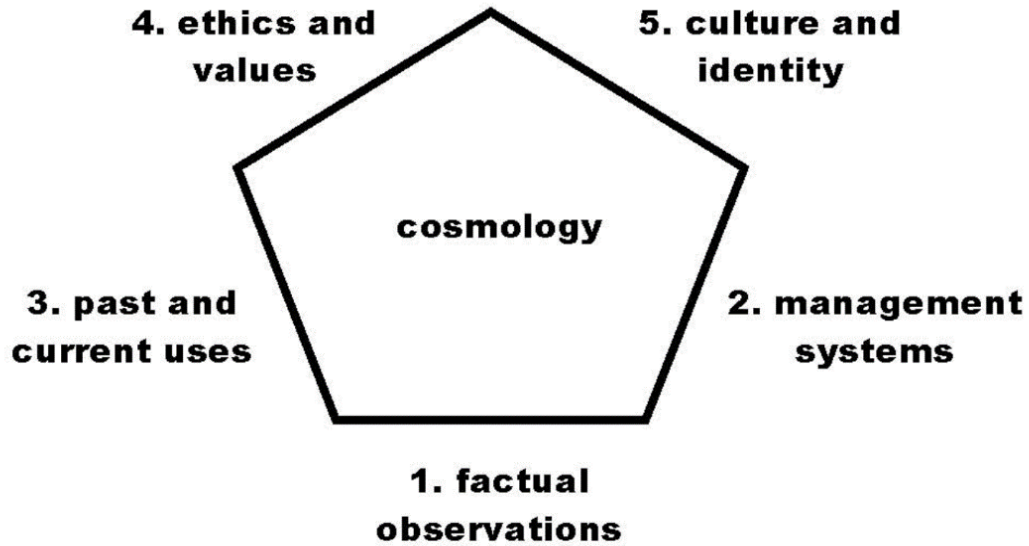


Figure 6. The "Six Faces of Traditional Ecological Knowledge" (Houde, 2007)

faced figure that he calls the “six faces of traditional ecological knowledge” (Fig. 6). His figure includes six “interconnected and mutually informing” faces that should be considered when bridging the gap between Indigenous and Western knowledges for collaborative management. By explaining the characteristics of each face in depth, Houde hopes to better inform co-collaborators of the challenges and the opportunities of incorporating TKS.

The ethics and value face is a feature of TKS that has been especially intriguing to proponents of sustainable environmental governance. Conventionally, collaborators have only seen what Whyte (2013) calls the “supplemental-value” of TKS, i.e. their ability to supplement the research of outside interests by providing a local or historical perspective to Western scientific research or management. Instead, Whyte suggests that the

governance-value of TKS should be recognized for its potential to guide Indigenous capacity building, resurgence, and decision-making processes.

In exploring the ethics and values of Indigenous communities, proponents hope to inspire new environmental ethics for a global community and create management systems—especially in Indigenous communities—based on these ethics. Kambu (2010) refers to this process as a “bridging” of informal and formal governance regimes, suggesting that the inclusion of TKS into formal water governance structures can help solve some of the challenges of water management.

However, as Tsosie (1996) asks, should our land ethics be based on Indigenous values, Anglo-American values, or a combination of both? How does one even come up with one, generalizable indigenous land ethic in light of the many intertribal *and* intratribal differences? What about the fact that social norms change? Tsosie also suggests that rather than treating Indigenous ethics as customary norms in tribal environmental governance, these ethics should be formalized in tribal policy. To do this, she suggests that research should first be generated from within Indigenous communities in order to “define the unique traditions governing their relationship to their Indigenous lands and resources” (p. 271). This process has now been implemented in many Indigenous communities working to incorporate TKS in environmental governance—especially with regard to water resources.

### Water and TKS

Incorporation of local knowledge into sustainable water governance has been identified by the United Nations’ Local and Indigenous Knowledge Systems Program

(LINKS) as an important application of TKS (UNESCO, 2006; Valderrama & Arico, 2010; “What is Local Knowledge?,” 2016). TKS can include knowledge about the collection and storage of water, the equitable distribution and management of water, the avoidance of contaminated water or aquatic resources, or more (Kambu, 2010).

For example, Jackson et al. (2014) discusses the documentation the knowledge of fish migration and habitat in northern Australia. To understand the TKS of the community, researchers conducting interviews with local members and “listened to stories about fish” while keeping in mind the processes of colonization and its impacts on the knowledge actions of the community (p. 11). These stories were successfully applied to the management of aquatic resources by supplementing low-flow models of the Daly River.

Cronin & Ostergren (2007) provide many examples of the incorporation of TKS into watershed management, including the Jamestown S’Klallam Tribe Watershed Management system where indigenous and Western science merge. Collaborators understand that culture and ceremony guide decision-making processes, especially with regard to river processes. Cronin and Ostergren also share information about the Confederated Tribes of the Umatilla Indian Reservation’s Watershed Management Program, which released its Spirit of the Salmon Plan in 1995. This plan laid out the cultural and spiritual importance placed on salmon, and was used to protect this vital resource. In both cases, the tribes’ natural resource programs were driven by a “clear cultural imperative”, even though each tribe depended heavily on resource managers trained by Western knowledge systems.

However, negotiation does not always mean making TKS legible to Western science and management. Examples of Indigenous environmental and relational ethics, the spiritual importance of water, and human responsibilities to all of Creation are present throughout much of the literature on Indigenous water governance, especially in the Canadian context (McGregor, 2014; Wilson, 2014). For example, McGregor (2012) discusses the collection of water-related teachings and understandings of 80 First Nations Elders in Ontario. Traditional leaders drafted a “Water Declaration of the Anishinabek, Mushkegowuk and Onkwehonwe” which was then adopted by the confederated Chiefs in Assembly and used to inform environmental decisions. The Declaration discusses the spiritual, animate, ethical, gendered, and sacred aspects of water. Of special interest are declarations ix. and x., which state that planning for water governance must take a long-term approach and that the knowledge regarding water must be shared. Another example of an Indigenous declaration exists within the Syilx Nation Siwkw Declaration, which outlines the Syilx relationship with water, current issues with water governance, and the inherent title, rights, and responsibilities that the First Nation has in relation to their water resources (Syilx Nation, 2014). Examples such as these are in line with the argument that the application of traditional knowledge systems in Indigenous communities is important for tribal self-determination, “whether or not” these applications are “part of non-Indigenous collaborative environmental governance” (von der Porten et al., 2016, p. 234).

Similarly, Tsosie (1996) discusses the efforts of Gail Small, a Northern Cheyenne woman and now a professor of Native American Studies at Montana State University. Small talked with her community about incorporating tribal religion into the tribe’s water

code. Her conversations with tribal members suggested they were worried about the water spirits. When Small tried to incorporate this information into the water code, she was met with ridicule from the U.S. federal attorneys appointed to assist her.

Challenges to validity, process, and relevance may work to impede the successful application of TKS to water governance structures. However, incorporating these informal governance regimes invokes a collaborative process of knowledge sharing between Indigenous knowledge holders and those educated in Western science (although the two categories are not exclusive). This knowledge sharing process in turn also has the potential to summon a process of cultural revitalization, which must take place from within the community itself. When Indigenous knowledge holders are involved in inclusive discussions of environmental management, safe from stereotypical assumptions and as full partners rather than as consultants, collaborative management practices are better situated to succeed.

### Conclusion

In the face of climate change and the search for alternative environmental management strategies the study and application of traditional knowledge systems has experienced renewed interest. TKS has the potential to provide insights for a changing global environmental ethic, yet it also has the potential to change the formal governance regimes within tribal communities themselves. In order to successfully implement the use of TKS in environmental governance, attention must first be paid to the latent power dynamics involved in defining TKS, and the assumptions or stereotypes that may be attached to the terminology used. This paper has sought to draw attention to these



assumptions by using existing literature to deconstruct formal definitions and the process of knowledge comparison to better inform the incorporation of TKS into environmental governance.

This incorporation also involves historicizing TKS, i.e. situating them within each community's specific histories of colonization, social institutions, and political relationships. In addition, it is important to understand that knowledges vary both between knowledge systems as well as within them, and that different members of a community will likely have different responsibilities and experiences with this knowledge. While it may be useful to contrast Indigenous knowledge with Western scientific knowledge, it is critical to understand the assumptions in doing so, and how these assumptions might affect the collaboration between Indigenous and Western knowledge systems in environmental management. Rather than focusing on comparing the two knowledges, perhaps the focus should be on bridging them and creating a cooperative environment for environmental governance, as many authors throughout this review have suggested.

