

Using a Value-based Approach for Informing Environmental Decision Making on Water
Security for Two Tribal Nations

Clarita Lefthand-Begay

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Reading committee members:

Elaine Faustman, Chair

Robert T. Anderson

Michael G. Yost

Other committee members:

Howard Frumkin

Patricia Cirone

David Fuller

Program Authorized to Offer Degree:

Department of Environmental and Occupational Health Sciences

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Clarita Lefthand-Begay

University of Washington

Abstract

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Clarita Lefthand-Begay

Chair of the Supervisory Committee:
Professor Elaine Faustman

Department of Environmental and Occupational Health Sciences, University of Washington, Seattle, WA and the Institute for Risk Analysis and Risk Communication, Seattle, WA

Water is central among indigenous cultures that depend on healthy ecosystems for their well-being. The value systems of indigenous peoples links their past to their present, determines what is significant to them and guides their sustainable practices as first stewards. In the present, numerous pressures are threatening their water security, thereby threatening their cultural, spiritual, physical, and economic health. For example, in some communities infrastructural limitations, contaminated drinking and surface water, extreme weather events and other factors challenge their accessibility to safe water.

Using case studies our research consisted of two Parts. In Part 1, we examined the opportunities and barriers experienced by two tribes when applying for the Environmental Protection Agency's Treatment in the Same Manner as a State (TAS), and the challenges faced when implementing water quality standards (WQS). For this part we conducted in-depth interviews with natural resource employees. In Part 2, we aimed to understand the cultural values expressed by two tribes in order to develop a means-ends network, value trees and performance measures. To understand the values, we held focus group interviews with tribal

community members, then utilized a structured decision-making approach to organize culturally driven objectives and actions to meet water insecurity needs.

Our research ranked the most demanding challenges experienced by these tribes when seeking to develop WQS under a federal framework. Furthermore, we learned about tribal values that can inform decision-making, and also issues that hinder water security. Values were used to develop a means-ends network, objectives hierarchies and subsequent performance measures for achieving water security. Understanding values allows us to inform environmental policies as to attain healthier communities. Lastly, this value-based approach may aid the incorporation of indigenous value systems into environmental management for tribes.

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Chapter 1: Introduction

This work was guided by four research questions aimed to understand the barriers and opportunities that tribal natural resource departments follow when they seek to develop tribally based water quality standards. This work also sought to highlight the cultural water security values held by two tribes. These research questions (RQ) frame my doctoral work:

- RQ1: What are the most important barriers and opportunities in applying for treatment in the same manner as a state (TAS)?
 - Specific Aim 1: We will interview 1-2 natural resource department employees to explore the opportunities and barriers experienced when applying for TAS.
 - Specific Aim 2: We will rank the barriers and opportunities of TAS.
- RQ2: What are the most important barriers and opportunities in developing water quality standards (WQS)?
 - Specific Aim 3: We will interview 1-2 natural resource department employees to explore the opportunities and barriers that are experienced by natural resource departments when developing WQS.
 - Specific Aim 4: We will rank the barriers and opportunities to developing WQS.
- RQ3: Does the CWA and WQS adequately protect the health of tribal members and the environment?
 - Specific Aim 5: Examine ways in which the water quality standards do not meet their intended goals within these tribal communities by examining the environmental issues faced by these communities.
- RQ4: Can cultural values be incorporated into a value tree for natural resource managers?

- Specific Aim 6: We aim to characterize cultural values held by community members by holding focus group interviews.
- Specific Aim 7: We aim to create a value tree that incorporates both western & tribal values that can be used by natural resource managers.

RQ1 and RQ2 are addressed in Chapter 3, and RQ3 and RQ4 are the focus of Chapter 4.

We address these questions by using two case studies, one in the Pacific Northwest and one in the Southwest. In these case studies, we conducted focus group and in-depth interviews following a questionnaire guide. The results of my research are divided into the following chapters.

Chapter 2 is a co-authored manuscript about the First Stewards Symposium titled, “Witnesses to Climate Change: Our reflections on the 2012 First Stewards Symposium.” This was the inaugural First Stewards Symposium that brought together over 200 indigenous coastal peoples and collaborators to discuss climate change at the Smithsonian’s National Museum of the American Indian in Washington DC. First Stewards is a non-profit organization started by the former Chairman of the Makah Tribe, Micah McCarty, who now serves as the Executive Director of First Stewards. When I was invited to serve as a witness at the Symposium, I eagerly accepted the invitation because of the opportunity to learn directly from the indigenous community about how climate change is impacting their lives. Similar to my role as a graduate student taking a course, as a *witness*, my role was to listen to each speaker tell their story. In this case their stories were about how climate change is altering the lifestyles of their communities, and how they are addressing the struggles they face with a variety of strategies. Additionally, in the spirit of Pacific Northwest tribal culture, the role of a witness is to share and teach such

stories. This manuscript, “Witnesses to Climate Change: Our reflections on the 2012 First Stewards Symposium” serves as Chapter 2 of my doctoral dissertation.

My role in writing this chapter began with asking permission from Chairman McCarty to lead and author this manuscript. I explained that the final paper would serve my role as a witness, and that I wished for it to lead to a journal publication and chapter in my doctoral dissertation. The structure of this chapter began immediately after the end of the Symposium and included three other witnesses: Kalei Nu‘uhiwa, Ted Herrera and Nelson Kanuk. At this time, we recalled the stories shared in the previous days and began to organize our thoughts by the challenges and solutions shared with us. We then agreed that Kalei and I would take on the responsibility of writing Chapter 2 while keeping Ted, Nelson, and Chairman McCarty well informed about our progress. In the end, Kalei and I wrote Chapter 2 together, and I later ask Carol Warrior to serve as a co-editor of the final chapter that would be delivered to the First Stewards Board.

Chapter 2 describes the impacts of climate change on indigenous communities, and then segues into discussing the importance of Traditional Ecological Knowledge (TEK) and Traditional Environmental Adaptive Methodologies (TEAM). Lastly, it ends by listing some research gaps and initiatives regarding discussions and presentations at the Symposium. In this Chapter, we highlighted many of the stories shared by panelists in the Symposium. The stories are significant to water security, environmental policies and indigenous peoples in a number of ways. For example, issues such as ocean acidification, melting glaciers and sea ice, and changes in water temperatures and water levels were central topics and concerns.

In the third chapter, we show the opportunities and barriers experienced by two tribes when applying for EPA’s TAS, and the challenges faced when implementing WQS. Beginning

in 1987, under section 518(e) of the CWA, all federally recognized tribal nations became eligible for a classification known as “Treatment in the same manner as a state” or TAS (1, 2). Section 518 describes the relationship between tribal nations and states, and defines the role of tribal nations in environmental resource management. In essence it acknowledges “a clear delegation of federal authority to tribes,” the responsibility to set water quality standards “based on their capacity to govern as sovereign nations” (3), and supports the movement of tribal nations toward self-determination (1). Furthermore, once tribes gain TAS approval they become eligible to receive grants through EPA. In order to be considered for TAS, tribes must provide evidence of their inherent regulatory authority by addressing the following:

- prove that they are a federally recognized tribe;
- describe the function of each governmental branch for the purpose of showing their governing capacity;
- comprehensively describe their jurisdiction over waters or water systems over which they intend to exercise their authority; and
- precisely indicate their capacity to implement an effective program and enumerate the qualifications of their technical and administrative staff.

As described in detail in Chapter 3, we decided to study the barriers because of the low number of TAS approved tribes. Out of 566 federally recognized tribes in the U.S., approximately 340 have reservations. During 1992-2012, 48 (14%) tribal nations out of approximately 340 have been approved for TAS (4). Among those who have gained TAS, 38 (11%) of these same tribal nations have approved water quality standards (5). In the approximately 27 years since the TAS policy was established, only a few tribes have applied to be authorized as TAS.

After approximately 12 months of recruiting tribal nations and their community members, we received approval from two tribes with TAS. No tribes from the SW, who did not have TAS, were interested in participating in this project. Reasons for this are not entirely clear, but in one case, a tribe's water manager stated that they were not interested in a value-based approach to thinking about water concerns and thought that it would be hard to recruit participants for in-depth interviews, so our conversations ended. In another case, the Tribe's water manager was recently retired and there was no other person with knowledge of TAS or EPA's water policies. In other examples, we left messages and followed up but contact was not made. We proceed forward with only tribes who were approved by the EPA for TAS under the CWA.

For this work we conducted in-depth interviews with natural resource employees from TAS approved tribes, and ask them to take a survey to rank a set of opportunities and barriers. As a prelude to carrying out the in-depth interviews, I conducted several informational interviews with specialists and professionals of TAS and WQS procedures. They included natural resource managers, a professor of law, several tribal leaders (including one person who was instrumental in drafting TAS in the mid-1980s), and employees from EPA's Headquarters and Regions 9 and 10¹. With each person, I discussed my interest to conduct interviews with tribes to understand the opportunities and barriers they experience, and asked for their recommendations for how to precede. Every person was extremely helpful and assured me that this work was important to carry forward. Many even expressed their frustrations about the despairingly low number of tribes who seek TAS, and the number of tribes who lack WQSs. Considering this input, I decided to pursue forward with in-depth interviews and surveys.

¹ [Region 9](#) serves Arizona, California, Hawaii, Nevada and the Pacific Islands (148 Tribal Nations). [Region 10](#) serves Alaska, Idaho, Oregon and Washington (271 Native Tribes).

Although the challenges of obtaining TAS and tribally developed WQS are examined and discussed in scholarly law journals, these topics, particularly TAS, are absent from public health discussions. The importance of water to health, especially under the growing pressures of climate change, makes it imperative to examine water security dynamics, and to understand the barriers tribes have to getting safe water within tribal communities.

Over the years, TAS has presented a way for tribes to exert tribal sovereignty when it comes to the environmental protection and health of their communities. Tribes who have been approved for TAS under the CWA have the authority to set WQS, which are needed for enforceable pollution control measures. In 1987 the Pueblo of Isleta was the first tribe to be approved for TAS under the CWA. With TAS status the Pueblo of Isleta set new arsenic water standards that were more stringent than the adjacent state of New Mexico. The City of Albuquerque is located upstream from the Pueblo of Isleta along the Rio Grande River and was required to meet the Pueblos' new standard. This led to a case known as *Albuquerque vs Browner* wherein the City of Albuquerque sued the EPA and Administrator Browner for approving the Pueblo's WQS. The courts determined that tribes with TAS standing have the authority to set WQS that are more stringent than the status quo (Dussias 1999; Mojtabai 1995; USEPA 1990). This case set precedence for all tribal nations with TAS status, and supports the decisions of tribes who create WQS for their reservation.

TAS is an important procedure for tribes who are interested in developing WQS to protect their citizens. In this study, we allocate our attention to TAS because without it, natural resource managers cannot create WQS to meet the needs of their communities or begin to incorporate their values into decisions pertaining to water management. TAS is an important procedure for tribes who are interested in developing WQS to protect their citizens. In this study,

we allocate our attention to TAS because without it, natural resource managers cannot create WQS to meet the needs of their communities or begin to incorporate their values into decisions pertaining to water management. Without TAS and WQS, EPA is the responsible authority to protect federal trust lands. EPA recognized they do not have the staffing, local expertise and ability to address Native lands by themselves. Furthermore without a procedure for tribes to ultimately develop WQS for trust lands, EPA is left with using adjacent States' WQS to review and issue permits (i.e. NPDES). An example is the current Washington State fish consumption rates, where Washington State WQS do not adequately address the public health and welfare protection of local Native or other minority communities or address their traditions or values.

In Chapter 4 we aimed to understand the cultural values expressed by two tribes, then to develop means-ends objective networks, value trees and performance measures. In large part, we were interested in this because WQS procedures have sorely lacked the values of tribes. Broadly, in order to create a WQS under EPA's CWA, states and tribal nations must designate how each water body within their jurisdiction will be used. This is called designated uses. Water quality criteria are then developed based on these defined designated uses. The procedures for creating a water quality criterion are laborious because this requires science-based evidence to show levels of risk presented to humans at certain concentrations. This requires hundreds of experiments that cost millions of dollars and must be done for every chemical compound detected in water environments. TAS-approved tribes who have developed WQS for their nations use water quality criteria created by the EPA or adjacent states (the status quo) instead of conducting science-based research for each chemical contaminate on their own. At present, aside from defining culturally important designated uses (e.g., unique designated uses are wild rice, fish consumption and ceremonial) there is no clear mechanism for incorporating water

values that reflect tribal lifestyles. This has marginalized the subsistence needs of many tribes. Though EPA's procedures for creating water quality criteria are useful, there are disconnections between the procedures set forth by the EPA and tribal cultural values.

We began our research by considering water values. However rather than narrowly seeking to understand a single dimension of water issues (e.g. quality), we quickly turned to a systems approach to understand water by looking at accessibility, quantity, quality and cultural needs. In broad strokes, to understand water values we held focus group interviews with tribal community members, and then analyzed transcripts by utilizing a structured decision making (SDM) approach to organize culturally driven objectives and actions to meet water insecurity needs. We used SDM because it provided a structure to analyze objectives and to generate alternative decisions that sets a foundation to determine the best value-based decisions for this complex topic.

SDM captures what is most important to a given situation by an individual, group or community (6). During focus group interviews, we began by broadly asking participants 'why water is important' to them, and then narrowed our questions to focus on the importance of quality, quantity and accessibility. Following SDM methodology, the values were then arranged as fundamental or means objectives. Fundamental objectives are core values and means objectives are ways of achieving the stated fundamental objectives (6, 7). In our study, we organized the values into objectives expressed by two focus groups from each of our case studies. Values were used to develop a means-ends network, objectives hierarchies and subsequent performance measures for achieving water security.

Chapters 2, 3 and 4 overlaps in several ways. In Chapter 2 we highlighted main themes discussed by leaders and panelists in the 2012 First Steward Symposium. These themes relate to

our analysis of TAS, WQS and cultural values by providing a big picture perspective about culture, environmental health, human health and policies. For example, many indigenous leaders who spoke at the Symposium shared their concerns about the impacts of climate change and emphasized the significance of employing indigenous value systems to ensure knowledge dissemination about sustainable practices. Furthermore, there was a strong illustration of the growing trend among indigenous peoples, including tribes in the U.S., to creatively incorporate cultural values into their governmental structures and policies. The discussion about climate change issues, concerns, values and culture was an ideal environment for me to practice using the key methodology I utilized in this study such as data analysis, and SDM.

Many of the values expressed by leaders correlated with the water security values highlighted in our focus group interviews by both communities. The concerns that were expressed provide an overview of the environmental pressures faced by indigenous groups, their strategies for solving them, the struggles they continue to face and the foundational pieces that lead the way toward self-determination.

The leaders that came together represented coastal communities so the importance of water was a central theme. Ocean acidification, melting glaciers and sea ice, changes in water temperatures and water levels have led to several well-documented catastrophes and indigenous communities are at the forefront. In more arid regions, climate change influences the water cycle, so in certain areas water resources that are already polluted become more concentrated as water tables decrease.

This work includes several unique aspects. First, most of the barriers and opportunities examined in this study have been identified in the literature. However in this work, employees who have the experience and knowledge about these procedures identified and ranked the most

demanding challenges experienced when seeking to develop WQS under a federal framework. Second, rather than narrowly seeking to understand a single dimension of water issues (e.g. quality), we take a systems approach to understand water security and add to WHO's definition of water security as discussed in Chapter 4. Third, we worked with tribal communities to list their water security values in order to develop performance measures that can be used to demonstrate the achievement of these prioritized goals. Fourth, understanding values allows us to inform environmental policies as to attain healthier communities. In future work, the results of this value-based approach may aid the incorporation of indigenous value systems into environmental management for tribes. Fifth, we acknowledge the data gathered in this work to be the property of respective tribes and honor tribal IRB procedures. Lastly, self-determination is a motivating force for tribes and is foundational to tribal success. Thus, understanding how tribes are building upon these concepts, and identifying what is important to tribes, are significant steps in understanding how to establish procedures that will function effectively within tribal nations and their communities. Approaches to addressing the challenges tribes face will require cooperation between multiple parties, adhering to EPA's Indian Policy and a continual recognition and support of tribal sovereignty and self-determination.

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Chapter 2: Title: Witnesses to Climate Change: Our reflections on the 2012 First Stewards Symposium

Authors

Clarita M. Lefthand-Begay

Department of Environmental and Occupational Health Sciences, School of Public Health,
University of Washington, Seattle, Washington, United States of America

Kalei Nu‘uhiwa

Researcher & Curriculum Developer, Hawaiian, Hawai‘i

Ted Herrera

The Spiritual Leader of the Coahuiltecan Nation of Texas

Nelson Kanuk

Undergraduate Student, Kipnuk, Alaska

Edited by

Clarita M. Lefthand-Begay

Department of Environmental and Occupational Health Sciences, School of Public Health,
University of Washington, Seattle, Washington, United States of America

Carol E. Warrior

PhD Candidate, University of Washington English Department

Introduction

On July 17-20, 2012 the inaugural First Stewards: Coastal Peoples Address Climate Change Symposium brought together indigenous coastal peoples and Indigenist collaborators to discuss climate change at the Smithsonian's National Museum of the American Indian in Washington DC. Five panels consisting of indigenous and non-indigenous experts from the East and West Coasts of North America, the Great Lakes region, Alaska, the Pacific Islands, and the Gulf of Mexico spoke about many of their concerns, research and stories regarding the effects of climate change within their homelands and around the world.