The resulting collaborative management process that results should be inclusive, respectful, and reciprocal. As McGregor states, "...Indigenous knowledge is a circle; it is part of the larger cycle of creation and re-creation. If we reclaim our original instructions that encourage us to think in terms of cycles...we are brought back full circle. That is what we have to do with our knowledge: bring it back full circle so it lives in ourselves, our communities, our nations, and our children" (McGregor, 2004, p. 403). The process starts from within the community

CHAPTER FOUR

“ALL THE ANSWERS ARE IN OUR CULTURE”: INTEGRATING TRADITIONAL  
KNOWLEDGE SYSTEMS INTO TRIBAL WATER GOVERNANCE ON FORT PECK  
INDIAN RESERVATION, MONTANA

Contribution of Authors and Co-Authors

Manuscript in Chapter 4

Author: Dionne Zoanni

Contributions: Conducted literature review, created study design. Collected and analyzed qualitative data. Wrote first draft of the manuscript, and obtained feedback on results from community.

Co-Author: Dr. Jamie McEvoy

Contributions: Provided field expertise, guidance, and feedback on the study design, and funding for travel. Provided formatting and feedback on manuscript.

Co-Author: Dr. Julia Haggerty

Contributions: Helped conceive the study design, and provided guidance on the literature review. Provided feedback on early versions of manuscript.

Co-Author: Dr. Elizabeth Rink

Contributions: Provided guidance on the study design, particularly on methodology and community participation. Provided feedback on early versions of the manuscript.

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**Abstract:** The Fort Peck Indian Reservation in Northeast Montana is home to the Assiniboine (Nakona) and Sioux (Dakota) Tribes. Conventional oil and gas development and the disposal of produced water has led to the contamination of the aquifer that had historically been the only source of drinking water for many community members. However, exploiting newly accessible shale resources has become a viable option as the Tribes continue to try to alleviate the high unemployment and poverty rates of tribal members. Even so, tribal members and authorities also understand the importance of ecological health in fostering a healthy community. Traditional knowledge systems (TKS) have been heralded throughout contemporary Indigenous governance literature as an important dynamic resource for Indigenous communities that deal with difficult decisions involving resource management and collaborative governance. Using a TKS framework and interviews with tribal members, this research asks: 1) What are the TKS that surrounds water and its use for each tribe? 2) What are some of the opportunities and barriers that exist for the successful incorporation of TKS into tribal water governance structures at Fort Peck? Challenges to validity, process, and relevance due to political histories and power imbalances, as well as diverse intertribal knowledge systems, may impede the successful integration of TKS in collaborative water governance initiatives with outside interests. The internal knowledge sharing process represents an organic solution that takes place from within the community itself. In addition, TKS-based tribal policies may uphold the expression of tribal self-determination, i.e. the “governance-value” of traditional knowledge systems.

**Highlights:**

- The integration of traditional knowledge systems into tribal water governance systems on Fort Peck Reservation faces barriers involving power imbalances and cultural loss as well as opportunities in cultural revitalization efforts and tribal policy-making.

- Political ecology offers a useful lens for exploring relations of power embedded within tribal water governance
- Latent power dynamics between outside interests and Indigenous communities and colonial processes may still work to impede the successful integration of traditional knowledge systems and tribal water governance
- Organic, bottom-up approaches exist in current educational and cultural revitalization opportunities at Fort Peck
- Tribal policies that seek to incorporate traditional knowledge systems into Indigenous governance regimes can potentially foster collaborative knowledge sharing between Indigenous Nations and those solely educated in Western resource management.

**Keywords:** traditional knowledge systems, water governance, Indigenous people, hydrosocial cycle, Montana, tribal natural resources

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### Figure captions

*Figure 4. The Fort Peck Indian Reservation, shown in dark green. Other reservations in Montana shown in light green.*

### Tables

Table 1. Water: Values and Ways of Knowing

### Introduction

Tribal members on the Fort Peck Indian Reservation in Northeast Montana face a conundrum. While most tribal members living on the reservation are aware of the massive environmental contamination that occurred on the reservation as a result of conventional oil and gas extraction in the late latter 20<sup>th</sup> century, there is still a desire for further development of oil resources. Over the last decade, the area of the Bakken shale formation in northeastern Montana and western North Dakota experienced a boom of oil and gas activity due to the advent of unconventional drilling practices (i.e. hydraulic fracturing, horizontal drilling) that allow oil and gas to be extracted from previously unavailable shale resources (Caraher and Conway, 2016). Recent news reports suggest that activity may again be picking up within the next year (Lutey, 2017). Exploiting these shale resources is one option that the Fort Peck Tribes have considered for alleviating the 50.6% unemployment rate and the 29.6% poverty rate of tribal members (Fort Peck Assiniboine and Sioux Tribes, 2013).

However, tensions have surfaced around future resource development and the responsibility many feel to protect the environment, especially since tribal water quality has been severely diminished by the development of these resources (Thamke, 2014). The events at the Standing Rock Sioux Reservation from 2016-2017 sparked a new movement for the protection of water resources among tribal members at Fort Peck. The Fort Peck Tribal Executive Board sent monetary aid and supplies to the Oceti Sakowin camp, and many tribal members traveled to the camp and became involved in the protection efforts (Peterson, 2016; Sangha, 2016). More recently, tensions have flared between the Fort Peck Tribes and TransCanada, when an Executive Order authorized

development on the Keystone XL Pipeline in the early spring of 2017, after the previous U.S. Administration had initially blocked the effort (Peterson, 2017). These environmental concerns have brought discussions of traditional knowledge systems, tribal self-determination, and the future of tribal natural resource development to the forefront.

Responding to these concerns, my research explores opportunities for the inclusion of traditional knowledge systems (TKS) in tribal water governance and collaborative efforts through the lens of political ecology. Political ecology explores relations of power embedded within environmental science and management, including questions of knowledge production, environmental policy, and material realities (Robbins, 2012). Specifically, there is a strong focus on power and knowledge present within *postcolonial studies*. In short, the postcolonial focus in political ecology “seeks to dethrone hegemonic discourses ... so that other possibilities and realities are made possible” (Robbins, 2012, p. 70).

Recent work in the Canadian context on the co-governance of Indigenous water resources has shown that even when environmental decision-makers keep collaborative goals in mind, there is still a lack of *meaningful* implementation of Indigenous knowledge systems due to long-standing power imbalances and a lack of focus placed on Indigenous self-governance in decision-making processes (von der Porten et al., 2016; Simms et al., 2016). Recent literature has also called for further research on Indigenous “hydrosocial relations” and how these relations inform Indigenous water governance (Linton & Budds, 2014; N. J. Wilson, 2014).

Responding to this call, Yates, Harris, and Wilson (2017) recently reviewed human-water relations and policy in British Columbia, arguing that the multiple ways-of-knowing water among Indigenous peoples do not consist of “different *perceptions* of or knowledge systems tied to water’s (singular) existence,” but rather the existence of “multiple water realities and ways of being-with-water” (p. 2, emphasis in original). In other words, Indigenous knowledge scholars are beginning to assert that TKS are knowledge systems based on Indigenous *ontologies*, which often view water and its materiality as being animate, and that these realities can be marginalized when seen as mere *perspectives*.

With a focus on power, knowledge, and management, this paper discusses the inclusion of traditional knowledge systems (TKS)/ontologies in tribal water management and co-governance efforts as a possible answer to the call for the enhancement of tribal capacity, self-determination, and cultural revitalization efforts among many Tribal Nations. This paper begins by defining traditional knowledge systems and discussing challenges associated with TKS research. This is followed by a description of the governance structures and current natural resource development present on the reservation. Next, the research framework, the research questions and the methods used to approach these questions are outlined. The paper concludes with a discussion of findings, opportunities, and barriers in knowledge incorporation at Fort Peck.



## Literature Review

### What are Traditional Knowledge Systems?

Over the years, scientists and resource managers have found many ways to refer to the local and/or Indigenous knowledge systems of the original inhabitants of their study areas. This knowledge has been referred to as ethnoscience, Indigenous science, folk science, rural peoples'/farmers' knowledge, *metis*, Indigenous knowledge (IK), local knowledge, traditional knowledge (TK), indigenous ways of living in nature (IWLN), Indigenous knowledge systems (IKS), and finally traditional ecological knowledge (TEK) (Aikenhead & Mitchell, 2011; Latulippe, 2015; Scott, 1999; "What is Local Knowledge?," 2016). Whatever the chosen nomenclature, the traditional knowledge systems of Indigenous peoples were originally studied for their applications to cultural ecology, sustainable environmental ethics and development research, and climate change adaptation research.

In the early 1990s, researchers and policy makers began to call for the incorporation of Indigenous knowledge systems into environmental management and assessment. With the shift to ecosystem-based management, interest in Indigenous knowledges expanded (Freeman, 1992; Menzies, 2006). The interest in alternative knowledges overlapped with interests in questions of territoriality, property rights and common pool resources as the field of human ecology/geography progressed (Berkes, 2012; Ostrom et al., 1999). More recently, the incorporation of local knowledge into sustainable water governance has been formally identified by the United Nations' Local and Indigenous Knowledge Systems Program (LINKS) as an important application of

Indigenous knowledge systems (UNESCO, 2006; Valderrama & Arico, 2010; “What is Local Knowledge?,” 2016).