The First Stewards Symposium is an adaptation tool that has taken a step toward building capacity among coastal indigenous communities. We, the indigenous participants of this unique Symposium, are deeply connected to our homelands, and in most cases, we understand how to approach climate change issues. Therefore, as we move forward, it is important for us to share our insights about how we are locally addressing climate change. The First Stewards Symposium strengthens collaboration in order to meet these challenges within the context of what is important to indigenous peoples, and further, it enables us to develop ways of forming alliances to better meet these challenges.

In the traditions of the Pacific Northwest, when important work or a significant event occurs, individuals are chosen to bear witness to that work, and to transfer that information from one generation to the next. We, the authors of this article, are four individuals from indigenous communities located in Arizona, Hawaii, Texas and Alaska, who were likewise entrusted to become witnesses as a means to record what was shared at the Symposium. In this document, we compose some key concepts, major themes, and stories shared by panelist and speakers. Each of us comes from communities that depend upon, and live closely with the environment. With this

in mind, our communities' concerns are paramount. As participants of the First Stewards' Symposium, we share these stories for several additional reasons, including:

1. to describe how climate change and its dire consequences have impacted our communities
2. to inform and educate our readers about how we are addressing these issues within our communities
3. to encourage our readers and Indigenist collaborators to help address climate change

Under the context of colonialism and exploitive western practices, sharing our stories publically comes with some hesitations. We have been cautioned by panelists and our elders to not give away our traditional spiritual knowledge, so in this document we only share knowledge that can be respectfully shared publically. In addition, we would like to extend our apologies if we have unintentionally omitted information that was shared at the Symposium. Lastly, we aim to honor the knowledge shared by each of our panelists by footnoting the names of speakers we quote below and we thank each of you for your dedication and generosity.

There are three parts in this article. We first begin by briefly describing the impacts of climate change on indigenous communities, and then segue into discussing the importance of Traditional Ecological Knowledge (TEK) and Traditional Environmental Adaptive Methodologies (TEAM). Lastly, we end by listing some research gaps and initiatives regarding discussions and presentations at the Symposium.

Climate Change Impacts on Indigenous Coastal Communities

The environmental and ecological processes around us shape our cultures, worldviews, values and our ability to survive. Currently, the impacts and challenges of climate change include adaptation, relocation and the retention of cultural and subsistence practices. In this section we discuss the impacts of climate change in some indigenous communities of Alaska, Washington and the Pacific Islands, but first we begin with an overview of climate change.

Since the industrial revolution in the United States, millions of tons of pollutants have been released into the earth's atmosphere. Such pollution has contributed to greenhouse gases that compose an atmospheric blanket that traps heat in the earth's atmosphere. The compounds trapped in the atmosphere include: carbon dioxide (CO₂), chlorofluorocarbons (CFC), nitrous oxide (N₂O) and other compounds. Due to policies and regulations implemented in the 1980s, CFCs have been reduced; however, carbon dioxide emissions continue to increase, and we are now beginning to realize the impacts this process has on ocean ecologies. Despite the overwhelming evidence that illustrates the relationship between increased atmospheric carbon dioxide levels, increased temperatures and decreasing pH levels in oceans², some continue to deny global warming and climate change. Such opposition is rare among first peoples who depend on the land and waters for subsistence and survival.

In fact, indigenous peoples have been describing extreme and unusual changes in their environments for decades now, attributing these conditions to "climate change."³ In some cases, while their stories were initially disregarded, researchers are now articulating them, albeit years later. Observations by indigenous peoples describe polluted conditions and extreme weather, and the resulting consequences that lead to compromised harvested biota, altered landscapes,

² Simone R. Alin PhD, Oceanographer at NOAA, Seattle, WA

³ Stanley Tocktoo from the Inupiaq village of Shishmaref

habitat loss, and migration anomalies. The summation of these significant events has affected how native peoples are adapting. Therefore, among indigenous peoples, the concern is not expressed in terms of whether climate change will affect us, but *when*, and more importantly, how we will learn to adapt and survive.

Next, we discuss some climate change and anthropogenic impacts on the lifestyles and well-being of coastal indigenous peoples.

Ocean Acidification, Marine Pollution and Food Security

Ocean acidification is largely caused from the absorption of higher than normal concentrations of carbon dioxide in the atmosphere by the world's oceans. Simply stated, the increase in atmospheric CO₂ levels also increases CO₂ in the world's oceans. Atmospheric carbon dioxide absorbed into the ocean reacts with water (H₂O) to produce carbonic acid (H₃CO₃). Carbonic acid dissociates into hydrogen ions (H⁺) and a bicarbonate ion (HCO⁻³). This process leads to an abundance of hydrogen ions in oceans, which ultimately consumes carbonate ions. Carbonate ions (CO₃²⁻) are present in oceans and used by shelled organisms to build healthy and strong shells. The abundance of hydrogen ions decreases the pH levels in oceans, creating ocean acidification, which causes the weakening of calcium carbonate shells. This chain of events cripples the reproductive capacity of mollusks and crustaceans, and leads to modifications in the ecological food chain. Ultimately, this process decreases the availability of subsistence food sources for indigenous coastal communities who depend upon these organisms for their food security.

Aside from shell weakening, in some indigenous communities, hunters observe physical signs of ocean acidification, pollution and environmental degradation in fish and sea mammals

caught for consumption.⁴ For example, some salmon with strange abrasions on their heads are found swimming upstream. Alaskan subsistence fishermen use these fish for dog food because they are not suitable for human consumption. Furthermore, physical abnormalities on the bearded seal have manifested as hairless patches on their skin, enlarged kidneys, and discolored or yellowish blubber.⁵ Other injuries are seen on walruses, such as sores on their flippers and necks. These new abnormalities and deformations are obvious to indigenous hunters, as they and their ancestors have hunted in their territories for generations, and therefore carry expert knowledge about the anatomy of their catch.

In the Symposium panels, each Pacific Island territory representative mentioned concerns regarding coral bleaching and the negative impact it has on the natural food webs for fish and other marine biota. Again, because many Pacific Islanders subsist off of the ocean, the loss of fish and other marine biota is a threat to their well-being and survival. Pollution, warming waters, and sedimentation, has devastating effects on coral reefs. Coral reefs are subjected to high water turbidity from sediment discharge due to heavy flooding, pollution runoff, and other anthropogenic factors.⁶ For Pacific Islanders, coral bleaching is a fearful problem. In many ancient stories, the coral is mentioned as the very first living creature that began the food web. These stories warn that everyone's existence is contingent upon a healthy coral bed; thus, coral bed health is vital to our livelihood and wellbeing.⁷ Indeed, even the land-base of islanders depends on the health of coral reefs. That is, not only do the reefs ensure a healthy food-web, but the structure they provide protects places like the Northern Mariana Islands, which depends upon the coral reef for protection from erosive waves and ocean tides, especially during storms.

⁴ Tocktoo, Stanley from the Inupiaq village of Shishmaref

⁵ Tocktoo, Stanley from the Inupiaq village of Shishmaref

⁶ Artero-Cameron Joseph President of the Guam Department of Chamorro Affairs, Guam

⁷ Governor Beningno Fitial, Commonwealth of the Northern Marianas

Ocean acidification and marine pollution threaten the food security of indigenous peoples who must subsist on fish, sea mammals, and birds, and who depend on healthy ecosystems to preserve the integrity of these organisms. The severity of these threats has yet to be fully understood by researchers and those living closest to marine waters. Accordingly, such uncertainty leads to well-founded anxiety among indigenous peoples that these environmental stresses will also erode our profound and beloved cultures that have evolved with these ocean organisms since our genesis. Though ocean acidification is thought to be irreversible within the current generation's lifetime, if our relatives and descendants are to survive, it's important for us to take action to eliminate or mitigate our dependence on fossil fuels.

Glacial Retreat, Melting Ice and Erosion

Globally, warming temperatures cause glacial retreat and rapid environmental changes. David Troutt, a First Stewards panelist, described the disappearance of several glaciers from the Pacific Northwest Coast; as many as eight major glaciers are substantially shrinking.⁸ Two examples of glaciers in retreat are on Mount Rainier and the Nisqually. The seasonal melting of glaciers is interrelated with the life cycle events of fish (i.e., salmon), such as spawning, migration and aggregation,⁹ because glaciers leave a signature in the water that lead salmon back to specific rivers and streams. In the future, if there are no glaciers to slowly melt into rivers and streams, there will be a diminishment of salmon, and the health of tribes who depend on salmon will be negatively impacted.

In a more positive light, collaborations among the Nisqually Watershed Council, the Nisqually Nation, and other partners, have lead to major efforts to protect and restore the Nisqually River, thereby improving the health of salmon runs. Some strategies that they have

⁸ Troutt, David Director of the Nisqually Indian Tribe's Natural Resource Department

⁹ Tom Younker, Former Vice Chairman of the Coquille Indian Tribal Council

employed include tree-planting events along the riverbanks, increasing the size of estuaries, and the development of rain gardens that allow water to percolate into soil.

In the past few decades, communities in Alaska have increasingly described early and aberrant ice melts, spring breakup, and flooding, and today they continue to fear these phenomena for several reasons. Once massive ice sheets, sea ice, and permafrost, are now thinning to the point where hunting on ice has become extremely dangerous,¹⁰ and landscapes are lost to erosion. Thin ice sheets make it nearly impossible for sea mammals to move in areas where ice creates island habitats. Closer to the villages, sea mammals previously hauled themselves out onto sea cakes, but they can no longer do so. This causes two visible problems. When sea mammals become tired from swimming, they may drown unless they can find ice to rest upon. Also, such an altered habitat encourages sea mammals to migrate to other and possibly more distant areas. Due to this behavioral shift, hunters must travel further away from their homes to find solid ice where sea mammals are located. The distance and instability of ice make the trek to hunting grounds extremely dangerous.

Melted ice also has implications to indigenous communities thousands of miles away. For instance, increased sea levels in the Hawaiian and Pacific Islands lead to fear among Islanders that their islands are going to disappear. Their fear is warranted. These islands are decreasing in area, and communities living on coastal territories are being relocated. For example, the Kiribati government is planning to move their entire population to Fiji.¹¹ The Kiribati nation are among the people who must move because low lying atolls and islands are directly affected by rising sea levels.

¹⁰ Dougherty, Erin, Staff Attorney at the Native American Rights Fund

¹¹ Artero-Cameron, Joseph, President of the Guam Department of Chamorro Affairs, Guam

The Alaskan panel shared several heartfelt stories about the devastation that erosion has caused in their lives. There are two types of erosion that were emphasized by the Alaskan panelists: - sea erosion due to sea levels rising, and water erosion due to quickly melting ice and permafrost. Islands and coastal communities are negatively impacted by such erosion and melting permafrost, which has caused their buildings, homes, and communities, and forests (i.e. habitats) to sink. Infrastructures are unstable; leaking and broken pipes, sewer systems, and sewage lagoons compromise community health.¹²

Coastal erosion is also intensified when ice melts along Alaskan shorelines; this leaves this region without a protective barrier from crashing ocean waves. Similarly, a coastal shoreline near Forks, Washington, has a high percentage of diminishing kelp beds due to anthropogenic forces.¹³ Kelp beds are natural buffers that slow down the impact from the ocean tidal movements, much like coral reefs. In this case, the ocean is now pushing up onto beaches causing beach and land erosion, which then exposes tree and plant roots to seawater.

Relocation

Erosion and sea level rise have forced many communities to relocate. One example is the Hoh Nation on the West Coast of Washington state. For years, they feared their homes would be swallowed up by the Pacific Ocean. The community was in a vulnerable position to the threats of tsunamis, and unpredictable, extreme weather. In 2010, legislation to expand their lands away from a flood plain was passed in Washington State, and they are presently in the process of relocating to higher ground within their “usual and accustomed” lands. Although relocation of Indigenous communities is tragic, in some cases retreating to higher ground is the only option.¹⁴

¹² Tom, Stanley, Yup'ik Village of Newtok, Alaska & Tribal Administrator

¹³ Morganroth, Chris, Elder of the Quileute Indian Tribe, La Push, Washington

¹⁴ Hudson, Dave, Vice Chair of the Hoh Tribe

Indigenous communities are burdened by relocation as a result of climate change, and those directly impacted face urgent needs for resources, while the emotional toll ripples through these communities. The relationships that indigenous peoples share with the lands where their ancestors and their families have lived are intact, so the mere anticipation of having to relocate creates depression and anxiety for these communities. The lack of land to move to, and the nonexistent financial means for moving every family, school, administrative building, social service and business in the entire village, creates an uncertain future for these communities who are further challenged to put into effect the necessary changes at a dizzying speed. Moving an institution can be slow in the best of circumstances, but for Native nations enmeshed in trust relationships with colonial governments, the process can last two or more generations. For example, the Quileute Nation fought for 56 years to move a children's elementary school to a safe location away from the tsunami zone. One reason it took so long was the challenge of land availability for relocation. Over several years negotiations between the Olympic National Park and the Quileute Tribe finally lead to a bill (H.R. 1162) that would transfer "approximately 785 acres of lands within and around the Olympic National Park."^{15, 16} The tenacity of this Nation to protect their youth from harm should not have been challenged so strongly and for so long. Upcoming challenges include generating the funds for relocation efforts. For communities whose survival will depend on swift and decisive action, a similar delay would mean the permanent dissolution of extended families as the residents essentially become refugees, with their homeland, submerged.

The people of Newtok, Alaska have already moved twice due to erosion and extreme weather. Despite funding and permitting obstacles, they are now preparing plans for a third

¹⁵ http://www.pbs.org/newshour/updates/science-july-dec12-quileute_07-05/

¹⁶ <http://www.gop.gov/bill/h-r-1162-to-provide-the-quileute-indian-tribe-tsunami-and-flood-protection-and-for-other-purposes/>

relocation to a site called Mertarvik.¹⁷ Still, there are even more examples, including some not mentioned in this article. The Alaskan panel expressed the relocation challenges they face in regions of Shishmaref¹⁸ and Akiak,¹⁹ where again, they emphasized the reluctance of their communities to move, and yet, it is urgent to find a safe and stable site to move to, given that there is no other option. When faced with this complex problem in Shishmaref, the Mayor, Stanley Tocktoo feels it's important to exercise as much control over their situation as possible, by taking the opportunity to train young people in skills that would help to maintain the survival of the group as a whole. That is, because the prospect of relocation, involves a daunting amount of work, he advocates training people in the skills necessary to design, build, and maintain sustainable communities. This strategy simultaneously helps address the resource gap, in addition to maintaining the self-determination of the group, as exemplified by Tocktoo's self-sustaining "community building task," a program that trains youth as carpenters, electricians, and plumbers so that they can contribute to the re-building of their communities.

Shifting and Decreasing Biota

Tom Younker, the former Vice-President of the Coquille Tribe, reflected on his childhood; a time when he could easily scoop sizable Dungeness Crabs from their habitat on Coos Bay, Oregon, with his hands. He remembers observing an abundance of striped bass, deer, ducks, perch and other biota during those years. Over time, many of these natural resources have decreased in population. He attributed this to industries such as timber companies, their usage of chemicals and poor forest practices, increased human population, and the resulting strain on resources, and of course, climate change. In Alaska, another anomaly was the citing of a dead

¹⁷ Tom, Stanley, Yup'ik Village of Newtok, Alaska & Tribal Administrator

¹⁸ Tocktoo, Stanley, from the Inupiaq Village of Shishmaref

¹⁹ Williams, Mike, of the Akiak Community & Member of Executive Committee on the National Tribal Environmental Council

stingray washed up onshore near Nome—miles and miles from temperate waters.²⁰ Panelists gave many other examples of habits and habitats being in a state of confusion, such as the decrease in seal and seabird populations among the Pribilof Islanders, the shift of fur seal populations,²¹ and the migration of the spruce bark beetle from warmer climates to the coastal regions of Alaska.²² Tying these numerous effects to human causation was Pat Pletnikoff (Aleut), who, from his vantage point in the Pribiloff Islands, observed that more than ever, humans seem driven by a constant need to consume. They have overfished, over-hunted, and over-used all that nature provides, to which, Pletnikoff says there is only one solution: “let the land and ocean recover”.²³ Pletnikoff and the other panelists’ clearly link human activity to pollution, to temperature changes, to habitat loss (for humans and other biota) migration anomalies, and the decrease in biota in specific areas. The consequences of climate change compromise food security, infrastructure, housing stability, well-being, ecosystems, and biota.

We now discuss the importance of culture when preparing, and planning for climate change.

Traditional Ecological Knowledge and Traditional Environmental Adaptive Methodologies

In this section we discuss Traditional Ecological Knowledge (TEK) and Traditional Environmental Adaptive Methodologies (TEAM)²⁴ that our panelists and their communities put into practice. We believe this information will help to educate people about how indigenous communities adapt to climate change, and will also serve as an adaptive tool in itself. As human beings whose identities and lives are embedded in the maintenance of our cultures and traditions,

²⁰ Williams, Mike of the Akiak Community & Member of Executive Committee on the National Tribal Environmental Council

²¹ Pletnikoff, Mayor Pat St. George, Alaska

²² Begich, Senator Mark, Alaska

²³ Pletnikoff, Mayor Pat, St. George, Alaska

²⁴ TEAM was coined by Kalei Nu’uhiwa, an author of this article.

we also understand our responsibilities as First Stewards to continue as caretakers of these lands, and as voices against the destructive global trajectory of policies and practices that have created the dire conditions of this age.

TEK has its roots in place-based environmental knowledge and cultural knowledge. This knowledge includes data, and the interpretation of that data, that a community has collected and refined over a long period of time. In some communities, TEK experts are trained to become excellent observers and interpreters. Survival practices, including spiritual exchange, are adapted into efficient and effective subsistence methods, which are then passed on from one generation to the next. Native peoples continuously contribute empirical data such as baselines for healthy and functioning environments, anthropogenic impacts on the health of environments, and pertinent information regarding adaptive practices when confronting adverse environmental changes.

Specifically, TEAM are the application of TEK and/or contemporary practices and procedures. TEAM are reflective of the worldviews of indigenous peoples to survive adverse change caused by environmental events. Furthermore, impacted communities provide instructions intended to prepare their descendants for similar adverse environmental episodes. Many instructions have been left in the form of stories, tribal histories, songs, poetry, and ceremonial or religious practices, so that valuable wisdom and information are passed on from one generation to the next. To the unfamiliar, these stories may seem like nothing more than the makings of “myth;” however, they are cautionary expressions filled with survival tactics meant to teach individuals and the community with tried and tested adaptive methods. For example, many stories will point towards natural indicators as signs that adverse environmental change is occurring, followed by the survival methodology the community needs in order to adapt and endure. Natural indicators such as shifting biota are what many indigenous peoples observe and

use when preparing for environmental changes. Native peoples have created observational baselines (e.g. glacier size over an extended time period) that enable a trained observer to recognize natural indicators, and then plan for expected environmental changes.²⁵ Climate change initiatives and other indigenous communities can benefit from the many TEAM developed by our peoples.

TEAM are embedded in food security and resource management strategies. These methodologies include returning to and promoting traditional practices to ensure that food stocks or natural resources are available for future generations. For example, in American Samoa, the tribes have returned to utilizing traditional materials for gathering food stock.²⁶ These communities are encouraged to educate the youth to prepare, develop and implement the traditional practices for fishing. This assures that traditional practices associated with fishing are passed on to the next generation, fish stocks are sustainable, and biodiversity and natural resources are maintained over time.²⁷

A suggestion expressed at the Symposium was to understand the decisions, knowledge and strategies that allowed indigenous communities to successfully adapt to climate variability in the past. Undoubtedly, there is a role for TEK to improve and compliment scientific understandings of climate change impacts, and simultaneously, TEAM can be developed to address these impacts for everyone's benefit.

In the final section, we discuss some examples of what can be done in our communities regarding climate change adaptation.

²⁵ Bailey, Paulokaleioku Timothy, Aha Moku Council, Maui, Hawaii

²⁶ Tulafono, Chief Ufagafa Ray, of the American Samoa, Director of American Samoa Department of Marine and Wildlife Resources

²⁷ Artero-Cameron, Joseph, President of the Guam Department of Chamorro Affairs, Guam

Research Gaps and Education

The phenomenon of climate change due to human activity is becoming more widely recognized as a fact of the current age, especially among scientists and indigenous communities. However, in the economic and political sectors there is no consensus about whether or not climate change is a result of humans or part of natural climate fluxes. Despite the lack of universal consensus, there is no denying we have much to prepare for, and still much to understand. The First Stewards Symposium brought together indigenous tribal leaders, scientists, witnesses, organizations and policy leaders from around the world. These diverse voices and stories sought to educate their audiences about their experiences and observations in their environments. From these panel discussions, we learned that the landscapes, communities, cultures, and biota have been stressed, changed and negatively affected by climate change. We also heard clearly that more action is needed.

As First Stewards we are tasked to educate the public about how to take care of the environment and to increase awareness about climate change and environmental issues. When it is not clear how to do this, we can collaborate and share our strategies, and if gaps exist in our understanding about the impacts of climate change and how to make the best decisions, our communities can initiate research objectives and an agenda for meeting our needs. Addressing these questions can help us close some of the current gaps in our understanding:

- How does climate change impact the life cycles of sea life?
- How do we minimize coral bleaching and its precursors?
- How can we protect shorelines and riverbanks against erosion?
- What kinds of sustainable infrastructures should be built in our communities?
- How will climate impact the economies of First Peoples?

- How can we best share local indigenous strategies between indigenous communities?
- How can we best promote respectful participation within our communities and partners?
- How shall we utilize TEK within local indigenous systems?
- How do we learn adaption strategies that were used in previous climatic fluxes and changes that impacted our communities?
- How can policies be enacted to help communities facing relocation?

This is not a comprehensive list, so we encourage future Symposium participants to highlight the research needs of indigenous coastal communities. We also encourage everyone to work in partnership with indigenous communities to address these concerns.

Because of the legacy of dehumanizing research conducted within indigenous communities, we suggest that all research partnerships and projects conducted with our communities and on our homelands include community training and empowerment tools that are culturally driven, appropriate and acceptable. Furthermore, research should be conducted *with* the community, not *on* the community. And wherever applicable (e.g., in the United States), partnerships should honor self-determination, the government-to-government relationship, and the trust responsibility of the Federal Government. In essence, we promote the commitment to our rights as indigenous peoples and nations, and strong research ethics for those who wish to work within our communities.

To educate our communities, we encourage our relatives to create councils, working groups, organizations, and to work with existing councils to strengthen food and water security; to clean up and improve our watersheds; to promote indigenous climate change stewardship; and to help address the research objectives listed above. We also encourage the development and

growth of indigenous-driven curriculum to teach our youth both TEK and western science, while holding on to indigenous value systems and worldviews through the implementation of TEAM.

Because storytelling is key to the sharing of knowledge and scholarship from one generation to another, we ask our elders to share their stories, and to teach us how to honor these stories, so that we may move through the world as human beings.

In developing our understanding and creating solutions, our panelists cautioned the importance of thoughtful and careful consideration when choosing and deciding on adaptive strategies. Tim Yonker succinctly stated, “When we decide on a route to improve our communities, we also need to consider how this will impact our world in the long term.”²⁸ The high uncertainty about the impacts of climate change on the environment and on our communities, affirms this concern. For example, it isn’t certain how temperature and weather changes will influence niches of plants, animals and sealife. Given that we currently do not know what our futures hold, planning needs to be conducted while considering the potential for damage that can be done to future generations.

Conclusions

Unwillingly, and unfortunately, Indigenous peoples have been described as “the canary in the coal mine,” or, to use another metaphor that’s maybe more familiar to scientists, native peoples are the litmus paper of the world. Because we subsist off of the lands, are dependent upon the integrity and continued existence of healthy ecosystems, and live by the natural seasonality of fish, sea mammals, birds, animals, and plants, we are vulnerable to climate change. For some native peoples, it’s a choice to harvest, hunt, or fish; however, for others, there is no choice. For instance, for coastal indigenous peoples, the ocean and land are comparable to

²⁸ Yonker, Tom, Former Vice Chairman of the Coquille Indian Tribal Council

stores. Harvesting, hunting, and fishing are necessary for survival when, because of the prohibitive costs and excessive carbon emissions expended when importing foods to remote areas, subsistence practices are the only options for indigenous peoples to acquire food. As retold here, the effects of climate change are devastating to the food security, stability, and well-being of indigenous peoples. Therefore, collaboration is required to positively impact what happens in our communities, and to ensure that our voices are heard.

Throughout the panel discussions, it became clear that there is an absolute need to ensure that our policies, practices, and strategies are based on indigenous wisdom. Relying upon our traditional and ancestral knowledge of adaptability and resilience are keys to our survival and identity. So, in this article, we highlight the importance of TEK and TEAM as we prepare the upcoming generations for adaptation and survival.

We also discussed our responsibility to educate and bring awareness to the stories shared at the First Stewards Symposium. Because participants gathered at this Symposium to learn and support one another, and to identify their roles in this conversation, we highlighted some key research objectives that were implicitly or explicitly stated. As witnesses of the inaugural First Stewards Symposium, we ask our partners and our communities to meet the needs expressed here. In taking steps to do this, we ask that partnerships are respectful of indigenous peoples by following Indigenist ethical standards that will help to empower our mutual goals. Above are some of the key concepts, major themes and stories shared by our panelist and will be retold to communities and political leaders by the witnesses of the First Stewards Symposium.

Chapter 3: The Opportunities and Barriers Experienced by Two Tribal Nations when Developing Clean Water Quality Standards for their Communities

Running Title

“The Opportunities and Barriers Experienced by Two Tribal Nations when Developing Clean Water Quality Standards for their Communities.”

Authors

Clarita M. Lefthand-Begay

Department of Environmental and Occupational Health Sciences, School of Public Health, University of Washington, Seattle, Washington, United States of America.

Elaine M. Faustman

Department of Environmental and Occupational Health Sciences, School of Public Health, University of Washington, Seattle, Washington, United States of America.

Abstract

Developing water quality standards as a tribal nation has many challenges. Reflective of the era of self-determination that began in the 1970s, tribal water quality standards have the potential to protect tribal waters and uses from off reservation pollution sources. Beginning in 1987, under section 518(e) of Environmental Protection Agency’s (EPA) Clean Water Act (CWA), all federally recognized tribal nations became eligible for a classification presently known as treatment in the same manner as states (TAS). Under the CWA, this classification recognized tribes with TAS approval as responsible entities in establishing and enforcing water quality standards (WQS) within their jurisdiction. To gain TAS approval, tribes are required to apply through EPA.

Today there are 566 federally recognized tribal nations and approximately 340 reservations. Between 1992-2012, 48 (14%) tribal nations out of approximately 340 have been approved for TAS. Among those who have gained TAS, 38 (11%) of these same tribal nations have approved WQS. Because the number of tribes who have obtained TAS is low, this study examines the barriers and opportunities that two tribes experienced when applying for TAS and developing WQS.

Our case study design includes two geographically distinct tribal communities located in the Pacific Northwest and the Southwest. We held 13 informal interviews with individuals from natural resource departments of several tribal nations, a professor of law, several tribal leaders and employees from EPA's Headquarters and Regions 9 and 10; and conducted semi-structured, in-depth interviews with 5 environmental managers who were knowledgeable about EPA's TAS and CWA. In addition to holding in-depth interviews, we asked participants to complete a survey to rank a list of 25 opportunities and 29 barriers of TAS and WQS.

The top three perceived opportunities in seeking TAS and developing WQS were financial, protection of health, and capacity building, while the top three barriers were financial, cultural and technical. Unique to this work is the ranking of the barriers and opportunities important to developing WQS. This study identifies one emerging barrier to obtaining TAS and lists several perceived opportunities of these procedures. Self-determination is a motivating force for tribes and is foundational to tribal success. Thus, understanding how tribes are building upon self-determination, and identifying what is important to tribes, are significant steps in understanding how to establish procedures that will function effectively within tribal nations and their communities. Addressing the

challenges tribes face will require cooperation between multiple parties, adhering to EPA's Indian Policy and a continual recognition and support of tribal sovereignty and self-determination.

Keywords

Water quality standards, treatment in the same manner as state, barriers, opportunities, tribes, tribal sovereignty

Background

Tribal Sovereignty

The inherent sovereignty of U.S. tribal nations has undergone a great deal of insult and diminishment. This began with early disputes pertaining to land ownership and the exercise of state law and authority on tribal lands. Sovereignty is a difficult term to define under the context of North American tribes, but has been defined as the inherent right or power to govern one's own nation" (Owley 2004). In the 1800's Chief Justice John Marshall described tribal sovereignty in three cases named *Johnson v. M'Intosh* (1823), *Cherokee v. Georgia* (1831) and *Worcester v. Georgia* (1832). Together these cases are known as the Marshall Trilogy. In these rulings, Marshall was the first to describe the legal relationship between the U.S. and tribes.

In *Johnson v. M'Intosh* the Supreme Court decided who held land title over tribal lands. From the perspective of the courts, before this case it was unclear if non-Natives, company owners, or states could buy land directly from Native individuals or nations. Drawing from the principles in the Doctrine of Discovery²⁹, as a means to resolve conflicts among colonialists, Marshall determined that tribes did not retain any rights to sell their lands to anyone but the federal government (Abbott 1888; Miller 2006). Marshall articulated that indigenous lands could only be acquired by the U.S. and no other foreign nation (Abbott 1888). With this case, the Federal government became the "only government allowed to buy Indian lands and to deal politically with tribes" (Miller 2006).

²⁹ The Doctrine of Discovery as provided by Miller: "in a nutshell, the Doctrine of Discovery, as applied by England and the United States to the American tribes, came to mean that when European, Christian nations first discovered new lands the discovering country automatically gained sovereign and property rights in the lands of the non-Christians, non-European nation even though, obviously, the natives already owned, occupied, and used these lands" (Miller 2005).

In *Cherokee Nation v. Georgia* (1831) Marshall examined whether tribal nations were defined as foreign nations for purpose of original Supreme Court jurisdiction under Article 3 of the Constitution. Marshall wrote that the Cherokee nation are “capable of maintaining the relations of peace and war, of being responsible in their political character for any violation of their engagements, or for any aggression committed on the citizens of the U.S. by any individual of their community” (Prucha 1975). In this statement Marshall acknowledged that the Cherokee nation governed and held power over their citizens, and were political entities. However, in defining the relationship between the U.S. and the Cherokee Nation, Marshall distilled it down to one of “domestic dependent nations” (Prucha 1975) rather than as foreign nations. In essence, this case held that tribes were neither states or foreign nations and were characterized as “domestic dependent nation” (*Cherokee Nation v. Georgia* 1831). This statement is axial to what is known as the federal Indian trust responsibility (Owley 2004); whereby the Federal government has a responsibly to protect and represent the interest of treaty tribes, especially their reserved rights to fishing and hunting on traditional lands (e.g., ceded, and aboriginal lands), and rights to health and natural resources.

In *Worcester v. Georgia* the courts determined that the laws and jurisdiction of the State of Georgia had no force in Cherokee territory (*Worcester v. Georgia* 1832). This was an important case because it stated that tribal nations were not subject to state law, instead tribal concerns were both a federal and tribal matter. Since these cases, Congress and treaties have governed tribes, thereby limiting the political sovereignty of all tribal nations within the United States.

Tribal treaties are “binding legal agreements” between the U.S. government and U.S. tribal nations (Kickingbird et al. 1980). The purpose of these agreements included land

acquisition and the subsequent relocation of hundreds of tribes onto reservations, peace and reconciliation, and the establishment of regulations for trade. During the treaty era (1776-1871) in exchange for land, the U.S. government perpetually agreed to provide healthcare, education, public safety (Prucha 1975; Nixon 1970; Frazier, Margai, and Tettey-Fio 2003), and in the Pacific Northwest, and other areas, hunting and fishing rights. Today, Article VI, Clause 2 of the U.S. Constitution continues to substantiate “all treaties [...] made under the authority of the United States” as the “the supreme law of the land.” Still the validity of treaties have been challenged and have endured centuries of anti-Indian sentiment that ultimately aimed to dissolve them (Echo-Hawk 2010; Deloria 1969; Mankiller 1993). It has been among this atmosphere that tribal nations have steered from federal government lead and authorized actions of assimilation and termination to an era of self-determination.

From the perspective of many indigenous peoples, the Marshall Trilogy diminished the sovereignty of pre-colonial tribal governments (Mankiller 1993; Echo-Hawk 2010; Miller 2010). The sovereignty defined today pales in comparison to the actual inherent powers tribal nations exercised pre-colonial contact. In the words of an Indigenous scholar, Taiaiake Alfred, “the concept of sovereignty as native leaders have constructed it thus far is incompatible with traditional indigenous notions of power” (Porter 2005; Alfred 1999). Alfred goes on to state, “sovereignty implies a set of values and objectives in direct opposition to those found in traditional indigenous philosophies” (Alfred 1999). Tribal nations are still bounded by the decisions of Chief Justice John Marshall, however under the goals of self-determination, many nations (i.e., Navajo Nation and Tulalip Tribes) are incorporating traditional law into their constitutions (Austin and Williams 2009), expanding

their governance, and strategizing for how to meet the needs of their citizens as self-governing entities.