Despite decades of research on the topic, a formal explanation of what “Indigenous knowledges” research entails has yet to be agreed upon by the interdisciplinary assembly of researchers and resources managers interested in the field. Many researchers have used the term “traditional ecological knowledge” (Berkes, 2012). But, the term “traditional ecological knowledge” is difficult to define because it is a complex reality and issues arise when trying to singularly define a way of life. For instance, many scholars argue that the term “traditional” can be used to imply that Indigenous cultures are static in nature, that their knowledge is unable to adapt to modern processes, or that Indigenous peoples simply prefer to “live in the past” without the influence of the market economy—a stereotype that Indigenous scholar Kimberly Tallbear calls “anti-technology scaremongering” (Nadasdy, 1999; TallBear, 2001, p. 5). However, as Pierotti and Wildcat (2000) explain, traditional knowledge systems inherently embody responses to long-term environmental changes and the survival of Indigenous peoples for millennia, therefore encouraging the adaptability of Indigenous responses “if environmental conditions so demand” (p. 1338).

Furthermore, the use of the word “ecological” to refer to Indigenous people’s perceptions and way of life pertaining to their environmental knowledge is problematic. The field of ecology has its roots in Western science. Most Indigenous languages do not have a term for “ecology” or “biology”, making the term “traditional ecological knowledge” an oxymoron (Berkes, 2012; Whyte, 2013). In addition, many Indigenous

cultures incorporate a non-dichotomous interpretation of nature and human life that does not adhere to the strict separation of society and nature indicative of traditional Western science. Without the separation of nature and society, Nadasdy (1999) questions how an Indigenous knowledge could be separated into “ecological” or “non-ecological”.

Finally, the term “knowledge” has its own critiques, as is it describes TEK as a noun, rather than pay respect to the verb-based reality of traditional knowledge as a system. As explained by many scholars, both Indigenous and non-Indigenous, traditional knowledge systems are not just “bodies of knowledge” but a complex set of practices, worldviews, and instructions. They are a “way of life”, something one “does”, not just the knowledge about Indigenous peoples’ relationship with their environment (Bavikatte et al., 2010; McGregor, 2004; Nadasdy, 1999; Pierotti and Wildcat, 2000; Whyte, 2013). TKS embody the way a person relates to all of Creation, a “knowledge-practice-belief complex” that is unable to be separated from the people who possess and practice them (Berkes, 2012; McGregor, 2004). To avoid the use of the term “knowledge”, some authors have used the term “Indigenous ways of living in nature” (IWLN) (Aikenhead and Mitchell, 2011).

Despite these challenges, leading author Dr. Fikret Berkes defines TEK 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” (Berkes, 2012, p. 7).

This definition emphasizes the adaptive and process-driven nature of TEK.

However, the definition does not fully encompass the existence of Indigenous knowledge systems as a place-based way of living. Indigenous scholars contend that TEK is not just

a body knowledge to be archived or shared—but it is an active process and a way of living that is highly specific to the community it comes from and is inseparable from its context (McGregor, 2004; Pierotti and Wildcat, 2000; Whyte, 2013). Keeping in mind the latent assumptions and problems with these terms, we use the term “traditional knowledge systems” (TKS).

### IK and Water Governance

The term “environmental governance” is used to describe a dramatic change in the way decisions about nature and natural resources are made. In summary, these changes include a blurring of authority between the public and private realms, with greater focus on third party actors such as nongovernment organizations or actors on smaller local levels (Stoker, 1998). Research has focused on the interactions between “new” and “traditional” actors involved in environmental governance, and how new governing styles influence the decision-making process (Bridge & Perreault, 2009). As Simms, Harris, Joe, & Bakker (2016) argue, this paradigm shift can “signal greater inclusion of local and traditional knowledge to inform decision-making” in the co-governance of Indigenous water resources (p. 12).

Conventionally, collaborators may have only seen what Whyte (2013) calls the “supplemental-value” of traditional knowledge systems, i.e. their ability to supplement the research of outside interests by providing a local or historical perspective to Western scientific research or management. Instead, Whyte suggests that the “governance-value” of traditional knowledge systems should be recognized for its potential to guide Indigenous capacity building, resurgence, and decision-making processes. In other

words, how can this knowledge inform current management systems, especially in Indigenous communities themselves? Similarly, Ellis (2005) outlines two benefits of incorporating TKS in environmental policy: 1) TKS can be used to prevent and predict environmental degradation as well as inform environmental management and 2) the protection and promotion of TKS builds tribal capacity and promotes the use of TKS in environmental governance.

However, the notion that “claims about nature” can “serve as instruments of power and domination” in environmental policy, especially when voices are marginalized by the hegemonic knowledge structure, is widely recognized in the field of political ecology (Castree, 2001, p. 9; Foucault, 1980; Robbins, 2012). Much of the current research on historical decision-making processes of the twentieth century revolves around the latent power relations in these processes. Political ecologists are particularly interested in “how social actors at different scales contest the claims of other actors or resources in a particularly ecological context” (Rodríguez-Labajos & Martínez-Alier, 2015, p. 2), as well as examining how water flows towards money and power (Linton & Budds, 2014).

The study of the management of water resources in the early and mid-twentieth century has been critiqued as being historically centered on the physical aspect of water as a resource, while the socio-political structures imbedded in these processes have been ignored (Swyngedouw, 2009). Emerging research on what Linton and Budds (2014) call the “hydrosocial” cycle is changing the way scholars think about the ontological nature of water. The “hydrosocial cycle” draws attention to the historical inequities in hegemonic

water management. The authors describe the hydrosocial cycle as a way of uncovering these unequal power dynamics in decision making by showing how “social and power relations ... shape the nature and dynamics of water and its circulation, and how water is influenced by social processes occurring at a wide variety of spatial and temporal scales beyond the basin unit” (Budds, Linton, and McDonnell, 2014, p. 168). In other words, how water and society make and remake each other over space and time. Water policy-making and management gives rise to new definitions of water in specific contexts, and these realities of what constitutes “water” has the ability to affect social and cultural processes.

Feldman and Ingram (2009) similarly call for a recognition of alternative “ways of knowing” water. A way of knowing (WOK) is “how one interprets the elements in a policy space and makes sense of the relationships among them” (p. 3). The authors discuss how the definition of water varies in how it is interpreted and utilized by an individual or peoples, i.e. the cultural, political, or economic values that are placed on it, or in some cases the lack, of such values. Yet, it is important to recognize the differences between *claims* about nature and the *reality* of relationships with it. To clarify, “While ontology attempts to account for what is in the world, epistemology asks how it is possible to know the world,” (Woodward, 2009, pg. 1). As Aikenhead and Mitchell state, TKS emphasize “what nature is” whereas Eurocentric sciences emphasize “how nature works” (p. 116). This research deals with Indigenous *ontologies*, which have often been disregarded in resource management.

Furthermore, global literature on collaborative environmental governance involving Indigenous Nations and their knowledge systems has arguably excluded important discussions of Indigenous self-determination, sovereignty, and inherent rights, treating Nations as mere stakeholders or interest groups rather than sovereign entities (von der Porten & de Loë, 2014). In addition, critical Indigenous knowledge scholars have argued that simply “incorporating” Indigenous knowledge systems into current governance structures without addressing the underlying structural and political framework might further “entrench hegemonic ontologies” (Yates, Harris, & Wilson, 2017, p. 13). Therefore, it is critical to this discussion of environmental governance to address the political and historical realities of nationhood and inherent rights and sovereignty of Tribal Nations in the United States.

Indigenous Self-Determination. Federal Indian policy in the United States has undergone many changes (some structural and other arguably superficial) within the past two centuries. The Homestead Act of 1863 opened up western land for settlement by “able citizens” pursuing agriculture, but excluded Native Americans by requiring citizenship. This was the pinnacle of Manifest Destiny—the belief that Anglo settlers had a divine right to “discover” and occupy Indigenous lands in the name of “progress” (Flanders, 1998). Furthermore, as settlement pushed west, the Anglo view of land as a commodity dominated over Indigenous culture. U.S. federal policy shifted towards protecting the interests of westward expansion, and away from the protection of Indigenous Nations. In the process, the Supreme Court established Indigenous peoples as

“domestic dependent peoples”, with a trust responsibility provided by the federal government.