Socioeconomics of Tribes Today

In 1970 during a message on Indian Affairs, President Nixon stated, “The first Americans—the Indians—are the most deprived and most isolated minority group on our nation” (Prucha 1975). Nearly 40 years later a report released by the U.S. Commission on Civil Rights wrote, “Native Americans rank at or near the bottom of nearly every social, health, and economic indicator. For example, the national poverty rate in the United States for the period between 1999 and 2001 was 11.6 percent. For Native Americans nationally, the average annual poverty rate was 24.5 percent” (U.S. Commission on Civil Rights 2003). In 2010, the U.S. census reported a national poverty rate of 15.3% and among American Indian and Alaska Native communities it was 28.4% (U.S. Department of Commerce 2011). Problems of unemployment and poverty are prevalent for tribal nations all over America. Despite the overwhelming pressures weighing against tribal communities, there are pockets of economic and tribal governmental success stories fueled by retail stores, ski and golf resorts, food stores, banks and natural resource exploitation. In a report examining the foundations of economic development for tribes, Jorgensen et al. reported that sovereignty, culture and institutions (e.g., governmental, social and cultural) were key drivers (Jorgensen 2007). However, even with these accomplishments, today there remains deep poverty and subpar living conditions within native communities.

Prior to self-determination policies, foreign governance systems were imposed onto tribal governments by the U.S. government and decision makers were largely non-tribally led bureaucratic agencies. Not surprisingly, many tribal leaders found these systems to be

unfitting of their customs and for the needs of their communities, and so for decades tribes struggled with implementing these systems. The shifts from traditional tribal governance to the fragmentation of colonialism have resulted in disconnections in the various ways tribes solved community problems. Strangely, with foreign values, tribes have been expected to thrive. Nonetheless, since colonial contact, tribes have struggled to thrive in most cases. In recent years a key factor to improved economic growth and living conditions within tribal communities is the framework of self-determination (Jorgensen 2007). Tribal nations who define their own futures, and cater to them in a way that best serves the needs of their communities do better (Henson 2008; Jorgensen 2007). In the next section we will broadly discuss EPA's Indian Policy.

Establishing Tribal Roles under EPA

With sovereignty in mind, in the 1960s and early 1970s, U.S. politicians and advocates of native nations were holding discussions pertaining to the future direction of Indian policies. One point of contention was the perpetual notion of termination, or a policy that would terminate previous tribal policies and treaty negotiations. In addition, to being unconstitutional, termination would effectively dissolve treaties, federal responsibility to tribes, sovereignty, dismantle reservations, and force tribal communities into mainstream America (Tsosie 1996). Consistent with several centuries of resistance, tribal leaders and activist were opposed to notions about any termination policy. In President Nixon's 1970 Special Message on Indian Affairs he declared that termination would be akin to the termination of the "citizenship rights of any other American" (Prucha 1975; Lewis 1986). He recognized that notions of termination were in opposition to the government's trust responsibilities agreed upon in over 600 treaties between the U.S. government and hundreds

of tribal nations. Instead Nixon outlined a new direction toward self-determination to be sought out regarding tribal communities.

In 1983, building on these notions, President Regan created the American Indian Policy. The framework of this policy “was a commitment by the federal government to foster and encourage tribal self-governance” and remove any federal impediments to tribal self-government (Reagan 1983). Each U.S. President since has reaffirmed this message.

Guiding Principles for the Relationship Between Tribal Nations and EPA

When EPA was first established, the relationships between them and tribal nations were undefined, and so it was not clear how environmental statutes, such as the Clean Water Act (CWA), would function on tribal communities. It was not until EPA’s Indian Policy of 1984 that clarification for tribal roles were established. EPA drew from the Federal government’s re-examination of their Indian policies to establish their relationship with tribal nations. Guiding EPA’s decisions were two consistent themes in the Federal Indian Policy which were to “pursue the principles of Indian “self-government” and work directly with the principles of tribal governments on a government-to-government basis” (USEPA 2009; Lewis 1986). In conjunction with this new direction to support tribal self-governance, and to meet congressional Indian Policy mandates, on November 8, 1984 EPA laid out nine principles (Table 1) to achieve their fundamental objective to protect human health and the environment (USEPA 2009; National Environmental Justice Advisory Council and USEPA 2000). In these principles EPA reinforced their pledge to work with tribal nations from a government-to-government foundation, and in that process it would encourage and assist tribal nations in creating environmental standards that are equal to or more stringent than EPA’s standards; support tribal nation’s participation in decision-making and managing; and

remove legal and procedural impediments (USEPA 2009). Additionally, EPA's guidance on tribal relations appeared in the Section 518 of the CWA.

EPA's Treatment in the Same Manner as a State (TAS): Section 518 of the CWA

Beginning in 1987, under section 518(e) of the CWA, all federally recognized tribal nations became eligible for a classification initially known as "Treatment as state" (TAS); however, in more correctly acknowledging that tribal nations are not the same as states, in 1994 the term underwent a slight renaming to "Treatment in the same manner as a state" (USEPA 1990, 2008). The acronym TAS continues to be used.

Section 518 formally describes the relationship between tribal nations and states, and defined the role of tribal nations in resource management. In essence it acknowledged "a clear delegation of federal authority to tribes," the responsibility to set water quality standards "based on their capacity to govern as sovereign nations" (Owley 2004), and once again supported the movement of tribal nations toward self-determination (USEPA 1990). Furthermore, once tribes gain TAS approval they would become eligible to receive grants. Section 518(e) also described the processes for tribes to meet TAS requirements, and created a dispute process to address problems between states and tribes who create different water quality standards within the same or connected water bodies.

The Process for Applying for TAS

In order for a federally recognized tribal nation to gain TAS they must submit an application to EPA. Each applicant must:

- prove that they are a federally recognized tribe;
- describe the function of each governmental branch for the purpose of showing their governing capacity;

- comprehensively describe their jurisdiction over waters or water systems over which they intend to exercise their authority;
- precisely indicate their capacity to implement an effective program and enumerate the qualifications of their technical and administrative staff; and
- provide additional documents to EPA upon request (Federal Water Pollution Control Act; USEPA 2008).

Submitted applications received by EPA undergo a review process. Afterwards, EPA prepares a Findings of Fact document, and finally tribal nations are informed about EPA's decision. Applicants who are denied TAS can re-submit applications at any time. States or tribes can apply for TAS for more than one program (e.g., CWA, Safe Drinking Water Act (SDWA), Clean Air Act (CAA), etc.). Once they submit and are approved for TAS for one program they are not required to resubmit redundant information, such as showing that they are federally recognized. Instead tribes are only required to provide specific information about the new program(s) they wish to implement (USEPA 2007). TAS applies to EPA statutes including the CWA, SDWA, CAA, the Toxic Substance Control Act, the Federal Insecticide, Fungicide and Rodenticide Act (USEPA 2011). Tribal nations can submit applications to EPA for the development of their own WQS either at the same time as they submit their TAS application, or once they are approved for TAS.

As explained in detail below (In Chapter 3), the development of WQS encompasses designated uses, water quality criteria to protect those uses, and anti-degradation policies. Tribal nations who create WQS are required to make them available for public comment and to submit them to EPA for approval (USEPA 2008). Although tribal nations can create their own WQS, the "EPA generally recommends that tribes adopt the standards of the adjacent

states when first setting tribal standards” (U.S. Government Accountability Office 2005); however, some tribes have developed standards that are more stringent than EPA or neighboring states.

In 1992, the Pueblo of Isleta tribe was the first tribe to obtain TAS. In that same year EPA approved their WQS pertaining to the Rio Grande River, which flows through their homelands. Because their WQS were more stringent (17 ppt arsenic) than the state of New Mexico’s standards (20 ppm arsenic) it led to a well-known court case called *City of Albuquerque v. Browner*, wherein the City of Albuquerque sued the EPA and Administrator Browner for approving the Pueblo’s WQS, which were forcing the city to enhance their waste water treatment facility, which is only several miles upstream from the Pueblo’s waters. In the end the courts determined that tribal nations with TAS standing have the authority to set WQS that are more stringent than the status quo (USEPA 1990; Dussias 1999; Mojtabai 1995). This case set precedence for all tribal nations with TAS status and synchronizes with the self-determination policies established in previous years. Since this time, however, it is not unusual for TAS approved tribes, especially those who create more stringent WQS, to experience opposition from adjacent states (See Appendix Table 2.1.).

Improved EPA Guidelines for Tribal Nations

Presently, there are 566 federally recognized tribal nations and approximately 340 reservations (Table 2). Between 1992-2012, 48 (14%) tribal nations out of approximately 340 have been approved for TAS (USEPA 2012). Among those who have gained TAS, 38 (11%) of these same tribal nations have approved water quality standards (USEPA 2011). In the approximately 27 years since the TAS policy was established, only a few tribes have applied to be authorized to develop WQS through the TAS procedure. Because the number

of tribes who have obtained TAS is low, this study examines the barriers that two tribes experience when applying for TAS and developing water quality standards. See also the Appendix for Clarification 3b.

A 2005 report written by the Government Accountability Office (GAO) led EPA to release a list of strategies to improve the process for tribal nations applying for TAS (USEPA 2008; U.S. GAO 2005). The improvements included internal guidelines for EPA to process TAS requests in a timely and efficient manner. For example, GAO suggested that EPA streamline the application review process, and make more information available to tribal nations about the application process. In addition to improving transparency, EPA made extra efforts to present a step-by-step process that a tribe must complete when applying for TAS. Broadly, there are five steps beginning with the submission of the application, which is followed by a comment period, a review by EPA, a finding of fact proposed by EPA, and a decision made and announced by EPA.

Objectives

Our objectives are to understand the most important perceived opportunities and barriers among tribes who applied for TAS under EPA, and the perceived opportunities and barriers to creating water quality standards. This type of knowledge can only be asked of individuals employed by tribal nations and who hold specific water management roles; therefore we held in-depth, qualitatively oriented interviews. According to Johnson (2002) “a researcher who uses in-depth interviewing commonly seeks deep information and knowledge—usually deeper information and knowledge than is sought in surveys, informal interviewing, or focus groups.”

Methods

Case Study

In this study we used a case study design consisting of two geographically distinct tribal communities—one located in the Pacific Northwest (PNW) and one located in the Southwest (SW). Initially, in order to refine our research questions, we held 13 informal interviews with individuals from natural resource departments of several tribal nations, a professor of law, several tribal leaders and employees from EPA’s Headquarters and Regions 9 and 10 (See Appendix Table 2.5). Subsequent to refining our research questions, we conducted semi-structured, in-depth interviews with 5 resource managers from two tribal nations who were knowledgeable about EPA’s TAS process, the CWA and the SDWA. The core questions in our interview guide were:

1. What do you see as the greatest *barriers* you have faced in regards to your efforts to obtaining *TAS and developing WQS*?
2. What do you see as the greatest *opportunities* you have experienced during your efforts toward getting *TAS and WQS*?

In addition to holding in-depth interviews, we asked participants to take a survey to rank a list of opportunities and barriers of TAS and WQS. We generated these questions about opportunities and barriers from our informal interviews and a literature review. Participants rated 25 opportunities and 29 barriers on a four-point scale of very important, moderately important, not important and not sure (See Appendix for a flow chart showing details about our sampling process and sampling frame).

Recruitment

Recruitment of participants began with discussions between the researchers and leaders of each tribal nation. We approached several tribes over a 12-month period, and continued recruitment with 9 tribal nations. After 12 months we received approval from 2 tribal councils, from TAS approved tribes, to conduct this study. We included a detailed flow chart with our sampling process in the Appendix of this dissertation (See Clarification 1 and 2). Once we obtained approval, through purposive and snowball sampling we generated a list of people to interview. As described by Morgan, “purposive sampling chooses the focus group participants according to the project’s goals”(Morgan, Krueger, and King 1998) and snowball sampling “uses a small pool of informants to nominate other participants who meet the eligibility criteria”(Morgan 2008). In total, we interviewed 2 employees from one tribal nation located in the Pacific Northwest, and 3 employees from one tribal nation from the Southwest for a total of 5 in-depth interviews. We specifically included participants who had knowledge about TAS and/or WQS.

IRB and Tribal Approval

This study was informed by the indigenous research methodologies literature, which encourages researchers to acknowledge historical injustices experienced within tribal communities and to create a safe, healthy and empowering space for native participants (Smith 1999; Denzin, Lincoln, and Smith 2008; Chilisa 2012). This study was grounded in the recognition and support of tribal self-determination, and sought to build upon the foundations for community-to-researcher partnerships. Additionally, we used the Canadian Institutes of Health Research publication titled, “Guidelines for Health Research Involving Aboriginal People” (Canadian Institute of Health Research 2007) to develop memoranda of

understandings (MOU) with tribal nations who chose this level of agreement.

Data Management

Digital recordings were transcribed shortly after each in-depth interview and all identifying information was removed from the saved transcripts to protect the anonymity of each participant.

Data Analysis

We used QSR International's NVivo 10 software to code transcripts (QSR International Pty Ltd. 2012). The results were analyzed to describe the perceived opportunities and barriers that were stated during in-depth interviews and the ranked opportunities and barriers.

Results

This study identified opportunities and barriers to applying for TAS and in developing WQS perceived by natural resource managers of two tribal nations. Survey respondents ranked a list of 25 opportunities and a list of 29 barriers as very important, moderately important, unimportant, or not sure. According to the survey, the top 3 perceived barriers that were ranked as very important were financial (60%), cultural (60%) and technical barriers (57%) (Figure 1). The top 3 perceived opportunities (Figure 2) that were ranked as important were financial (80%), protect health (80%), and capacity building (70%). In this section for each category of a barrier or opportunity we discuss the results from the surveys and in-depth interviews. We begin by describing the survey results of barriers from the ranked survey and in-depth interviews, and then we describe the ranked opportunities from the ranked survey and in-depth interviews.

Barriers of TAS and Water Quality Standards

Financial Barriers:

Survey

Figure 1 shows that among the 7 categories of ranked barriers, financial limitations were ranked as very important by 60% of the natural resource employees of both tribal nations. This percentage was derived from the results of a survey whereby respondents ranked 29 barriers as described above. In the survey we asked participants to rank the perceived barrier “*lack of funding to sustaining environmental programs*” (See Appendix Table 2.1). Four-fifths stated this was very important while 1/5 ranked it as moderately important. We also asked how important of a barrier was “*the end of financial funding from EPA for tribal programs once water quality standards are approved.*” Again 4/5 ranked this as very important and one employee ranked it as not important. Three-fifths of respondents ranked the barrier “*insufficient funds to hire contractors*” as moderately important.

In-depth interviews

During our in-depth interviews, financial constraints were also stated to be a limitation to the process of applying for TAS, as was competition for resources available by USEPA for states, counties, and tribes. One interviewee stated:

“With TAS there comes more authority and the responsibility to be in compliance with regulations. This costs money and tribes often don’t have the funding sources that states have.”

Furthermore, another respondent stated:

“Being equal to the state means competing for the same resources as a state.”

Technical Barriers:

Survey

The next barrier in Figure 1 shows that technical knowledge as a barrier was a very important barrier for 57% of the respondents. For tribal natural resource departments having technical knowledge is important internally and externally. More specifically, in terms of technical knowledge, 4/5 respondents ranked two barriers as very important: “*the difficulty in understanding case law by natural resource department staff*” and “*the insufficient understanding by EPA about treaties signed between the federal government and tribes.*” “*The insufficient understanding about federal trust responsibility by EPA*” was ranked by 3/5 as very important. Of moderate importance were “*the uncertainty about tribal jurisdiction over land*” and a barrier that was perceived as not important by 3/5 was “*the insufficient understanding by EPA about usual and accustom lands.*” Lastly, 2/5 of respondents perceived “*The difficulty of translating traditional knowledge into western science as a means to develop water quality standards*” as very important.

In-depth interviews

During the in-depth interviews this category of a barrier did not emerge.

Cultural Barriers:

Survey

The cultural barrier “*cultural competency [of the USEPA] when interacting with this Tribal Nation*” was ranked by 60% of respondents as a very important barrier.

In-depth interviews

During the in-depth interviews, one interviewee stated that after obtaining TAS, a barrier was the *lack of understanding and acceptance of indigenous or traditional knowledge by government-to-government partners*. In particular one person stated:

“Acceptance by western scientists of traditional knowledge is minimal. There is a tendency to brush it aside and not pay attention to it as being viable [...] I think modern science and traditional knowledge should be working together but they don’t because of cultural bias and perceptions.”

Capacity Building Barrier:

Survey

As shown in Figure 1, capacity building was a very important barrier for 40% of the respondents. In particular, 3/5 of interviewees perceived the “*difficulty in recruiting expert staff*” as a very important barrier, and 2/5 thought “*difficulty in retaining expert staff*” was a very important barrier.

In-depth interviews

During the in-depth interviews two managers articulated insufficient capacity building as a barrier to applying for TAS and reflected on the time EPA required during the approval of this tribal nation’s TAS’s application. One person responded to the question about important barriers of TAS:

“It [the barrier] would be having qualified staff. Being a tribe without a casino, we really do not have a competitive edge to get those types of biologist or scientists [on our staff].”

This person continued by complementing the ability and presence of their staff at keeping their natural resource department running. However, there is strong

interest in training the next generation of environmental managers to fill offices and positions that protect their community's health.

Political Barriers:

Survey

Political barriers were ranked as very important by 35% of the participants. The “*exclusion of this Tribal nation at the Federal level (but not by EPA) from decision-making regarding environmental issues*” and “*exclusion of this Tribal nation at the State level (but not by EPA) from decision-making regarding environmental issues*” was ranked as very important by 3/5 of respondents. Two-fifths of the respondents who were asked to rank the following barriers listed them as very important. These barriers were: “*concern of increased disputes between state and this Tribal Nation as a result of applying for or obtaining TAS,*” and “*the lack of respect as a sovereign by EPA.*” Of moderate importance, as ranked by 2/5 of participants, were “*concern of increased disputes between neighboring counties and this Tribal Nation as a result of applying for or obtaining TAS*” and “*concern of increased disputes between federal government and this Tribal Nation as a result of applying for or obtaining TAS.*”

In-depth interviews

One interviewee articulated the lack of tribal government and council receptivity or interest to new information as a general barrier to addressing environmental issues within this tribal nation. This interviewee described the importance for the tribal council, the Nation's leadership, to take interest in resolutions to save wetlands, or recycling, addressing climate change and other agendas as a first step to getting the tribal community involved. He went on to explain that the tribal government has a responsibility to make informed decisions

about the environmental health of their communities but if they lack the political will or receptivity to such information that produces a barrier to getting environmental issues addressed. He added:

“Some people have lived on the reservation all of their lives so the tribal government is the only avenue [for getting environmental related information], so if things seem to be 20 years behind everybody else, it’s because the local government isn’t pushing forward to reach bigger goals.”

Another political barrier described in regard to developing water quality standards is the resistance from states when tribes update their fish consumption rates and/or water quality standards to be more stringent than states. For instance, another person made the following statement:

“The national or state consumption rate is like 6 grams a day, which isn’t even a tuna sandwich...we need the state to get real and start reducing their criteria for allowable pollutants.”

Another interviewee who was knowledgeable about water systems under the SDWA commented on jurisdictional issues:

“Jurisdiction is one of the major hurdles, and even today we’re still working on obtaining primacy on certain water systems that are obviously on [our reservation], but still we are having a hard time obtaining primacy over areas that are obviously trust lands or Native land.”

This natural resource manager went on to explain that there are jurisdictional tensions between non-Native businesses that are located on trust lands which inhibit the natural resource department from inspecting, monitoring or enforcing water standards for their business. This results in some businesses evading enforcements and creates a gap in the

protection of human health from leaking underground storage tanks, spills and poor well conditions.

Institutional Barriers:

Survey

Institutional barriers were very important perceived barriers for 17% of respondents. As ranked by 2/5 of respondents, the top two very important barriers were the “*time allotted by EPA to this tribal nation to complete requests regarding TAS and water quality standards.*” “*The involvement of multiple agencies in the management of issues pertaining to water quality*” was ranked as moderately important by 2/5 of participants. The “*changing of EPA's requirements, rules and regulations regarding TAS and water quality standards*” was ranked as not important by 2/5 of respondents. Also within this category, a barrier ranked as not important or not sure by all respondents was the “*involvement of multiple EPA statutes (e.g., CWA, CAA, and SDWA) in the development of water quality standards.*”

In-depth interviews

During the in-depth interviews one person mentioned the introduction of a new governance system and culture to tribes as a perceived political barrier. One natural resource manager stated when asked if he could list a barrier to applying for TAS:

“[The] introduction of a regulatory compliance and enforcement paradigm into a nation that really had it's own culture, and introducing a mechanism from another culture and society into a tribal nation.”

This interviewee added:

“That being said, EPA has been pretty respectful. Probably more than most other federal agencies in trying to work with tribal governments and

negotiating solution of setting the regulatory compliance and enforcement paradigms.”

During the development of water quality standards, two barriers mentioned by interviewees were the lack of enforcement of federal or state WQS within usual and accustomed lands (U & A) and tensions between tribes and states over jurisdictional boundaries, authority on fee lands (e.g., checkerboard areas, or land with non-contiguous boundaries) and monitoring responsibilities. In the former, an example was provided by one natural resource manager when asked about the challenges to creating water quality standards that are protective of a PNW tribe. He mentioned the lack of enforcement of WQS on usual and accustomed lands:

“On our usual and accustomed places there is a real lack of enforcement by non-tribal entities, states, county, [and] state agencies who are required to enforce water quality standards but are not doing so.”

Communication Barriers:

Survey

Communication barriers were the least important category (10%). We asked respondents to rank “*the lack of EPA's transparency regarding tribal water quality interest*” and 1/5 ranked it as very important while 2/5 ranked it as a moderately important barrier. The barrier “*difficulty in communicating with EPA*” was ranked by 2/5 as moderately important.

In-depth interviews

No communication barriers were mentioned during the in-depth interviews.

Emerging Barriers from In-depth Interviews

Command and Control Management:

When asked about the perceived barriers experienced after obtaining TAS, one person explained the top down management style by USEPA when interacting with her natural

resource office as a constraint. Top down directives can come across as pushy while not having a complete understanding of the realities that tribes must negotiate within their communities. One person stated,

“We are always being looked at, and I don’t want to say picked on, but I think the glass is magnified on us versus other tribes in the state. It could be reports or data compilation. I think that through the whole thing, I felt that USEPA has been thoroughly looking at what we do more than other states.”

Opportunities of TAS and Water Quality Standards

The opportunities from ranked survey questions are listed in Appendix Table 2.2 and the corresponding percentages are illustrated in Figure 2. In the survey one participant left several opportunities unranked, so for these answers we inserted “no answer” as the response. We now discuss the results from the ranked opportunities of TAS and water quality standard survey and those expressed during in-depth interviews.

Financial Opportunities:

Survey

Figure 2 illustrates that 80% of respondents ranked financial opportunities as a very important opportunity. Out of 5 survey respondents, 4 ranked the following opportunities as very important: “*increased funding opportunities after TAS approval*” and “*increased funding opportunities after the development of water quality standards*” (See Appendix Table 2.1).

In-depth interviews

In an in-depth interview, several people stated key benefits of applying for TAS are the grants available to implement programs to improve water quality. For example one person commented about TAS:

“It’s an important part in maintaining water quality here. Obviously it brings in funding that’s continuous under TAS. [...] So it brings resources to bear that would not normally be available to the tribe in setting standards and monitoring for these standards.

There are incentives for TAS tribes who build up their water quality programs and departments. EPA base funding is an example of these funds. When asked about the favorable aspects of developing water quality standards, one natural resource department commented:

“[...] The 106 and 319 programs, which are non-point source programs, are another bonus that you get after you establish yourself as a mature program. And then from there it’s just broadening out what you do in your area. Could be wetland restoration, estuary, near shore or coastal monitoring. Your program gets to be successful through monitoring strategies.”

Protect Health Opportunities:

Survey

Also ranked as very important by 80% of respondents were health protection opportunities. In this category, 4/5 perceived “*enhanced protection of human health for this Tribal Nation subsequent to approval of TAS*” and “*enhanced protection of human health for this Tribal Nation subsequent to approval of water quality standards*” as very important opportunities.

In-depth interviews

During the in-depth interviews health protection opportunities did not arise.

Capacity Building Opportunities:

Survey

We asked interviewees to rank perceived opportunities that help attain greater capacity building. Our data shows that 70% of respondents ranked capacity building as a very important opportunity. More specifically, 4 out of 5 respondents ranked the following three opportunities as very important *“increased technical assistance from EPA,” “increased ability by this Tribal Nation to address environmental issues for this Tribal Nation”* and *“help from EPA with technical knowledge development.”* In addition, 3/5 of respondents ranked *“training from EPA,” “recruitment of expert staff within this Tribal Nation”* and *“retention of expert staff within this Tribal Nation”* as very important.

In-depth interviews

There was no capacity building barriers mentioned during in-depth interviews.

Institutional Opportunities:

Survey

Institutional opportunities were ranked as very important by 68% of respondents. Two opportunities were equally ranked by 4/5 as very important. These opportunities were: *“encouragement to take control of environmental decision making”* and *“increased inclusion by EPA as a government-to-government entity.”* Three-fifths ranked the following three opportunities as very important: *“encouragement from EPA to take control of environmental programs,” “encouragement to submit a TAS application to EPA”* and *“encouragement to develop water quality standards.”*

In-depth interviews

When one person was asked to discuss opportunities that have been realized in regards to developing water quality standards for this nation, he responded with this statement:

“Well, TAS puts us up there with the State. [Having] our standards in place make it so that we do not have to rely on anybody else--just our numbers.”

Political Opportunities:

Survey

The political opportunities listed in our survey were ranked as very important by 65% of respondents. Three opportunities were ranked as very important by 4/5 of respondents. They were “*increased attention by EPA to federal trust responsibility*,” “*federal support of sovereignty*” and “*increased respect by EPA of tribal decision-making as a sovereign nation*.” The following 4 opportunities were ranked as very important by 3/5 of respondents: “*help with dispute resolution between industries and this tribe under the Clean Water Act*,” “*beneficial collaboration with EPA*,” “*help with dispute resolution between federal government and this Tribal Nation under the Clean Water Act*” and “*help with dispute resolution between state(s) and this Tribal Nation under the Clean Water Act*.” The opportunity to “*help with dispute resolution between neighboring counties and this Tribal Nation under the Clean Water Act*” was ranked by 2/5 of respondents as very important.

In-depth interviews

During in-depth interviews, the recognition of tribal authority and sovereignty was

discussed as an important aspect of TAS. This is a significant acknowledgement for many reasons because this recognition strengthens actions to address water quality and human health by tribal communities. The recognition of tribal sovereignty makes TAS possible and enables tribes to develop WQS along with water quality guidelines set by tribes. One person expressed these important opportunities in the following statement:

“EPA allows tribes to set their own standards such as water quality standards, air quality standards [and] pollution limits. [...] Tribes have been historically left out of the equation in environmental protection, and this is one of the reasons that tribes approached EPA a long time ago because they wanted equal protection on environmental issues. Tribes have stepped forward to set some pretty strict standards in water and air quality.”

Communication Opportunities:

Survey

Forty percent of respondents ranked communication as a very important opportunity and (3/5) ranked “*improved communication with EPA*” as very important. And of moderate importance as ranked by 3/5 of respondents was the opportunity: “*beneficial interactions with environmental consultants.*”

In-depth interviews

According to one interviewee the proximity of their water quality management offices to the community is beneficial because it allows managers to work with the other water managers and community to keep up dated with compliance issues and new regulations, to understand issues occurring within the community, and to better understand how to manage the problem. This creates a streamline of communication between environmental management and tribal communities.

Emerging Opportunities from In-depth Interviews:

Education and Outreach

Several interviewees expressed education and outreach events as benefits to having TAS and to developing water quality standards. These processes have allowed for a greater understanding about environmental issues occurring among their communities and some EPA funding programs facilitate environmental outreach and educational programs that teach about pollution control strategies and creates a space for natural resource managers to communicate to the community about water issues in nearby regions. When asked about the opportunities that come out of developing water quality standards, one interviewee stated:

“In doing outreach and educational efforts with the community, and other tribal nations, the tribes have worked together in helping to educate people at the local level and other surrounding cities and county jurisdictions about the interests and values of the tribe. For example how water quality relates to salmon health and recovery. This would not be out there if it weren’t for the tribes.”

Cultural Opportunities

A cultural opportunity from the TAS process that emerged from an in-depth interview was the notion of incorporating traditional ecological knowledge into environmental management more and more over time. For example, one person expressed:

“TEK is going to be something that’s really going to have a bigger point of discussion when dealing with government-to-government roles and consultation [...] it deals with not just the physical but also the spiritual. Tribes have their songs, their language and they are raising their families to be like that.”

He went on to explain how the government-to-government relationship includes a growing understanding about how tribes want to live and how native communities

define their own communities. Traditional knowledge is the foundation for how tribes have made decision about how to manage the land.

Legal Protection

The legal protection of designated uses and WQS to protect those uses are another opportunity that emerged from in-depth interviews. One participant mentioned the significance of legal protection of culturally important designated uses such as fish spawning, ceremonial and subsistence.

Discussion

The primary goal of this study is to identify the most important perceived barriers and opportunities to applying for TAS and developing water quality standards by two tribal natural resource departments. The top three perceived opportunities were financial, protection of health, and capacity building, while the top three barriers were financial, cultural and technical. As the results illustrate, natural resource managers identified additional concerns and opportunities related to our goals.

Interestingly, **financial** constraints are perceived by participants as both an opportunity and barrier, and are related to other barriers such as insufficient capacity building and technical knowledge. Tribes can apply for grants available through EPA as a means to build the capacity of tribal water programs and to acquire technical assistance (See Appendix Table 2.3.). Once tribes have been approved for TAS status they can apply for CWA's Section 106 funds, and when their programs mature, they can also apply for Section 319 grants and other grants. However, even with the current number of TAS approved tribes, funding is competitive and limited (Ranco and Suagee 2007). In EPA's 2009 status report, it

boasts that tribes who became eligible for Section 106 monies increased by 76% from 2002-2009, yet funding specific to tribes did not keep pace and increased by only 43% (USEPA 2009). The 2009 report predicted that future challenges would include inadequate funding for tribes under Section 106. Furthermore, in 2010 though the CWA's Section 319 program annually received approximately \$200 million from Congress, tribes were allotted a statutory limit of approximately 0.33% of these funds (USEPA 2010). When we consider the larger economic context of tribes, there is little relief from these financial woes. The 2010 U.S. Census shows that tribes experience the highest poverty rates, which are aggravated by the unmet funding needs across all areas of tribal government. Clearly EPA has recognized the top two barriers identified in this study as important requirements for tribal success, and tribes undoubtedly depend on these monies to fund their environmental programs; however, their unmet funding needs persist.

There are many opportunities that are generated from EPA grants and funding. Our participants communicated their appreciation for grants that help them improve and grow their programs. In addition, as discussed below, with grant monies tribes are able to strengthen their community education and outreach initiatives. Some additional successes that have been highlighted by EPA include the development of water quality standards, building capacity to inform local governments, developing non-point source management plans and enhancing environmental programs (USEPA 2009). In our work, with adequate funding to support their endeavors, respondents expressed enthusiasm about the improvements they envision for their education and outreach initiatives.

Our results suggested the lack of **technical** knowledge as an important barrier. When tribes set out to apply for TAS, they must prepare to navigate through the U.S. legal system

and principles, and in some cases, tribal law. Most tribal employees do not have the experience to endure this process alone, so they hire consultants and other external specialists. As one example, given the complexity of tribal law and the eligibility requirements of the TAS application, such as the requirement to prove tribal jurisdiction over a water body, a lack of understanding of case law is a significant barrier. In order for tribal natural resource departments to be successful in both TAS and developing WQS, they have had to strengthen their technical knowledge, which is interrelated to **capacity building**. EPA has been instrumental in providing training on numerous topics that can be accessed on their website, in webinars, and by attending conferences or workshops, however, most of these lectures are merely glimpses of the knowledge or skills that tribes need to be fully autonomous. The overarching social barriers that impede many tribal citizens from attaining high school degrees, much less college degrees, are huge social costs to tribal nations and are deterrents to the future improvements in technical knowledge in all areas. At present, this is realized when some tribes have no other option but to turn outside of their community to recruit staff to work in tribal natural resource departments.

According to our results, another challenge faced by tribes is the lack of understanding some EPA staff have about treaties and federal trust responsibilities. Nationally the fact that these concepts are convoluted from decades of neglected discourse and inconsistencies may contribute to these misunderstandings and knowledge gaps. EPA has responded to these gaps in written instructions for how to carry out their trust responsibility, for example in EPA's Indian Policy (Table 1). In parallel, tribes have been vocal about how the federal government can better meet these responsibilities (Treaty Indian Tribes in Western Washington 2011). In fact, if it were not for tribes exerting their treaty

rights, and holding the federal government accountable for following their trust responsibilities, these rights and responsibilities would likely be nonexistent. Despite these efforts on the part of EPA and tribes, our data suggests that there are shortfalls in the transmission or embracement of these foundational principles.