From the years following the Civil War until the 1930s, the Assimilation/Allotment Era aimed to assimilate Indigenous Nations into a settler-society and gain control over Native land. This was followed by a shift in policy towards “empowering” Tribal Nations by stopping the allotment of Indigenous lands and passing the Indian Reorganization Act (IRA) of 1934 (Allen, 1989). However, the IRA perpetuated assimilationist ideals by suggesting each tribe adopt a tribal constitution through negotiation with state and federal government, as well as establish a governing tribal council. These imposed western governance structures completely ignored traditional Indigenous notions of governance and culture.

With the civil rights movement, the growing recognition of Indigenous culture, and the country’s need for additional sources of energy throughout the 1960s-70s, federal policy shifted again, in this case towards increasing the power of Tribal Nations through policies of self-determination. Early manifestations of this policy approach include the 1961 Declaration of Indian Purpose, in which dozens of Tribal Nations demonstrated a desire to reduce U.S. federal authority in tribal matters, and the 1968 Indian Civil Rights Act that established Native American self-determination as a federal priority (Allen, 1989; Getches et al., 2011). In 1974, the Indian Financing Act was passed, and the following year the Indian Self-Determination and Education Act was passed, giving Tribal Nations an increased say in affairs involving the development of natural resources (Royster, 2008). Tribal Nations were now able to set up their own law enforcement



programs, and later on, their own environmental programs with the right to criminalize practices that didn't adhere to tribal environmental standards. For example, with Treatment-as-State (TAS) status, a Tribal Nation may develop its own water quality regulations and enforce them not only on tribal members, but also on nontribal members living within tribal jurisdiction (Krakoff, 2002; The EPA, 1991). In summary, since the 1800s, Tribal Nations in the United States have had *political* sovereignty—the status of a sovereign entity from the U.S. federal government. However, Tribal Nations have been increasingly expressing *practical* sovereignty by using their sovereign status in decision-making processes to conform programs (such as environmental regulation) to tribal needs and desires (Royster, 2008).

Barriers to the Implementation of TKS in Water Management. Other barriers to the implementation of TKS in resource management include a resistance to change on the part of resource scientists and managers, a skepticism about the validity of TKS among some professionals, and/or a lack of interest in working with and in Indigenous communities (Huntington, 2000). Furthermore, the entire framework that resource management rests upon is a framework created within Western institutions of governance and ethics. Scholars have argued that anything (e.g., social institutions and spiritual aspects) that isn't legible to Western thought or quantitatively presented is in danger of being “distilled out” during collaborative processes. If it is not distilled out, it is “validated” against Western scientific standards (Agrawal, 1995). McGregor (2004) calls these distillation and compartmentalization processes “a process of colonizing Indigenous knowledge” (p. 400). She argues that by taking the “environmental” aspect out of

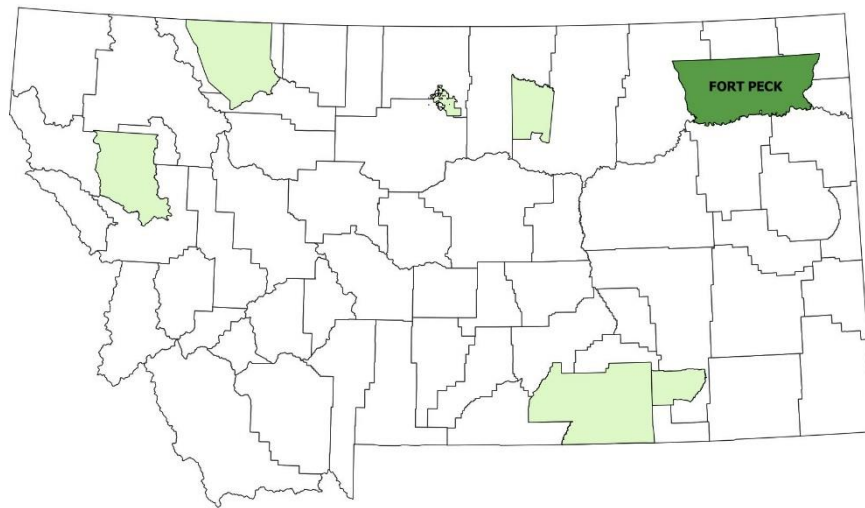
indigenous knowledges, one is removing it from its context, which is a dangerous and unethical practice that contributes to generalizations and improper applications.

For example, Nadasdy (1999) argues that “the very idea of such [knowledge] integration implicitly assumes that knowledge is an intellectual product which can be isolated from its social context” (p. 11). Nadasdy builds off of Latour's (1987) work on the social, physical, and conceptual networks involved in the production of scientific knowledge by adding that the extension of these Western scientific networks into Indigenous communities is connected to power imbalances between the two as the former renders the latter “limited and unreliable” (p. 12). Similarly, recent work suggests that in order for collaborative governance systems to work, attention must be paid to if, and how, Indigenous knowledge systems are privileged (or not) within decision-making processes and through collaborative efforts (Simms et al., 2016).

Finally, incorporating traditional knowledge systems into environmental programs and tribal decision-making is complex. It is imperative that the current issues be understood in light of the specific cultural and historical context, as well as the political and social realities of the community itself. Butler (2006) calls this “historicizing” TKS, where each community must be placed within the context of its own specific history of European contact, policy changes, and practice. In addition, due to the co-produced nature of TKS research, researchers must link shared knowledge to the experience and position of those who share it (McKenna & Main, 2013). The following two sections attempt to contextualize this research.

### Case Study Context

The Fort Peck Indian Reservation is one of seven reservations in the state of Montana. It is located in the Northeast corner of the state, and is home to the Nakona/Nakoda (Assiniboine) and Dakota (Sioux) tribes (fig. 1). The Southern boundaries of the reservation border the Missouri River. The area consists mostly of high plains grasslands, rolling hills, and wide river valleys. The climate is semi-arid, receiving on average less than 15 inches of precipitation annually (Fort Peck Assiniboine & Sioux Tribes, 2013, 2016).



*Figure 5. The Fort Peck Indian Reservation, shown in dark green. Other reservations in Montana shown in light green.*

Today, the reservation is home to around roughly 10,000 people, with 7,000 residents identifying as Native American. Over 12,000 people are enrolled as members of the Tribes, which consists of members of the Ihaŋktoŋwaŋŋa, Sisitoŋwaŋ, Wahpetoŋ, and Titoŋwaŋ bands of Dakota, as well the Wadopana, Hudu'shabina, Iyatuwambi,

Shahiya Iyeskabi, and Waziyam Winchashtabi bands of Nakoda (MILPP, 2014). The reservation itself is very rural and isolated from large population centers. Most residents live in and around the communities of Wolf Point and Poplar, while others live in or near the smaller communities of Brockton, Riverside, Fort Kipp, Oswego, and Frazer (Fort Peck Tribes, 2013, 2016).

### Fort Peck Tribal Governance

In December of 1934, with mounting concerns about the allotment process on the reservation, the Fort Peck Tribes voted against the provisions of the Indian Reorganization Act, making it one of only two tribes in Montana, along with the Apsaalooke (Crow), to do so. The current Tribal Constitution, the document that describes the rules and procedures for Fort Peck Tribal Government, was adopted in the fall of 1960. Under the 1960 Constitution, the official governing body of the Tribes is the Tribal Executive Board (TEB), which consists of a Tribal Chairman, Vice-Chairman, Secretary-Accountant, a Sergeant-at-Arms, and 12 Board members (Fort Peck Tribes, 1960; Miller et al., 2012). In addition, the governance structure includes both the Assiniboine and Sioux Councils, which were created during a General Council in the spring of 1927 in order to address the concerns of each tribe. The Executive Board members of the Assiniboine Council are elected yearly at General Council. The Sisseton-Wahpeton Sioux Council (SWSC) officially adopted a constitution in February 2001, and are formally recognized by the TEB as being authorized to speak on behalf of all Sisseton-Wahpeton Sioux on the reservation (Miller et al., 2012).

Water and Development on the Reservation. The reservation has a total land area of 2,093,318 acres, with about 926,000 of those acres being Native- or tribally-owned land (Fort Peck Tribes, 2016). As part of the formal governing body, the Fort Peck Tribes have their own environmental protection office, the Fort Peck Tribes Office of Environmental Protection (OEP), which has been in operation since 1981. The OEP has been successful in many areas, including establishing its own non-point source pollution program, as well as being the first tribe to receive Treatment-as-State (TAS) status within the general area (FPOEP, 2017). The intersection of federal, state, tribal, county, and city politics and environmental policy, as well as the checkerboard nature of reservation land ownership, creates unique challenges of jurisdiction and environmental governance on the reservation.

In context of United States water laws, formally-recognized tribal entities hold water rights under the Winter's Doctrine, which states that tribes have a vested water right that goes back to the creation of the reservation itself, and that this right is to be used "to fill the purposes for which the reservation was set aside," (Royster, 2013, p. 203; *Winters v. United States*, 1908). Water rights at Fort Peck were negotiated formally in 1983 through Montana's Reserved Water Rights Compact Commission, with the Tribes securing a substantial right to use just under one million acre feet per year (McNally, 1993).

Oil resources and energy development have historically provided a large source of revenue for both the Tribes and individual tribal members on the reservation. Oil was first discovered by Murphy Oil in the early 1950s, and the first tribally-owned well in

Northern Plains history was drilled by the Tribes in the 1980s (Miller et al., 2012). However, from the 1950s to the 1990s, this conventional oil and gas development led to the contamination of 15-37 billion gallons of groundwater in the shallow aquifer underlying the oilfields north of Poplar, Montana, the tribal headquarters (Thamke, 2014). The groundwater resources that were contaminated had historically been the only source of drinking water for residents of Poplar. Currently, remediation of the southeast corner of the contamination plume is being conducted by Pioneer Natural Resources (PNR), a company formed by a merger that included one of the parties responsible for the contamination (Mesa Petroleum) back in the 1990s. However, the majority of the plume remains in contact with groundwater resources.

### Positionality and Research Questions

#### Positionality

Positionality refers to “aspects of social identity” and privilege that are “articulated as positions in a multidimensional geography of power relations” (Rose, 1997, p. 308). Positionalities embody researcher age, sexuality, income, education level, gender, race, and more. Some scholars have argued that researchers’ positionalities, including both power and privilege, have the potential to affect the entire research process. Therefore, personal reflection is critical in addressing these potential power imbalances (Muhammad et al., 2015). The idea that researcher identity, assumptions, and intentions can reinforce or reproduce existing inequalities in the research relationship and influence research outcomes has been extensively discussed by feminist theorists as well

as Indigenous scholars the last several decades (Haraway, 1988; Smith, 2012; Wolf, 1993).

It has been widely acknowledged that it is impossible to completely and transparently situate oneself within one's research (Rose, 1997). Nevertheless, it is important to attempt to situate the authors within the research topic and among research participants by addressing our own personal intersections of researcher identity and status. Following the recent examples of authors who have situated their work in this way, the first author explains her own positionality as a researcher and then situates this work within the existing categories of traditional knowledge literature (von der Porten, de Loe, and McGregor, 2016).

First-author Positionality. Cažé mitawa Tašiyapoba Wįya ħįnkna Dionne Zoanni wašįjubí emagiyabí. As first author, my positionality first and foremost includes my identity as an enrolled member of the Fort Peck Assiniboine and Sioux Tribes. I am Nakoda (Assiniboine), Wadópana (Canoe Paddler) band. However, I am also a person of European descent on my father's side, and thus approach this research with a multi-racial perspective due to the various influences in my upbringing. My background has the potential to affect the way people interacted with me, including the trust they placed in me and their willingness to open up about the sensitive information I wish to discuss throughout my research.

To add to this complex identity, I am an Indigenous researcher doing research within my own Indigenous community. I am what has been termed an "insider-outsider" (Muhammad et al., 2015; Wolf, 1993; Zinn, 1979). While being an insider may hold such

advantages as being able to potentially ask more relevant questions, being able to form more trusting relationships, and being familiar with local history and culture, it can also complicate the research process due to additional responsibilities, assumptions, and accountabilities with one's own community (Smith, 2012). While working with my home community and remaining accountable to them through data sharing and discussion, I am also navigating through my own space in academia as a graduate student, and am required to answer to the demands and rigor of conducting research in such a space. The need to walk in the two worlds of academia and my own community complicates the research process immensely, as they tend to be two very different worlds with different approaches to knowledge and different expectations of research priorities.

In summary, my own identity and status has the potential to affect the research process, and consequently the outcomes of this research. Nevertheless, my researcher identity has also helped to foster my interests in my culture, water quality, and the future of environmental governance at Fort Peck.

Co-author Positionality. As co-authors, we have offered our academic expertise in areas of political ecology of water, energy resource geography, and community-based participatory research on Fort Peck. Although we all identify as non-Indigenous, two of us have been involved in research efforts with Fort Peck tribal members and are familiar with the culture and landscape.



### Situating the Work: Research Questions

The first goal of my research was to understand the Indigenous knowledge systems that surround water and its use for both Nakoda and Dakota people at Fort Peck. Interview questions were designed to ask participants about the values associated with water and what the term “traditional” or “Indigenous knowledge” means to them. This goal aligns with the relational approach to TK research, which “tends to emphasize the relationship between knowledge, place, and practice” (Latulippe, 2015, p. 122) of Indigenous ways of knowing and relating, and links these knowledge systems to various approaches to environmental governance.

The second goal of my research was to understand what the tribal members at Fort Peck actually thought about incorporating their knowledge systems into water governance systems on the reservation, specifically in terms of tribal oil and gas development and water quality. Did they think incorporating TKS would be beneficial? Why or why not? What are some of the ways the Fort Peck Tribes could go about this as a Tribal Nation with goals of self-determination? What are some of the challenges they might expect in attempting to do this? This aligns with the collaborative approach to TK research, which has traditionally sought to “blend divergent approaches and enhance environmental governance through mutual respect, learning, and the maturing of working relationships,” (Latulippe, 2015, p. 124).

Finally, the critical aspect of this research emerged during the interview process. The critical perspective in TK research focuses on colonial influences and power imbalances ever-present in the co-governance of environmental resources between

Indigenous and non-Indigenous decision-makers, and calls for structural change in policy and collaborative approach in order to remedy these barriers (Latulippe, 2015). Several challenges and barriers to collaboration involving ontological pluralities, colonial influences, and power structures in the current systems of environmental governance at Fort Peck emerged throughout the interview process, underscoring the political nature of environmental research (Robbins, 2012).

### Methods

Methodologically unsound and biased research has plagued Indigenous communities for centuries. Hidden power dynamics, colonialist policy, non-contextual methodologies, and stereotypes have contributed to an unbalanced environment between Western scholars/resource managers and Indigenous communities (Smith, 2012)<sup>2</sup>. Therefore, this project sought to incorporate aspects of community-based participatory research (CBPR) into its methodologies. CBPR methodologies have emerged as a way of emphasizing local priorities, data sharing, context-specific methodologies, researcher reflection, and equitable community participation and capacity building (Cornwall & Jewkes, 1995; Israel et al., 2013; Rosenthal et al., 2014). This research approach, combined with Indigenous methodologies, has been applied to various projects within North American Indigenous communities and has aided in building and maintaining trust within the community as well as creating context-specific and community-led research

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<sup>2</sup> It is important to note that these two categories are not exclusive.

methodologies and outcomes (Christopher, Watts, McCormick, & Young, 2008; Rasmus, 2014; S. Wilson, 2009).

The first step taken in the research process was to connect with both Dakota and Nakoda spiritual leaders (i.e. “key informants” in Western nomenclature), to gauge their interest in the topic and the relevance of the issues to be discussed, and to receive input on the questions that would be asked (McKenna & Main, 2013). These key informants were people who are considered spiritual leaders by many tribal members. These key informants also helped to clarify and contextualize Indigenous methodology.

After these conversations, 18 semi-structured interviews were conducted with elders and other knowledgeable men and women within the community during the spring of 2017. These interviews were conducted in a conversational way, using open-ended questions, to allow participants to share their stories and traditional knowledge systems in the way they deemed most appropriate, without the worry of time constraints (Trimble, Sommer, & Quinlan, 2008)<sup>3</sup>. Participants were selected based on their position within the community using snowball sampling techniques (Hay, 2010). Ten of the interviewees identified as Dakota tribal members, and eight as Nakoda tribal members. After transcribing, the interviews were analyzed using NVivo software (Version 11) to code for themes throughout the interviews (Hay, 2010). After completion of this step, key informants were contacted to obtain valuable input on initial results, and for advice on appropriate dissemination techniques. The summation of these research efforts and copies

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<sup>3</sup> All tribal and University IRB procedures were followed. Interviews were conducted and recorded with the expressed informed consent of interviewees. When very personal or spiritual information was shared, the recorder was turned off at the request of the interviewee, and this information will not be shared.

of each of the transcripts were back to participants and discussed with tribal officials involved in environmental decision-making processes on the reservation in Fall 2017.

## Results and Discussion

### TKS: A Protean Concept

One of the very first questions that interviewees were asked was what the concept of “traditional knowledge” meant to them. This question was asked so that the term could be contextualized to the specific history at Fort Peck and its tribal members. The following examples offer various definitions of traditional knowledge, as well as important insights into some of the challenges with defining traditional knowledge.

Traditional knowledge is the knowledge of our people, of our ancestors, that were brought down. And it’s been carried on from generation after generation.

Traditional knowledge is knowing about life, taught in the Dakota way.