Respondents also perceived **cultural concerns** as presenting both opportunities and barriers. At the core of these concerns were the lack of incorporation, acceptance and understanding of traditional knowledge (also referred to as traditional ecological knowledge (TEK)). Among many indigenous peoples traditional knowledge (TK) is part of daily life and “cannot be separated from the people” (McGregor 2004). Regrettably, during the boarding school era, the Federal government tried to forcefully acculturate and assimilate tribal members into the dominant society. Today tribal communities are fighting to retain Indigenous knowledge systems, which is one reason the incorporation of TK into environmental management and policy is important to indigenous communities and our respondents. In addition, TK is considered as an instrument to the strengthening of indigenous culture and it contains the values that are important to sustaining strong indigenous cultures (Simpson 2004). In the research community, although reluctance is still present, acceptance of TK is growing as more researchers gain access to communities who are willing to share their knowledge about sustainable strategies and new alternatives to western styles of resource management (Berkes 2008). Still, TK continues to be undervalued, perhaps because many continue to have a lack of understanding of TK and a vision for how to utilize it in resource management and policy development. Our data restates the importance of incorporating cultural values and traditional knowledge into environmental management and stewardship, as a means of supporting self-governance of

tribal communities. Moreover, as environmental managers, tribes are determined and inspired to use TK to manage their resources and to participate in the strengthening for tribal culture values.

The recognition of tribal sovereignty and authority by EPA has opened up opportunities for federally recognized tribes to begin distinguishing their needs that were never before reflected in Federal policy. Possibly the greatest attraction to TAS by tribes are the opportunities to **protect the human health** of their citizens by setting standards that are protective of the designated uses defined by tribes themselves (which, as in the Pueblo of Isleta case, can impact off reservation pollution sources). Examples of unique designated uses are wild rice, fish consumption and ceremonial. As reflected in our in-depth interviews, a **political opportunity** that is interlaced with human health is that TAS-approved tribes can set water quality standards that are more stringent than adjacent states. The significance of this cannot be understated because tribes can develop water quality standards that are protective of their unique lifestyles, which generally would not be possible under most state or current federal water quality regulations (one exception is the revised fish consumption rates in Oregon).

Our results also indicated the importance of education and outreach and the legal protection tribes received subsequent to gaining TAS approval. Of course, **education and outreach** are key opportunities for tribes to grow their water quality program and build networks with neighboring communities and governments. In this study we learned that having a clear understanding about local environmental issues allows tribes to educate their communities so they may create internal solutions to addressing them, which increases the likelihood for the emergence of culturally appropriate methods and is an exercise of self-

determination. Furthermore, knowledge transmission creates the possibility of encouraging future generations of natural resource managers to take on important environmental management work. For many of these communities there are few routes for obtaining such information about the health of the environment, how it might impact community members and their role in providing solutions.

The legal protection of cultural and ceremonial uses of water, and the ability to control the release of pollutants on adjacent areas of reservation lands are important opportunities expressed by both tribal communities who participated in this study. Since the formation of TAS, U.S. Courts has continually upheld EPA's approval of TAS and WQS set by tribes, even when standards were more stringent than adjacent states. Although this protection is a tremendous drive for tribes to attain TAS, some tribes worry that there is an imminent threat to sovereignty that lurks over them. Since 1996 in several court cases (See Appendix Table 2.1), states have challenged the WQS set by tribes, EPA's granting of TAS to tribes, and tribal claims of land jurisdiction. So some tribes may have to weigh the potential for litigation when they are deciding whether to apply for TAS while other tribes may have fewer reasons to be deterred.

The present study extends prior work by revealing an additional barrier category that was not considered in our ranked survey. For example, **command and control management** was discussed during the interviews. During our in-depth interviews, a common experience was the disconnection tribal natural resource managers had with top down directives common to bureaucratic institutions. While command and control management might be commonplace for many, it may be new for some tribal citizens. According to EPA, before tribes can be authorized for TAS they must provide evidence that they are able to create and

enforce regulations; therefore, a decision about a tribe's baseline capacity is made before they are granted TAS status. TAS-approved tribes are then encouraged to exercise self-governance and self-determination through EPA's Indian Policy. When a tribal business located on the reservation is found to be out of compliance with tribal environmental standards, there are a few ways to address this. For example, tribal managers can work with businesses to assist them in reaching compliance levels rather than implementing fines. The former is the best choice for businesses that are financially unable to absorb the cost of fines, but whose functions are necessary to the community. This, however, may reflect poorly on EPA's compliance numbers and give the impression that managers are not enforcing their standards well enough. Hence, depending too strongly on compliance numbers ignores the multi-dimensional realities tribes face. In essence, EPA's regional offices must be aware that tribes must first work within the confines of tribal reality, and that the economic circumstance of businesses on reservations often need approaches that don't lead to the threat of closure. We learned in our research that tribes are not asking for leniency instead they need Regional EPA staff to be more cognizant of the conditions and cultural differences present in reservation communities.

In this work, we interviewed two tribal nations who have successfully established water quality standards, yet there are hundreds of additional tribes who have not proceeded on this path. The barriers identified in this work suggest potential reasons that only a small percentage (47%) of tribes have applied for TAS and seek to develop their own water quality standards. Understanding the barriers in this process is important for several reasons. The survey conducted in this work will allow each tribal nation to focus their attention on the most important barriers identified and suggest areas to prioritize. Furthermore, for tribes

who plan on applying for TAS and to develop their own water quality standards, it's important that they understand the structures that may impede their progress in order to better strategize.

This study was subject to a few limitations. Firstly, the sample size achieved here limits the generalizability of these data to other tribal nations. However, for the tribes included in this work, these data provide valuable insights about the challenges they experience when seeking to develop water quality standards under EPA's framework. Secondly, we asked interviewees to recall the barriers and opportunities they experienced or perceived during their involvement, so recall bias may have occurred during interviews. Lastly, this work examines a small fraction of the complexities surrounding water issues within tribal communities. There are numerous other factors that might be impacting a tribe's decision to obtain TAS or to develop water quality standards. For example, tribes must weigh whether or not the development of water quality standards would create the goals necessary to address the pollution problems they encounter. Given limited capacity and resources, obtaining TAS might not be the greatest priority for tribes.

Future directions of this research ought to gather input from additional tribes about the barriers to applying for TAS and developing WQS. Our work highlights some of the areas of concern; however, to better meet the needs of tribes nationwide a larger sample size is needed. Also, it would be useful to explore what tribes and EPA can do to improve upon the top opportunities, and what they can do to alleviate the top barriers ranked by these communities. Furthermore, the required procedures tribes must follow to gain TAS should be re-examined and updated to better fit the realities that tribal nations experience. Self-determination is a motivating force for tribes and is foundational to tribal success. Thus,

understanding how tribes are building upon these concepts, and identifying what is important to tribes, are significant steps in understanding how to establish procedures that will function effectively within tribal nations and their communities.

Conclusion

In conclusion, this work identified and ranked several perceived barriers and opportunities to obtaining TAS and developing WQS by tribal natural resource managers of two tribal nations. The top three perceived opportunities were financial, protection of health, and capacity building, while the top three barriers were financial, cultural and technical. Most of the barriers and opportunities have been identified in the literature; however in this work employees who have the experience and knowledge of these procedures identified and ranked the barriers and opportunities. This work supports other reports about opportunities and barriers. To our knowledge, unique to this work is the ranking of the barriers and opportunities important to developing water quality standards. This study identified one emerging barrier to obtaining TAS and listed several perceived opportunities to these procedures. Approaches to addressing the challenges tribes face will require cooperation between multiple parties, adhering to EPA's Indian Policy (Table 1) and a continual recognition and support of tribal sovereignty and self-determination.

Acknowledgements

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Figures and Tables

Table 1. EPA’s Indian Policy of 1984.

1.	Be ready to work directly with Indian tribal governments on a one-to-one basis.
2.	Recognize that tribal governments are the primary parties for setting standards, making environmental policy decisions, and managing programs for reservations, consistent with Agency standards and regulations.
3.	Take action to encourage and assist tribes in assuming regulatory and program management responsibilities for reservation lands.
4.	Take action to remove existing legal and procedural impediments to working directly and effectively with tribal governments on reservation programs.
5.	Consistent with the federal trust responsibility, ensure that tribal concerns and interests are considered whenever EPA's actions and/or decisions may affect reservation environments.
6.	Encourage cooperation between tribal, state, and local governments to resolve environmental problems of mutual concern. This concept can be sensitive, and experience has taught the Agency that the tribes and states must initiate cooperation.
7.	Work cooperatively with and enlist support of other federal agencies which have related responsibilities on Indian reservations in order to help tribes assume environmental program responsibilities for reservations.
8.	Work to assure compliance with environmental statutes and regulations on Indian reservations.
9.	Incorporate the preceding principles into planning and management activities including budgets, operating guidance, legislative initiatives, management accountabilities systems, and ongoing policy and regulation development processes.

(USEPA 2011)

Table 2. Number of tribes with EPA approvals for TAS and WQS.

Tribal nation application approvals for TAS and WQS	2012
Federally recognized tribal nations	566
Federally recognized tribal nations with reservations	340 ³⁰
TAS approved application (for WQS program)	48
TAS and tribal WQS approved	38
WQS promulgated by EPA	1

(USEPA 2012)

³⁰ EPA states, “Of the approximately **340** tribes with reservations, 48 have been approved...” BIA’s FAQs pages states, that “There are approximately 326 [...] reservations. I’m not sure why EPA lists 340 reservations.

Figure 1. Percentage of natural resource employees who ranked barriers from each category on a 4-point scale.

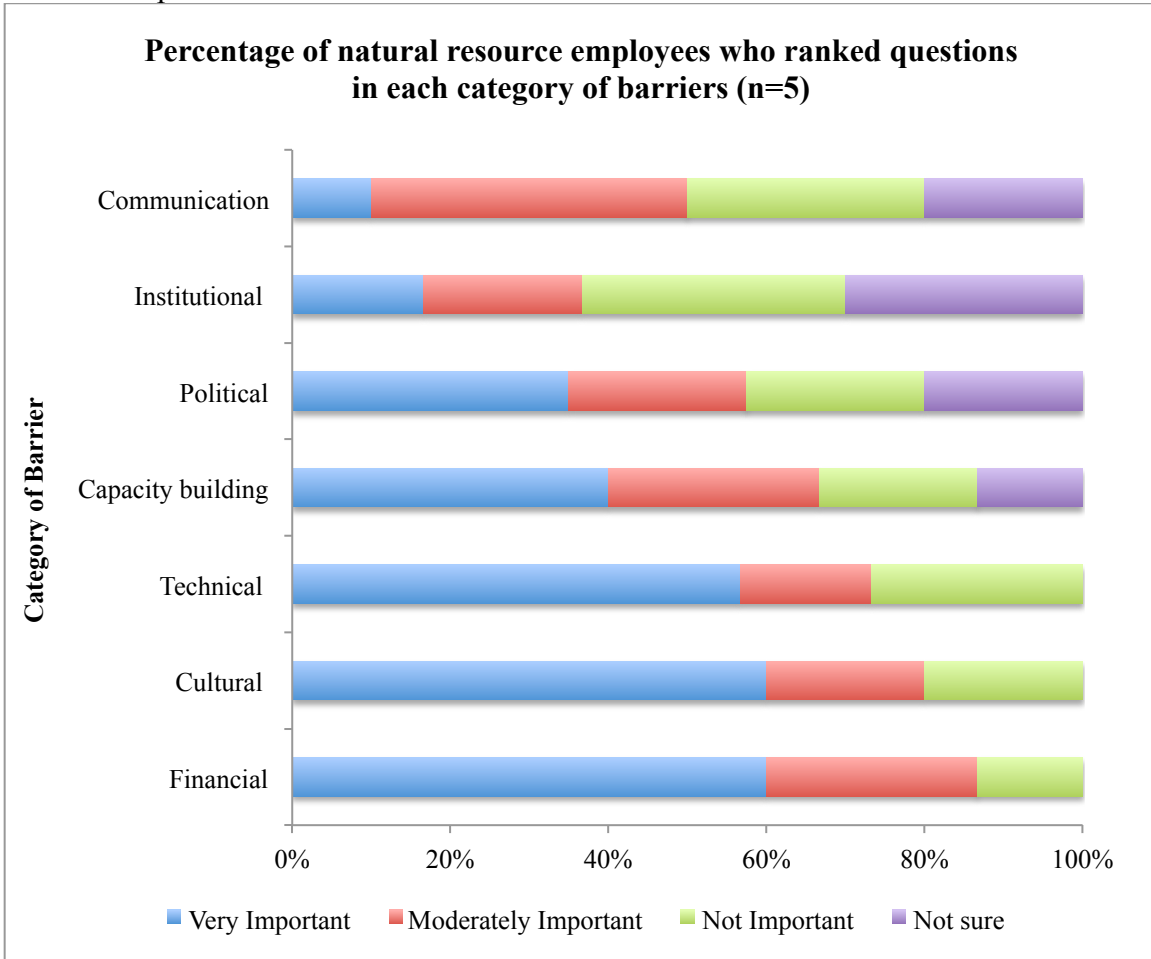


Figure 2. Percentage of natural resource employees who ranked opportunities from each category on a 4-point scale.

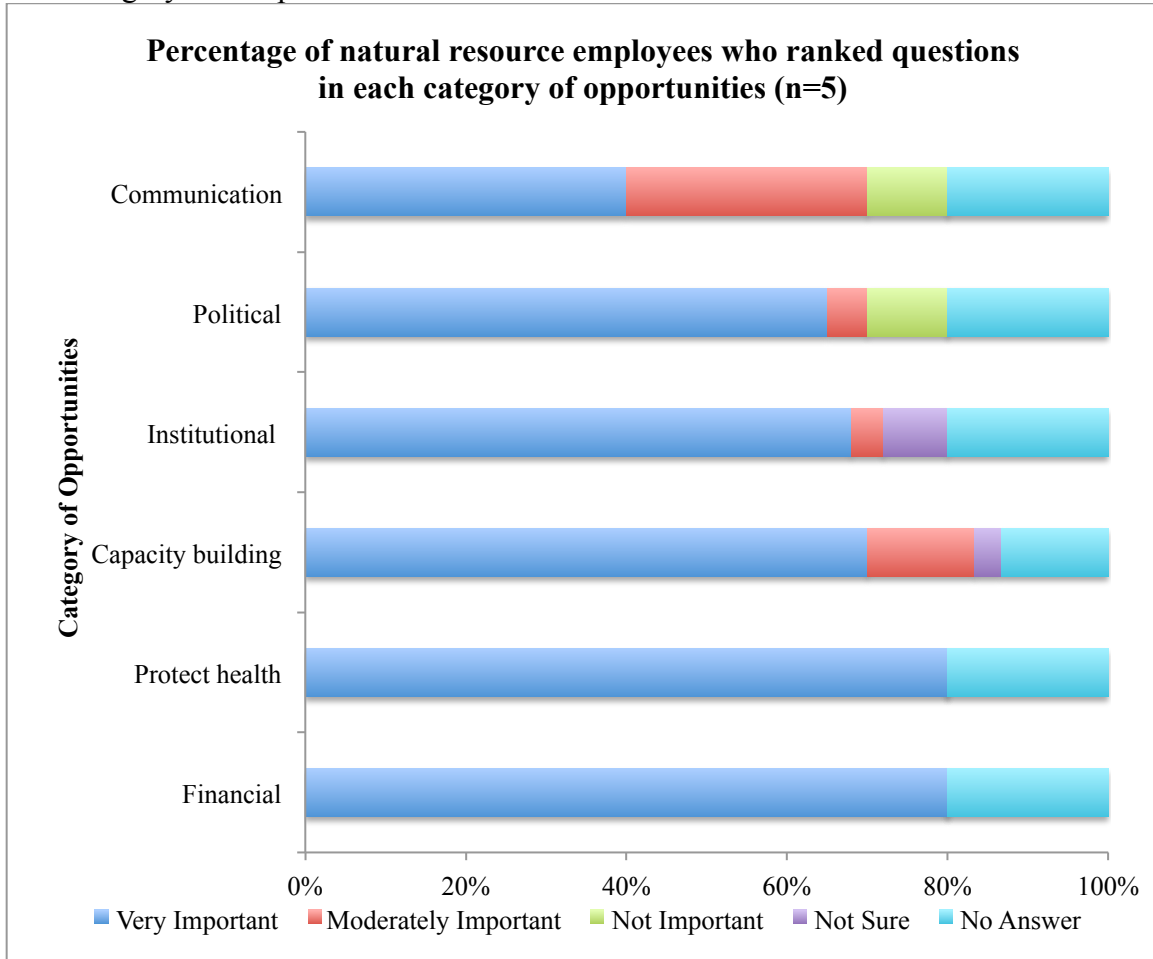


Table 3. Perceived barriers in the TAS and WQS process.

EPA application process	Barriers
Before TAS	<p>Financial</p> <ul style="list-style-type: none"> • Long term financial implications of TAS <p>Capacity building</p> <ul style="list-style-type: none"> • Insufficient capacity building • The time needed by EPA to approve TAS is too long <p>Institutional</p> <ul style="list-style-type: none"> • The introduction of a new governance system and culture to tribes <p>Political</p> <ul style="list-style-type: none"> • Lack of tribal government and council receptivity to new information • Lack of trust rooted in the historical relationship between federal government and tribes
After TAS	<p>Financial</p> <ul style="list-style-type: none"> • Competition for resources available by USEPA for states, counties, and tribes <p>Cultural</p> <ul style="list-style-type: none"> • Lack of understanding and acceptance of indigenous or traditional knowledge by government-to-government partners <p>Capacity building</p> <ul style="list-style-type: none"> • Difficulty developing partnerships with federal agencies as a sovereign tribe with TAS <p>Command and control management</p> <ul style="list-style-type: none"> • Top down directives can come across as pushy while not having a complete understanding of the realities that tribes must negotiate on reservation communities
WQS	<p>Political</p> <ul style="list-style-type: none"> • Resistance from states when tribes update their fish consumption rates and/or water quality standards to be more stringent than states • Tensions between tribes and states over jurisdictional boundaries, authority on fee lands (checkerboard areas) and monitoring responsibilities <p>Institutional</p> <ul style="list-style-type: none"> • Lack of enforcement of federal or state WQS within usual and accustom lands

Table 4. Perceived opportunities of having TAS and WQS.