I think for me, there’s no such thing as “traditional knowledge”, and there’s no such thing as “formal knowledge”, because if you’re raised like I was by my grandparents, as you grow older you integrate those two until they form a very strong fabric and give you your strength of your environmental perspective on what needs to happen for things to work.

I think it’s [TK] just having that understanding of the four directions. Understanding what’s going on in each direction, and everything that happens between those directions, and having that good understanding of what sits in those directions, as it pertains to life. As it pertains to us getting up in the morning, and going to bed at night. And being thankful for everything.

Traditional knowledge is just an understanding—a belief. A sense of inclusion in our original relationships with the earth, and all the things that consists of the earth. Understanding our stories, how we got here. Understanding our relationships with different other entities. Plants and animals. And with each other.

In the context of Fort Peck, traditional knowledge systems include the relationships and histories between ourselves and other living entities, taught in a way specific to our living histories. For some, this knowledge system is inseparable from other knowledge systems, such as those based in Western knowledges, as they interact and intertwine throughout life. Defining knowledge systems in this context-specific way shows that the term can mean different things to different people within a Tribal Nation itself. It is critical to take into consideration intratribal differences when defining the knowledge systems of a body of people.

#### Water: Traditional Values and Ways of Knowing

The ontological properties of water as an entity were discussed extensively throughout the interview process. By asking participants, “How did you come to know water?” through process and relation, rather than asking about specific aspects of water, participants in this study were able to share their knowledge of water in the way they deemed appropriate, whether that be through personal anecdotes, knowledge of historical water issues on the reservation, or stories that were passed down to them about the spiritual importance of water.

10 Ways of Knowing Water. In conversations with interviewees, there were ten traditional values and ways of knowing water that were most commonly discussed, including (Table 1):

- Water **has inherent cleansing properties**. It has the potential to purify and wipe away negative energy and is used in various ceremonies to cleanse.

- **Water has the ability to heal.** Several elders told stories of water working wonders on the human body and spirit.
- **Humans are made of water.** Interviewees/elders stated on many occasions that most of the human body is water and that it is impossible to live without it.
- **Water is life, or “mni wiconi”.** This chant from the recent conflict at Standing Rock Indian Reservation in North Dakota echoed across the globe, as Indigenous people from around the world gathered in solidarity against the construction of the Dakota Access Pipeline (Sisk et al., 2016). This traditional phrase is common among both Nakoda and Dakota peoples at Fort Peck. The concept has two meanings. As one elder explained, most think that “water is life” simply means “water gives us life, and without it we wouldn’t survive.” It does mean that, but it also means “the life force that is within water.” Just as we ourselves have a life force within us, so does everything on Mother Earth.
- **Water has a spirit.** Many interviews spoke of water as a living entity.
- As much as water has the ability to give life, it also **has the ability to take life away.** Interviewees described how the force and natural cycles of water contribute to its powerful nature.
- Because of its powerful nature, **water should be respected.** This includes respect by individuals who use water, as well as by those who manage water and make water-related decisions for the larger community.
- **Water is gendered.** Although this aspect of water was less commonly mentioned, it was clear that there is a close association between water and women. As one

interviewee explained, both water and women have the ability to give life and both are highly respected for this within the culture. Others mentioned the sacred process of being born into water in the womb of our mother.

- **Water is sacred.** Water is considered sacred for each of its attributes mentioned above.
- **Humans are environmental stewards** of the land to protect water and hold it sacred not only for the health of our communities, but for the water’s health as a living and influential being.

While this is not an exhaustive list of traditional values and ways of knowing water, these are the key themes that emerged during the interviews. These values and ways of knowing shape the relationship between interviewees and water resources on the reservation.

Table 1. Water: Values and Ways of Knowing

The Value of Water	
Water cleanses	<b>Water is powerful, it can take life away</b>
Water heals	<b>Water is respected</b>
We are made of water	<b>Water is gendered</b>
Water is life (Mni Wiconi)	<b>Water is sacred</b>
Water has a spirit	<b>We take care of water</b>

Water and Ceremony. Almost every interviewee, save one, mentioned the importance of water in ceremony. It is important to note that while Dakota and Nakoda share some similarities in their ceremonial practices, there are specific ways of conducting ceremonies that differ between the two tribes. However, water is used extensively in both

tribes' ceremonies, whether it is pouring water on rocks in inípi/iníbi (sweat lodge) to purify the mind and body, using water to make traditional medicines, or allowing water to teach the soul what it means to go without water. Rather than focusing on the specific sacred and intimate ways in which water is used during ceremonies, interviewees/elders focused on their relationship with water during ceremonies, such as:

I think every ceremony I've ever been to, water is involved somehow, either with the food or used as a blessing, or in sweat lodges [...] So, it's involved with every aspect of our culture.

So in all of our ceremonies, the water is utilized and respected. And if some people say, 'Well, not all ceremonies have water in it,' look around you. The people in the ceremony *are* water.

One of the main rites in both Dakota and Nakoda traditional culture is to experience deprivation to create a better understanding of life. When fasting, one goes without water for days. Prayer, isolation, spiritual connection, and concentration are very important during this time. Along with teaching one's place and purpose in life, interviewees noted that fasting teaches the importance of water.

And we always believed that until men go through that, they don't understand their role in life. And it's out of that that we get our values, and so we're teaching them the value of something that they take for granted, as a drink of water. How special that is. How special it is.

### The Incorporation of TKS at Fort Peck

What follows are two sections on the incorporation of TKS in water governance at Fort Peck. The first section deals with the incorporation of TKS into collaborative efforts with outside entities, while the second section explores opportunities of incorporation within internal reservation processes.



Traditional Knowledge Systems and Collaboration with Outsiders. When I explored community perceptions on sharing local knowledge systems with outside entities—such as oil companies interested in working on tribal land—and whether those companies should try to understand or incorporate traditional knowledge systems and values into how they collaborate with tribal leaders, I received varied responses. For those interviewees that thought that this was an important process, most decided that outside entities should simply understand that this is tribal homeland and seek to understand why tribal members perceive this land the way they do and appreciate the importance of water in ceremony. Many interviewees were especially concerned about the protection of many sacred and historical sites that span the reservation. Some participants felt strongly that companies interested in working on tribal land should first contact the tribal cultural department and collaborate with traditional and tribal government leaders to become culturally literate, especially in terms of the respect that is given to water and the cultural sites located in and around oil fields. For example, one elder stated:

And so in that, I believe that the people coming here have to be culturally aware that, although we don't speak about it, we live it. And so there's this certain respect that we have, especially ceremonial time.

Another reasoned:

It [the incorporation of TKS in collaboration] should be one of the main priorities because the Native American people were here before anything else. And our way of life, and all our people, should be respected.

Interviewees highlighted two examples of how traditional knowledge has been incorporated into tribal governance and community development. The first example

describes how spirituality was incorporated into a modern, multi-million-dollar water treatment plant that was completed by the Fort Peck Tribes and serves much of Northeast Montana, including non-reservation communities. This treatment plant was built in response to a 15-37 billion gallon groundwater contamination that occurred a result of conventional oil development on the reservation from the 1950s-1980s (Thamke, 2014). It was also built, in part, as a response to poor water quality related to agricultural activity (Nimick & Thamke, 1998). The entire pipeline is slated for completion by 2030, but completed portions have been serving the highest-populated reservation communities for a few years. Before the treatment plant opened and began pumping water from the Missouri River, two traditional leaders from each tribe were asked to visit the intake site to do a pipe ceremony for the water. Elders explained that tobacco was offered to the water spirit, and that the water was asked for protection from disease for tribal members, and was thanked. The water was shown respect not only for its protection of tribal members, but for its own existence as a living entity.

Another example of how traditional knowledge has been incorporated into environmental management involved a knowledge-sharing process with an oil drilling company from Texas. This company created a camp north of Poplar for elders so that the elders could look for sacred sites and ensure that they were not disturbed by the drilling process. During the camp, the company explained to the elders what the drilling process would entail, and showed them photographic examples. The elders were then able to share place-based knowledge with the company representatives in what was interpreted as a very valuable knowledge sharing process.

Barriers to TKS and Collaboration with Outsiders. While the interview protocol was not designed to explicitly probe for issues related to TKS implementation, the community voiced many concerns and challenges that they saw as possible hurdles to TKS incorporation and collaboration.

As discussed, the integration of knowledge systems may hide power relations and agendas; integration efforts must pay special attention to this (Nadasdy, 1999). Many interviewees were concerned that a lack of recognition of traditional knowledge systems from the broader society would create a challenging atmosphere for collaboration. For example, one participant believed that “a lot of people don’t understand who we are, what we are, and why we are in respects to First Nations people.” Another shared, “I don’t think you’re going to be able to make a money man understand any culture.” The threat still exists that as tribal leaders seek to involve tribal members and initiate collaborative processes with outside interests, the incorporation of traditional knowledge systems in decision-making processes will face further scrutiny and its validity will be challenged.