EPA application process	Perceived Opportunities
TAS	<p>Financial</p> <ul style="list-style-type: none"> • Opportunity for funding such as grants that can be sought out to implement programs to enhance the protection of water <p>Political</p> <ul style="list-style-type: none"> • Recognition of tribal authority and tribal sovereignty • Helps to promote a knowledgeable tribal counsel and by doing so this will help to educate the community <p>Communication (internal)</p> <ul style="list-style-type: none"> • Allows local tribal natural resource departments or water quality management to be close to tribal community <p>Cultural</p> <ul style="list-style-type: none"> • TEK incorporation
WQS	<p>Institutional</p> <ul style="list-style-type: none"> • Obtaining TAS to develop WQS provides water quality guidelines that tribes set <p>Political</p> <ul style="list-style-type: none"> • “TAS puts us up there with the State, our standards in place, not having to rely on anybody else by our numbers, having our own standards” <p>Education and outreach</p> <ul style="list-style-type: none"> • Engaging the tribal community and surrounding communities • Having WQS helps to educate about environmental and water issues at the local level, surrounding cities and county <p>Legal</p> <ul style="list-style-type: none"> • Legal protection of designated uses and WQS to protect those uses

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Chapter 4: Using a value-based approach to inform environmental management decision making aimed to meet the water insecurity needs of two tribal communities

Running Title

Using a value-based approach to inform environmental management decision making aimed to meet the water insecurity needs of two tribal communities

Short Running Title (<50characters and spaces)

Authors

Clarita M. Lefthand-Begay

Department of Environmental and Occupational Health Sciences, School of Public Health, University of Washington, Seattle, Washington, United States of America.

Elaine M. Faustman

Department of Environmental and Occupational Health Sciences, School of Public Health, University of Washington, Seattle, Washington, United States of America.

Name and contact information:

Clarita Lefthand-Begay,
1212 E. Barclay Ct, Seattle, WA, 98122
206-856-7658,
clarita@uw.edu

Abstract

Background: Water is central among indigenous cultures that depend on healthy ecosystems for their well being. The value systems of indigenous peoples links their past to their present, determines what is significant to them and guides their sustainable practices as first stewards. In the present, numerous pressures are threatening their water security, thereby threatening their cultural, spiritual, physical, and economic health. For example, in some communities

infrastructural limitations, contaminated drinking and surface water, extreme weather events and other factors challenge their accessibility to safe water.

Objective: Using case studies we aimed to understand the cultural values expressed by two tribes in order to develop a means-ends network, value trees and performance measures.

Methods: Case studies were composed of two Tribal nations—one located in the Pacific Northwest (PNW), and the other located in the Southwest (SW). To understand the values, we held focus group interviews with tribal community members, then utilized a structured decision making approach to organize culturally driven objectives and actions to meet water insecurity needs.

Results: The most important values expressed by focus group participants included “water is life”, the importance of an indigenous policy of conservation, spiritual bathing, access to water, and concerns for future water sources. The water security concerns of these tribes were organized into 68 fundamental and means objectives. Lastly we developed performance measures to improve access to water. **Conclusions:** An understanding of value allows us to inform environmental policies as to attain healthier communities. Lastly, this value-based approach may aid the incorporation of indigenous value systems into environmental management for tribes.

Key words

Water security, water quality, accessibility, natural resource management, structured decision making, Tribal nations, tribes.

Introduction

Using case studies we aimed to understand the cultural values expressed by two tribes in order to develop a means-ends network, value trees and performance measures. This study is guided by two research questions. The first question is: can cultural values be incorporated into a value tree for use by natural resource managers? We explored this question by examining the cultural water values held by two tribal communities in the PNW and the SW, and then applying structured decision making (Gregory and Keeney 1994; Gregory and Keeney 2002; Hammond et al. 1999; Keeney 1982, 1992, 1996; Keeney and Gregory 2005) to the concerns voiced by each group during focus group interviews. We used a water security framework in our focus group questionnaire to understand the cultural water values held by these communities. During interviews, participants articulated important water quality, quantity and accessibility values held within their communities, and described sources and uses of water. The concerns that emerged from conducting focus group interviews allowed us to examine our second research question. The second question we sought to explore was whether the Environmental Protection Agency's (EPA) Clean Water Act (CWA) and water quality standards adequately protect the health of tribal members.

According to UN-Water a working definition of water security is “the capacity of a population to safeguard sustainable access to adequate quantities of and acceptable quality water for sustaining livelihoods, human well-being, and socio-economic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability” (UN Water Analytical Brief 2013). In this work we began by examining accessibility, quality, quantity and cultural water values. Our analysis of cultural water security values led to the modification of UN-

water's definition by including cultural water security values expressed by focus group participants.

In terms of water quality, there are multiple agencies and tribal nations that develop water quality standards including tribal natural resource departments, EPA, and in Washington State, the Department of Ecology. Theoretically, sovereign tribal nations who are authorized under EPA's Treatment in the same manner as state (TAS) are eligible to set tribally-based water quality standards³¹. Such standards are developed using risk assessment methods that use averages from population-wide data (USEPA and Office of Science Technology 2000), and require technical skills and exorbitant budgets to carry out. In fact, EPA's human health criteria are controversial because they are based on exposure estimates that do not reflect tribal lifestyles (Harper et al. 2007). For example EPA's fish consumption patterns are not reflective of tribal consumption, and therefore presents a greater risk to individuals who consume fish at rates higher than the national average (USEPA 2000). In 2011, Oregon addressed this human health risk by increasing their fish consumption rate (FCR) (State of Oregon Department of Environmental Quality 2008). In Washington, to the disappointment of tribal communities, the decision to increase FCR has been delayed. Presently, Washington, Idaho and Florida are in the process of updating their FCR (Conklin 2013).

Many tribal communities are subsistence communities who hunt and fish throughout the year, and who continue to live closely to the landscape. The interdependence between environment and health is the essential reason we highlight the need to incorporate indigenous values and voices into decision making and policies in order to address the health disparities experienced by many indigenous communities. Additionally, we are interested in

³¹ See Chapter 3 for a discussion about TAS

understanding cultural values as to enhance water security. This chapter will highlight water security gaps and inform decisions to heed these issues present within Indian Country.

Background

Water Health Disparities

The goals of the CWA in 1972 were well intentioned, but after 40 years they have not been achieved. The CWA has been strongly criticized for failing to reach the goal to eliminate the “discharge of pollutants into navigable waters” by 1985 (USEPA 2011f). Some argue that these goals were not necessarily meant to be achieved, instead were created as a means to encourage the innovation of new ideas and solutions that would get the country closer to the initial goal (Foran and Adler 1993; Robert W. Adler et al. 1993). Whatever the reason for setting such overextended goals, they have a lower priority inside communities who face environmental risks, and whose environmental health needs are continually unmet.

For example, there are many groups in the United States (U.S.) who subsist on fish and shellfish, and for some, these organisms hold strong cultural purpose. Because access to fish and shellfish are pivotal to cultural identity and survival, some spend their lives advocating for healthy fish, and safe water (Trova Heffernan et al. 2012), which has lead to more stringent fish consumption standards in Oregon. In 2011, after a lengthy period, Oregon revised their fish consumption rate from the national average of 6.5 grams/day to 175 grams/day. This effort was spearheaded by tribes and drew from fish consumption surveys that represented more accurate consumption and exposure patterns of tribal communities (USEPA 2000). In 2012, Washington State decided to follow suit; however, in a matter of months, actions to develop more stringent standards came to a halt. Advocates of more stringent fish consumption standards in Washington were highly disappointed, and those

consuming fish at levels greater than the current standard continue facing a disproportionate risk to exposures to a number of compounds.

It is evident from fish advisories, which are signs of poor water health, that within tribal communities health disparities are coupled with regulatory gaps. Indigenous groups in the U.S. have expressed concern for polluted surface waters and inadequate drinking water. For example, in Montana the Crow Tribe is concerned about “contamination and degradation of the Little Big Horn River and other rivers which flow through” their reservation (Cummins et al. 2010). A major concern for the Penobscot nation in Maine has been the discharge of dioxins and mercury by an upstream paper and pulp mill (Bradbury 1997) that has forced the reduction in local fish consumption despite its cultural significance for the tribe. In the Southwest (SW), tribes have been struggling to address contaminated well water, which for some is exacerbated by their restricted access to piped water (VanDerslice 2011). In this study, our research echoes these disparities by explaining inadequate water access barriers, infrastructure and a heavy dependence on water hauling.

Additionally rural and remote communities, such as the First Nations of Canada and the Inuit located in the Arctic, are confronted with water security related issues daily—hundreds of these communities have ongoing water advisories that warn households to boil their water before consumption. Specifically in Canada, “more than 100 First Nations communities live with permanent water advisories” (Norman E et al. 2010). Limited water delivery infrastructure and the vulnerabilities associated with the leaching of contaminants to groundwater compound these problems.

Models of Indigenous Environmental Stewardship

Globally, Indigenous environmental stewardship has been affirmed through rights-based laws and declarations that highlight principles recognizing the rights to culture, and more recently, the Rights of Mother Earth (Shahriari 2012; Weaver 1996; World Future Fund 2013). On September 13, 2007, the United Nation's Declaration on the Rights of Indigenous Peoples (UNDRIP) was adopted in Resolution 61-295. After 3 years of opposition, the United States ratified it on December 16, 2010. The political and moral principles held in the Declaration are not legally binding. In spite of that, it creates a minimum international standard for all to follow. Article 43 of the Declaration concretely establishes these rights as "the minimum standards for the survival, dignity and well-being of the indigenous peoples of the world" (United Nations 2007a), and broadly represents the obligations, ambitions, and the essence of Indigenous peoples. While the UNDRIP includes human rights held by all peoples of the world, its focus is on Indigenous peoples.

According to James Anaya (2009), the Special Rapporteur to the United Nations,
"the purpose of the Declaration is to remedy the historical denial of the right of self-determination and related human rights so that indigenous peoples may overcome systemic disadvantage and achieve a position of equality [...]. This remedy should not have to exist, just as the history of oppression that gives rise to it should not have been. But that history did happen, and its ongoing consequences make necessary a global remedial response"

In North and South America, Indigenous environmental ethics and traditional laws have been around far longer than the 1970s environmental movements that helped to shape the CWA. In 2012 perhaps inspired by the UNDRIP, Bolivia passed the Law of the Rights of Mother Earth which obligates the Bolivian government with the responsibilities to honor the Rights of Mother Earth (Shahriari 2012). As stated in Article 7, Mother Earth has a right to

life, the diversity of life, water, clean air, equilibrium, restoration, and to pollution-free living (La Asamblea Legislativa Plurinacional 2012; World Future Fund 2013).

Another indigenous group who is located in the Northeastern U.S., the Haudenosaunee, are taught to take responsibility for the life that exists today and in the future. Three of their key principles that guide their decision making are: the effect decisions will have on peace, the natural world, and on future generations (James W. Ransom and Kreg T. Ettenger 2001; King 2007; Lyons 1980; Tsosie 1996). These values are based on original instructions that were intergenerationally shared, and in present times, integrated into culturally-based air and water quality standards that serve to protect this community (Lynette S. Printup 2002; National Tribal Water Council 2009). Many other indigenous groups follow similar instructions.

In the Southwestern U.S., the Diné Nation continue to draw from their cultural values to guide decision making and to sustain traditional methods of self-governance (Austin and Williams 2009). Similar to the Diné, many other Tribal communities have cultural identities that are rooted in principles that are interwoven with their creation stories. Such stories encompass many of the values that inform environmental stewardship, and that inspire the inclusion of ceremonial uses in the CWA.

EPA's CWA

The protection of surface water in the United States is rooted in the Federal Water Pollution Control Act (FWPCA) enacted by congress in 1948 (Flynn and United 2010; Owley 2004; USEPA 2004) and has since undergone many modifications. Initially, it set out to encourage states to address interstate water pollution, improve sanitary conditions, conserve waters, and construct treatment plants— all of which were focused on protecting

human health. Unfortunately, it did not address the health of the environment (USEPA 2004), it lacked enforcement authority and didn't provide financial assistance to states (USEPA 2012a). These oversights were important enough to stimulate improvements.

Thus in 1956, the FWPCA was amended to provide state grants intended for the construction of treatment plants, and it established modest enforcement measures to protect waters from pollution. These efforts lead to small improvements in water quality and resulted in weak consequences for industrial polluters. Building on the FWPCA, the Water Quality Act was passed in 1965. Under this new Act, the Water Pollution Control Administration was composed. This administration required states to create water quality standards and wherever states did not do so, the administration was authorized to set standards for states (USEPA 2012a). These water quality polices were perceived by many as ineffectual because they lacked in a clear strategy for how compliance would be achieve (Flynn and United 2010). Additionally, over a few years it appeared unrealistic to achieve improvements in water health by depending only on water quality standards. This was telling from the environmental pollution catastrophes, such the ignition of the Cuyahoga River in 1969 (USEPA 2011e). Visible events like this were critical to gaining the attention and support of the environmental movement, and it also heightened political attention among the Nixon administration.

In 1972, to strengthen water pollution control strategies, both the FWPCA and the Water Quality Act were overhauled and renamed the Clean Water Act (CWA). The overarching goal of the CWA is to “restore and maintain the chemical, physical and biological integrity of the Nation’s waters” and has been amended several times since its inception (1977, 1981, 1987 and in 1990) (USEPA 2011d). This is the first time a water

pollution policy has applied water quality standards to intrastate waters and established deadlines for the EPA to meet compliance deadlines. Today, the CWA continues to uphold minimum water quality standards and has grown to include a violation driven enforcement strategy that utilizes a point source discharge permitting process focused on a technology-based approach. Two approaches have been used to meet the goals of the CWA: implementation of water quality-based standards and technology-based standards. Next we'll discuss each of these standards.

Water Quality-based Standards

The WQS approach of the EPA contains four main programs. They are water quality standards, water body monitoring and assessment, reports on the condition of the nation's waters, and total maximum daily loads (TMDLs). Below we explain the water quality standards and TMDLs. Monitoring, assessments and reports are used to inform decisions about water quality standards and provides information about the state of waterbodies around the nation. The process of creating a water quality standard includes three steps:

- Identifying the designated uses,
- Creating water quality criteria, and
- Establishing antidegradation policies.

In total, these three steps aim to protect aquatic life, human health and the quality of water.

Tribal nations and States must identify how each water body or source within their jurisdiction will be used. This step is called designated uses and may include uses for drinking water supply; protection of aquatic organisms, and wildlife; recreational; agricultural; industrial; and navigational purposes. In addition, Tribal nations often choose to designate uses for ceremonial and cultural practices. The Pueblo of Isleta, located in New

Mexico, was the first tribal government to gain EPA's approval to identify ceremonial uses as a designated use in their water quality standards. In 1996, their designation of ceremonial use was challenged in a landmark case known as *City of Albuquerque v. Browner*. The Tenth Circuit's decision to uphold ceremonial uses is greatly significant to protecting tribal communities because it upholds a tribes authority to set more stringent water quality standards in comparison to the standards of neighboring states or the EPA (Owley 2004).

Water quality criteria are developed based on designated uses to protect aquatic life and human health, and are informed by scientific data and judgments that quantitate pollutant concentrations, duration and frequency of exposure (USEPA 2003). They manifest as numeric values or as narrative statements in order to set a maximum on the amount of water pollution (USEPA 2011c). We describe numeric values below along with human health criterion. Narrative criteria are descriptive statements about limitations on pollutants. They are required in the absence of numeric criteria and where the toxicity of a pollutant is undetermined through scientific methods (USEPA 2012b).

Aquatic life criteria for acute and chronic exposures are established to protect organisms such as fish, shellfish, plants, and wildlife living in dynamic environments (Code of Federal Regulations 2005; USEPA 2011a). Aquatic life criteria consider magnitude, duration and frequency of exposure and other environmental factors that are specific to the condition of a waterbody (USEPA 2012b).