An example of the lack of recognition of Indigenous self-determination, knowledge systems, and concerns can be found in recent meetings concerning the Keystone XL Pipeline between TransCanada and the Fort Peck Tribal Executive Board. When Board members expressed concerns of past water quality impacts caused by industry as well as the meaning of water to the reservation’s population, Corporate representatives simply presented more numbers, figures and other “empirical evidence” and emphasized the promised “safety” of the proposed pipeline route. Recognition of tribal concerns and self-determination was largely absent in those first meetings, while

the overbearing authority of Western science and values was entirely present (Azure, 2017).

As other studies have found, when collaborating with outside interests on environmental projects directly related to tribal welfare, Indigenous peoples are often treated as interest groups rather than sovereign entities whose actual concerns, inputs, and ontologies are seen as irrelevant to formal discussion, or as something less than the “truth” of Western science and management (von der Porten & de Loë, 2014; Yates et al., 2017). In order for true and equitable collaborative processes of environmental governance to work, these political and cultural realities must be not only acknowledged but applied to collaborative decision-making processes.

Opportunities for TKS and collaboration with outsiders. Interviewees who were in favor of sharing traditional knowledge saw two pathways for achieving this. First, the outside world should be made aware of their unique relationships and spirituality associated with water. This pathway involves tribal members continuing to actively share—not only with the community but with the world—that both Nakoda and Dakota people have a very specific, sacred, and unique relationship with water. By sharing their traditional knowledge systems, interviewees hope that their relationship with water and their ways of knowing water will be recognized and understood as *realities* by people both inside and outside the reservation, especially as they make decisions that shape the future of water use and development on the reservation.

As part of this first pathway, the Tribes have recently begun developing a GIS layer of cultural sites, aided by collaborative efforts with outside researchers, so this

information is readily available for tribal employees to access when consulting with outside entities. However, it is important that these entities establish a trusting relationship with the department and express interest in the protection and preservation of cultural resources (Burney, 2014).

The second proposed pathway seemed especially promising—creating policies that incorporate environmental values and ways of knowing. As a sovereign Tribal Nation with inherent rights to land and water resources on the reservation and the ability to apply environmental restrictions and tribal policy to govern these resources, the Fort Peck Tribes are in a unique position to answer participants' call for policies based in traditional knowledge systems. Creating environmental policy informed by TKS might also address the issues involved with the expression of traditional knowledge systems to outside interests.

The incorporation of traditional knowledge systems in environmental management does not necessarily imply putting these systems into the terms of Western science and management. Examples of Indigenous environmental and relational ethics, the spiritual importance of water, and human responsibilities to all of Creation are present throughout much of the literature on Indigenous water governance, especially in the Canadian context (McGregor, 2014; N. J. Wilson, 2014). For instance, McGregor (2012) discusses the collection of water-related teachings and understandings of 80 First Nations Elders in Ontario. Traditional leaders drafted a “Water Declaration of the Anishinabek, Mushkegowuk and Onkwéhonwe” which was then adopted by the Confederated Chiefs in Assembly and used to inform environmental decisions. The Declaration discusses the

spiritual, animate, ethical, gendered, and sacred aspects of water. Of special interest are declarations ix. and x., which state that planning for water governance must take a long-term approach and that the knowledge regarding water must be shared, respectively. Another example of an Indigenous declaration exists within the Syilx Nation Siwllkw Declaration, which outlines the Syilx relationship with water, current issues with water governance, and the inherent title, rights, and responsibilities that the First Nation has in relation to their water resources (Syilx Nation, 2014).

Interviewees' desire to involve elders and traditional leaders in tribal water governance and environmental protection processes can potentially be addressed through the involvement of these leaders in the drafting of similar environmental policies and/or declarations. This would involve a community-led, bottom-up approach to tribal environmental policy, meant to guide tribal decision-makers and natural resource professionals as they continue to make internal decisions—often involving outside interests—about the future of tribal water resources. These policies could blend the diverse traditional knowledge systems on the reservation as well as the capacities of the Tribes' Environmental Protection, Reality, and Natural Resources offices. In doing so, community partners should be sure to acknowledge diverse perspectives by addressing intratribal and even potentially *intriband* differences in knowledge systems. These initiatives can provide positive outcomes for tribal self-determination, whether they are used in collaboration with outsiders or not (von der Porten et al., 2016). By creating place-based and TKS-informed policy, the Fort Peck Tribes can continue to take control

of their own environmental destiny through the involvement of community leaders and the expression of tribal self-determination and natural resource sovereignty.

Traditional Knowledge Systems in the Community. Many interviewees felt that it was more important for tribal members *themselves*, especially tribal leaders, to understand traditional knowledge and ways of living. For example, one elder maintained throughout her interview:

I believe that all the answers to all of our problems is in our culture. We have answers for everything.

A portion of each interview focused on brainstorming ideas for how traditional knowledge systems are – or could be – incorporated into tribal water governance. In order to incorporate these systems into decision-making processes, the majority of participants agreed that education is key. Many saw a disconnect between traditional values and decision-making processes. In order to have this viewpoint heard, it was suggested that elders or other traditional leaders approach tribal leaders on these issues. Others suggested that the decision-makers (i.e., those in the tribal government structure) should start educating themselves in the cultural traditions, learn their language, and understand the land intimately. This knowledge would help to ensure that they would have the traditional value system present when making decisions—especially those related to future resource development. As a starting point, one elder suggested direct community involvement the following way:

My hope is that they [the Tribal Executive Board] will hold a General Council or they will hold some kind of open forum to get the opinions of people. Because our sacredness and our spirituality is our survival. Our spirituality, that incorporates respect for water and earth. All the things that God gave us. All these things have to come together, and they have in the past, and they've helped us to survive.

Another added:

So, at the end of the day, they [tribal leaders] have to have that traditional knowledge, so that when these companies come in, they have the understanding of how this is best going to serve our people. [...] where we might miss out on some money, but we save our land. Because that's all we have at this point.

Barriers to TKS in the Community. The first major challenge that surfaced was that interviewees perceived a lack of understanding, recognition, and acknowledgement of traditional knowledge systems and values in the community. Many interviewees lamented that, because of colonization and missionary influences and the resulting cultural loss on the reservation, current leaders and community members simply do not have the traditional background or deep environmental knowledge to incorporate TKS.

The following quotes are from two participants that shared this perception:

But it's hard to get people to come back to this way of life. This is the way of life that was given to them, from all eternity, but they have also been told to fear this way of life. And that's a huge, huge hurdle for people like myself, who are trying to encourage that kind of spirituality.

We function and operate as Westerners now. How do you get back to a cultural perception? It's tough to do. How do you get back to sitting around smoking the pipe and telling the truth when politics has dirtied our minds, and dirtied us to be able to talk bad, write bad in the paper?

When cultural loss surfaced during the interviews, interviewees often discussed a "generation gap" between the older generations and youth. This gap in traditional



knowledge and ways of knowing was mostly attributed to historical factors and trauma. For example, many brought up how forced boarding schools limited the acquisition and sharing of cultural values and practices. Others brought up the influence of drugs and alcohol on community cohesion and family structure. Finally, some discussed the arrival of missionaries on the reservation, and how they perhaps contributed to the erosion of traditional belief systems. The occurrence of these colonial processes are articulated in the following quotes:

A lot of it is because of the drugs and alcohol. That's the two main things. That's why our families aren't the way they used to be. That's the two main things, right there. And a lot of our children aren't learning about their way of life, our way of life. The Indian way of life. They're not learning about it.

Religion was actually illegal here. And so what our people did—and I grew up in that—I didn't know that you traditionally did ceremony during the day, because when I grew up, it was all done at night. They did it at houses where they turned all the lights off outside, and they darkened the windows. You couldn't see. It was pitch dark. You'd pull up to a place, and it'd be pitch dark, and we'd have ceremony all night. And we'd go home. And this was in the 50s and the 60s, because it was illegal. And during the day ... I used to always say, 'During the day I'm Christian, I'm Catholic. But at night, I'm Indian. I'm Indian.'

While historic loss and trauma poses a major challenge to TKS, other participants expressed concern about the practicality of TKS incorporation into environmental governance. What does this actually look like? What are some of the methods that other Tribal Nations have used? The “incorporation” process is easy to contemplate, but actual implementation can prove difficult for reasons previously discussed. One elder explained that as long as there's a “disconnect” between traditional knowledge systems and actual application, incorporation is “not going to make any logical sense.”

Opportunities for TKS in the Community. Many interviewees felt that the best way to incorporate TKS is to build capacity within the community itself through cultural revitalization, decision-making tools, and education, so that current and future leaders have the necessary educational and cultural toolsets to address environmental and cultural issues. This is directly in line with the aforementioned “governance value” of traditional knowledge systems, which suggests that these knowledge systems must be recognized for their potential to guide Indigenous capacity building, resurgence, and decision-making processes (Whyte, 2013).

The most commonly mentioned way of incorporating TKS was through community education initiatives, which would provide a long-term, organic solution. Building community capacity through cultural revitalization techniques and tribally-led environmental education programs will help address the historical trauma and loss and information gaps the community faces. This pathway for incorporating TKS involves building tribal capacity and empowering community members themselves through:

- The creation of additional tribal jobs in water development and remediation
- Policies that incorporate environmental values and ways of knowing
- Educational opportunities related to environmental health, tribal natural resources, and culture
- Cultural revitalization.

Several programs have already been implemented and many interviewees find hope in the youth of the community. For example, the Fort Peck Assiniboine and Sioux Tribes Language and Culture Department (FPLCD) has been addressing the challenge of

culture and language revitalization in recent years. The cultural vision of the FPLCD includes goals to:

increase the language revitalization and cultural restoration with our Nakona and Dakota communities. This vision foretells our youth being embraced daily with our cultural ways of knowing, speaking our language, hearing our elder stories, hearing our creation stories, understanding and perpetuating our history, singing our traditional songs, sharing our ways of dance, living and perpetuating our seven sacred rites of Pte San Win (White Buffalo Calf Woman) and Traditional rites . [(FPLCD, 2017)]

The educational vision includes:

the emergence and acceptance of our traditional languages and cultures, into the daily lives of the people to instill a rebirth of their cultural identity, which is dignified to become an integral part of their contemporary lives. [(FPLCD, 2017)]

The FPLCD has been extremely successful in the implementation of various programs in recent years. Past initiatives include Dakota and Nakoda “language bowls”, the development of two separate language applications for mobile devices, summer community immersion programs and classes, and the development of language booklets and K-12 curriculums that incorporate culture and language (FPLCD, 2017).

While some interviewees were concerned that incorporating TKS into tribal environmental governance was not practical, it is worth mentioning that several frameworks and opportunities involving capacity-building programs have emerged in the northern United States. For example, the American Indian College Fund, which invests in Native American students and tribal colleges to “transform lives and communities”, has recently established its Scholarly Emergence for Environmental Design and Stewardship (SEEDS) program. The SEEDS program is of interest to the Tribes because of its mission to help fund tribal colleges and universities (TCUs) in Montana that wish to integrate

place-based and inter-generational knowledge exchange to “build program, faculty development, degree programs, and student success in the field of environmental sciences and related fields” (AICF, 2017).

The potential relevance and application of projects like SEEDS to Fort Peck was noted throughout the interviews. For example, interviewees mentioned Fort Peck Community College as a space designated for accomplishing goals of tribal capacity building through education and cultural revitalization. Additionally, interviewees noted that concerns of tribal water governance involved not only concerns over the lack of traditional knowledge systems present, but also the lack of environmental education of community members regarding conservation and water quality.

In sum, interviewees shared their desire to take control of their own environmental destiny by empowering tribal members, sharing Indigenous relationships with water, revitalizing local knowledge and culture, and continuing to evolve as a community. A well-respected female elder summarized the sentiments about sharing traditional ways of knowing and relating to water and the general worldviews that was expressed by many interviewees:

I think today we're going to have to start sharing our knowledge and our feelings about certain things, and especially water. It is a living force, and in order to respect and to continue to share our life with it, to communicate with, we need to share that we have songs, and we have prayers, and have offerings. All of those things create the spiritual connection that we have. I don't want to just say we have a spiritual connection without telling you that we make offerings, that we have songs, and we pray. Those are essential.

### Conclusion

This paper has discussed the hydrosocial relations, traditional knowledge systems and ontologies of Nakoda and Dakota tribal members on Fort Peck Indian Reservation. Several examples of the challenges and opportunities both groups perceive in incorporating their knowledge systems into tribal water governance processes have been discussed. Challenges to validity, process, and relevance due to political histories and power imbalances, as well as diverse intertribal knowledge systems, may impede the successful integration of Indigenous knowledge in collaborative water governance initiatives with outside interests. These challenges must be explicitly addressed and contextualized throughout collaborative processes of environmental governance.

Tribal policies that seek to incorporate traditional knowledge systems into Indigenous governance regimes can potentially foster collaborative knowledge sharing between Indigenous Nations and those solely educated in Western resource management. Importantly, tribal policies also uphold the expression of tribal self-determination, i.e. the “governance-value” of traditional knowledge systems. The internal knowledge sharing process has the potential to enhance cultural revitalization efforts on the reservation – which represent an organic solution that takes place from within the community itself. Collaborative environmental management must be safe from stereotypical assumptions often underlying decision-making processes. True equity in Indigenous water governance exists only when Indigenous Nations are respected as self-governing sovereign Nations with inherent rights.

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## CHAPTER FIVE

## CONCLUSION

From the moment tribal members living within the East Poplar Oil Field began noticing the strange colors and odors flowing from their faucets to the recent events at Standing Rock Sioux Reservation and the debate over the Keystone XL Pipeline, concerns for water quality and community welfare have been mounting among Fort Peck community members and tribal leaders. Assertions of the validity of traditional knowledge systems, tribal sovereignty, and water quality are emerging on the reservation and across the country as tribal leaders continue to vie for an equitable role in collaborative decision-making processes, especially those that have the potential to adversely affect tribal environmental and community health.

As stated in the early chapters of this thesis, my researcher positionality has shaped my interests in these issues and influenced my desire to come back to my reservation and discuss with tribal leaders the possibility of incorporating traditional knowledge systems into water governance systems on the reservation. Scholars who take the collaborative and relational approach to traditional knowledge research have underscored the importance of understanding and acknowledging the “governance value” of traditional knowledge systems, i.e. their ability to inform tribal decision-making processes, which has been shown to enhance tribal capacity, self-determination, and cultural revitalization efforts for Tribal Nations who take this path. I wanted to know if similar processes of knowledge incorporation could occur or were of interest to community members at Fort Peck.

I approached these questions through the lens of political ecology, specifically by focusing in on the “hydrosocial relations” or ways of knowing and relating to water resources on the reservation. By doing so, I hoped to understand the values associated with water, the definition of traditional knowledge for our tribal leaders, and the potential challenges and opportunities associated with knowledge incorporation. The process began with the contextualization of the political, historical, and social framework within which environmental decisions are made on the reservation. The historical contamination of potable water resources and the desire for economic development on the reservation shape these decision-making processes in various ways. In addition, Federal Indian Policy, tribal water rights, and the checkerboarded nature of tribal land and mineral ownership underscores the complexity of these processes.

As shown throughout this thesis, the desire for traditional knowledge incorporation is present among tribal leaders at Fort Peck. Nakona and Dakota traditional knowledge systems value water as a powerful living entity with inherent rights and sacredness; water is a respected relative. However, the process of incorporating these values within the current governance system would involve facing several challenges, most deep-rooted within the political histories of colonization and Federal Indian Policy present among tribal lands and peoples in the United States. These challenges include challenges to validity, process, and relevance due to political histories and power imbalances, as well as diverse intertribal knowledge systems. These challenges may impede the successful integration of Indigenous knowledge in collaborative water governance initiatives with outside interests, and must be explicitly addressed and

contextualized throughout these processes in order for collaboration to be truly equitable and successful.

One thing is for certain at Fort Peck: Hope is placed in youth, and in future generations. These future leaders have seen what can happen when Tribal Nations do not get an equitable seat at the table. Some have heard stories of “dirty water” from their neighbors, others have witnessed the events at Standing Rock firsthand. By closing the generation gap through cultural revitalization activities and continuing to promote educational opportunities on the reservation, the community hopes to create culturally-conscious and intellectually-capable tribal leaders who will continue to promote the protection of tribal water resources and the acknowledgement of traditional knowledge systems for years to come.

### Future Directions

Future work at Fort Peck would continue to invest time getting community members and traditional leaders involved in the discussion of knowledge system inclusion by addressing differences in opinion and with tribal members of diverse backgrounds. This process would work to create inclusive spaces for these discussions and would use community-based participatory research, allowing tribal members an equitable role in the research process.

Future related work outside of Fort Peck might explore and review current or potential Indigenous policy initiatives in the United States that incorporate traditional knowledge systems within the context of current federal Indian policy. This work should address the potential limits current U.S. environmental policy might pose to tribal self-



determination regarding the expression of traditional knowledge systems and water resources. Research on the processes and opportunities U.S. Tribal Nations have taken to develop these policies might be helpful in guiding and informing future policy initiatives within other Tribal Nations, provided context is taken into consideration and applied accordingly.

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