Human health criteria are a vital component for the protection of all individuals. These criteria consider chronic exposures to toxic pollutants and acute exposures to microorganisms. They primarily hinge on exposures from the ingestion of contaminated fish and shellfish, but also consider water consumption. Therefore, in developing these criteria,

other exposure routes are not considered unless there is strong reason for consideration. Toxic pollutants and bacteria are the main pollutant classes that are considered for human health criteria. An example of a human health criterion is methylmercury. The human health criterion for methylmercury in water or marine organisms consumed by humans (i.e., shellfish and fish) is 0.3 mg/kg methylmercury. According to EPA, this concentration (0.3 mg of methylmercury per kg of fish or shellfish) of methylmercury in water “is not expected to pose a significant risk to human health” if ingested (USEPA 2011a, b). The process of creating a water quality criterion is laborious and very expensive because it requires risk-based evidence to show levels of risk presented to humans at certain concentrations. This requires hundreds of experiments that cost millions of dollars and can’t possibly be conducted for the thousands of chemicals used by society (Robert W. Adler et al. 1993).

Antidegradation policies are the responsibility of States and Tribal nations, and are meant to maintain or promote the highest quality of water for a waterbody (Code of Federal Regulations 2005). Such policies protect existing uses of a waterbody whose water quality exceeds the goal to provide “for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water” (2). Antidegradation policies give special attention to Outstanding National Resource Waters (ONRW). For these waterbodies, “States may allow some limited activities which result in temporary and short-term changes in water quality, but such changes in water quality should not impact existing uses or alter the essential character or special use that makes the water an ONRW” (USEPA 2012c). Some examples of where ONRW are applied include State and National Park waters.

National Pollutant Discharge Elimination System

The National Pollutant Discharge Elimination System (NPDES) is central to the CWA. This is a federal permit program that limits the amount of point sources released into surface waters. All industries and municipalities discharging treated wastewater effluent into waterways are required by the EPA to have a permit to discharged pollutants in a manner that does not violate WQS. Through the NPDES, violators may incur financial, criminal or civil penalties, which is in contrast to the previous water Acts and polices prior to 1972.

The EPA authorized Tribes or States to issue discharge permits to industrial categories such as the municipal wastewater systems, municipal and industrial storm water systems, industrial and commercial facilities, and concentrated animal feeding operations (USEPA 2001). At the very least, permits specify effluent limitations, requirements for monitoring and reporting, and may include notes on general and unique conditions specific to the facility. Today, under EPA's Section 101, 47 states are approved to administer permits within their jurisdiction. No Tribes have been approved (USEPA 2003).

Permits are written based on two approaches: water quality-based standards and technology-based standard. Generally, permit writers look to water quality standards and effluent guidelines (established for each category of discharger) to enumerate the allowable level of pollution discharged for permit holders. Permit requirements are expected to uphold water quality standards when setting effluent discharge limitations. For specific dischargers, permit writers must consider numerous factors that encourage industries to use the best technology available to control pollution. These factors include best practicable control technology (BPT), best available technology economically achievable (BAT), Best Conventional Pollutant Control Technology (BCT) or New Source Performance Standards (NSPS). BPT is based on the "best existing performance by well operating plants with each

industrial category or sub-category” (USEPA 2004) and applies to conventional, non-conventional and toxic pollutants³². BAT is defined as “the performance associated with the best control and treatment measures that have been, or are capable of being achieved” and is considered in conjunction with cost. BAT applies to non-conventional and toxic pollutants. As a replacement of BAT, BCT must be more stringent than BAT, and applies to conventional pollutants only. More recently, the NSPS applies to new sources that have the opportunity to incorporate the best technology available for conventional, non-conventional and toxic pollutants.

Total Maximum Daily Loads

When a specific water body becomes polluted with more than one pollutant and monitoring data indicate non-compliance, a TMDL must be calculated. TMDLs are "pollutant budgets" that are calculated for each type of pollutant individually and are tailored to each water body (USEPA 2010).

Risk Assessment and Risk Management

In the late 1980s, the EPA assembled a science advisory board to create a systematic process for quantitating human risk to environmental exposures. After years of deliberation, they formalized a risk assessment and management framework. The EPA uses risk assessment to characterize the health risks to humans upon exposure to an environmental pollutant. Since its inception it has been criticized for focusing on an objective scientific process (e.g., methods that focus on single pollutant, individual exposures, and singular stressors), for developing methods that privilege the general population, and consequently

³² Conventional pollutants are biological oxygen demanding pollutants (e.g., BOD5), total suspended solids, fecal coliform, pH, oil and grease. Toxic pollutants include metals, and manmade organic compounds. Non-conventional pollutants include ammonia, nitrogen, phosphorus, chemical oxygen and whole effluent toxicity (See Section 304 (a) (1-4) of the CWA).

leave some groups unprotected from environmental harm (Donatuto and Harper 2008), and for inadequately including the values and worldviews of stakeholders (Arquette et al. 2002). As risk assessment has matured, the divisions between risk analysis, risk characterization and risk management has revealed the need to genuinely consider stakeholder involvement (National Research Council 1996). For instance it has become important to consider place-based environmental decision making, and a cohesive process that increases the representation of affected communities.

In light of this, there is considerable interest in developing methods that can incorporate community worldviews, knowledge and values into environmental decision making and management (Failing et al. 2007). This is evident by indigenous communities who have been advised to decrease their consumption of fish in order to minimize their exposure to harmful chemicals (e.g., methylmercury, PCB, etc.). Many of these communities depend on fish and shellfish for their health and livelihood, and in some cases do not have alternative food sources. For communities whose cultures have been systematically disrupted, giving up important cultural resources that are connected to identity and wellbeing is non-negotiable. Because local foods are an important part of traditional diets, cultural identity and spiritual wellness, tribal communities are unlikely to compromise these food sources in favor of ongoing destruction to the ecosystems that have provided life to their ancestors and relatives since their creation (Harper et al. 2007).

For some there has been hesitation about integrating indigenous knowledge and western approaches to science³³ (Simpson 2004). For indigenous communities, given the

³³ Some researchers are skeptical about the retention of indigenous knowledge because they believe that this oral and intergenerational knowledge has been disrupted over time from a process of cultural genocide and colonialism Simpson LR. 2004. Anticolonial strategies for the recovery and maintenance of indigenous knowledge. *American Indian Quarterly* 28:373-384..

exploitive practices on the part of unprincipled researchers (Mosby 2013; Vorhaus 2010), this is not surprising. However, when indigenous governments, agencies and communities create internal institutional review boards, they take control of the collection and dispersion of data in their communities, as well as approve, disprove or require modifications to submitted research proposals so as they are aligned with tribal needs and principles (College of Agriculture and Life Sciences at the Univeristy of Arizona 2013). Therefore, researchers interested in working with tribal citizens have a responsibility to understand the community's needs before embarking on research projects with indigenous peoples, and to ensure that the outcome of the research is of mutual benefit. Furthermore, the importance of meaningful and respectful inclusion of indigenous communities at all levels of decision making is evident from the growing body of international literature under community based participatory research (Minkler and Wallerstein 2008), indigenous research methodologies (Chilisa 2012; Smith 1999; Walters et al. 2009), and the United Nations Declaration on the Rights of Indigenous Peoples (See Article 18) (United Nations 2007b). The trajectory of research with indigenous communities calls for protocols that are inclusive and respectful and far from exploitive practices.

Tribal nations that developed water quality criteria for their citizens generally use the status quo instead of conducting or funding risk-based research for each chemical contaminate on their own. It is clear that EPA's processes for creating water quality criteria are useful; however, there are disconnections between the values set forth by the EPA and tribal cultural values. In framing the disconnections for this work, we have identified the following:

- Some tribal communities are skeptical about implementing risk assessment models because they are not useful in quantifying many of the values that are important to Native people. As a result, there has been interest in tools that included tribal values and needs (Satterfield et al. 2013; Failing, Gregory, and Harstone 2007; Arquette et al. 2002).
- The decision making and participation of sovereign tribal nations and their citizens is limited in risk assessment. This in turn leads to policies, regulations and standards that are inadequately protective of tribal lifestyles and worldviews.

Objectives

In this work we discuss the results from focus group interviews conducted within two tribal nations in the United States. The scope of these interviews was to inquire about values regarding water quality, quantity, accessibility and culture. To organize the values we used structure decision making and identified fundamental and means objectives (Gregory 2011; Keeney 1992, 1996). We identify similarities and dissimilarities in water use and sources between these geographically distinct groups and illustrate how value trees can be used to incorporate indigenous values into a water management decision framework.

Methods

Case study

In this work we used case studies including two geographically distinct tribal communities located in the PNW and the SW (Yin 2009). We approached these tribes in order to highlight water security similarities and dissimilarities between these geographically distinct nations. In order to refine our research questions we held informal interviews with

individuals from natural resource departments of several tribal nations, EPA leaders and community members.

Recruitment

As part of our recruitment strategy, when we contacted tribal communities we provided our key informants and research review committees with proposals describing the purpose of the study, and details about how we would gather, use and store information, and we provided the opportunity for tribal nations to review and comment on publications resultant of this study. Subsequent to distributing these proposals we presented to tribal councils, research boards, community citizens and other local community centers as a means to generate interest and to gain permission to conduct this research. Participants were recruited with the help of key informants, flyers, and word-of-mouth. Initial key informants were identified through leaders of each community. Each focus group participant was offered a modest \$40 incentive and informed consent was obtained.

Institutional review boards and indigenous research ethics

This study was informed by the indigenous research methodologies literature, which encourages research protocols to acknowledge historical injustices experienced by tribal communities and to create a safe, healthy and empowering space for native participants (Chilisa 2012; Denzin et al. 2008; Smith 1999). This study was grounded in the recognition and support of tribal self-determination, and sought to build upon the foundations for community-to-researcher partnerships. The University of Washington's Institutional Review Board (IRB), Tribal IRB committees, internal tribal agencies, and/or tribal council members approved this study. Furthermore, an MOU was signed between the researchers and the PNW tribe's research review committee. We used the Canadian Institutes of Health Research

publication titled, “Guidelines for Health Research Involving Aboriginal People” (Canadian Institute of Health Research 2007) to develop memorandums of understandings (MOU) with tribal nations who chose this level of agreement.

Focus group interviews

To address our research questions we conducted two focus group interviews, in English, to identify important cultural values held by community members of two tribal nations. Focus groups were composed so as to gain a spectrum of in-depth perspectives and voices from indigenous peoples about water values held by community members rather than generate population level perspectives. Additionally, focus groups were used to compose a comfortable space where participants could share their experiences in a less command and control environment (Krueger and Casey 2000; Krueger 2002; Morgan 1993; Morgan et al. 1998). In collaboration with key informants interviews were held in community centers on both reservations.

Questionnaire guide and interviews

A questionnaire guide was designed to guide interviews as to understand the uses and sources of water, as well as the values pertaining to water quality, quantity, accessibility and culture (See Appendix) (Krueger and Casey 2000). All participants were asked to speak retrospectively and prospectively about their values, experiences, knowledge, attitudes, and beliefs. To draw deeper meanings of values, to promote more discussion and to fully develop subtle concepts we prepared probing questions. One example of a probing question we used is: “ Can you tell me more about this notion?” During interviews, and as we moved through

our questionnaire, a scribe wrote participants' responses on portable easel pad paper located in view of all focus group participants.

To start interviews we asked participants to list their water uses and water sources. We then asked about the importance of water quality, quantity and accessibility among their community, children and culture. At the end of each interview, we asked participants to write their names on 5 sticky notes, then place their notes on the portable easel pads next to the themes, phrases or values that were most important to them. Portable easel pads were taped to walls around the room. We then counted and documented the number of sticky notes for each quote in the interest of prioritizing important notions expressed by participants.

Data analysis

Digital recordings were transcribed shortly after each group interview and all identifying information was removed from the saved transcripts to protect the anonymity of each participant (Figure 1). We used QSR International's NVivo 10 software³⁴ to code transcripts (QSR International Pty Ltd. 2012). Findings from this qualitative study were used to inform the next steps of data analysis. Data analysis included coding main themes into categories and subcategories (Miles 2014). The foundations of the coding systems included water quality, quantity, accessibility, and notions about the cultural importance of water. Further, emerging themes and categories were identified from focus group transcripts. To improve the organization of data, we developed a database that included fields such as: Identification (ID), Coded theme, Objective type (e.g., means (MO) or fundamental objective (FO)), Coded passage, Prioritization value, and Definition (Box 1). This database was then imported into The SageMathCloud (Stein 2013) to conduct queries, analysis, to create

³⁴ NVivo 10 is software that facilitates the organization and identification of themes from transcripts.

means-ends objective networks using the Python programming language. Each objective was assigned an identification name beginning with OB plus a number.

Structured decision making

Techniques from structured decision making (SDM) methods were used to organize coded themes and values into objectives (Gregory and Keeney 1994; Gregory and Keeney 2002; Hammond et al. 1999; Keeney 1982, 1992, 1996; Keeney and Gregory 2005). Structured decision analysis is a systematic values-based approach to analyze decisions and to improve the quality of decisions. Major themes from focus group interviews were transformed into means and fundamental objectives. Gregory et al. defines a means objective as an “objective whose importance stems from its contributions to achieving another objective” (Gregory 2011). A fundamental objective is an essential reason for caring about a decision (Gregory 2011; Keeney 1992). The structured decision making steps included in this work were problem formulation, identifying mean and fundamental objectives, organizing objectives into means-ends objective networks and developing value trees (Gregory 2011). Lastly, value trees were created from a subset of fundamental objectives.

Results

Demographic characteristics

Demographic characteristics considered upon selecting each participant were: race (i.e., an enrolled tribal member), age (i.e., at least 18 years of age, but preferably between the ages of 50-80 years old), occupation (i.e., fisherperson) and location (i.e., living on their

reservation). Other factors such as gender, education level, income and/or marital status were not used as selection criteria for this work since we were most interested in cultural environmental values as a result of lived experiences and perspectives. In total 19 individuals, between the ages of 18-75 years old, participated in these focus group interviews (8 in the PNW and 11 in the SW group).

Uses and sources of water by each community

Following the questionnaire guide we asked focus group participants to describe how they use water and about their sources of water. The similarities in water uses stated by each focus group are listed in the middle column of Table 1, and dissimilarities are in the first and second columns. There were more similarities in water uses than there were dissimilarities. Similarities included water for animals, bathing, ceremony and prayer, etc. While most uses categorized in Table 1 are axiomatic, we categorized uses such as basketry, weaving, carving and regalia under Indigenous knowledge systems and avoided using terms such as arts and crafts³⁵. Traveling by ocean was a unique use of the PNW group. Unique to the SW group were the agricultural and industrial uses of water. Notable phrases that represent the connection between water and life of these two communities surfaced. In the SW, a popular community phrase was “water is life”, while in the PNW a similar term was “water sustains all life.”

We also asked about the sources of water among each community. Table 1 shows a comparison of sources. In the PNW, water was stated to be collected from fast moving

³⁵ See Canadian International Development Agency. 2001. CISA handbook of CIDA: Project planning and Indigenous traditional knowledge; and Priscilla Settee (2007) Pimatisiwin: Indigenous knowledge systems, our time has come. Ph.D. thesis (University of Sackatchewan).

water; plants; and in emergencies, ocean water by a desalination process. In contrast, the SW group listed getting their water from a neighbor's house, nearby springs, water pumping windmills, and hauling water from water pumping stations. Shared experiences included collecting water from oceans, public utilities, the store, rain, snow, and well water.

The prioritization of water security values by participants

As described in our methods section we used an approach where participants prioritized the most important quotes and themes discussed as a group during interviews. In total we gathered 30 priorities from the PNW (Figure 2) and 46 from the SW groups (Figure 3). Among each focus group, 1 person did not participated in this activity. Within the PNW 17% of the (5 out of 30) priorities were placed next to the phrase “everything we eat depends on water” which was the most popular theme, phrase or value noted by this group. Among the SW group a similar notion “water is life” received 20% of the (9 out of 46) priorities. In the PNW, the next three most important phrases were “indigenous policies of conservation”, “spiritual bathing” and “some songs come from water.” In the SW the next three most important phrases were “access to water is challenging”, “concerns about the present and future availability of water” and “teach children Indigenous epistemology.”

Means-ends objective networks

Using qualitative data analysis we coded 68 water security themes from the questionnaire transcripts that were categorized under water security factors such as quality, quantity, accessibility and culture (QSR International Pty Ltd. 2012). This categorization scheme is consistent with our focus group questionnaire and forms the framework of the means-ends objectives networks in Figures 4 and 5 (See Appendix for Questionnaire). In the PNW group we coded 36 themes, phrases and values, and in the SW group we coded 32 (See

Appendix Table 4.1). To organize water security themes, phrases and values, following structured decision making, we translated codes into objectives and then separated fundamental and means objectives (Figure 4 and 5). These analyses lead to 11 fundamental objectives and 22 means objectives for the PNW group, and 9 fundamental objectives and 25 means objectives for the SW group. The means-ends objective networks are illustrated in Figures 4 and 5. In the middle of Figure 4 the fundamental objectives are listed along with an identification number as described above. Means objectives encircle the fundamental objectives and are color coded by categories or components as illustrated in the Key (Figure 6). The arrows shows an influence an objective has on another objective. For example, addressing the means objective OB22 would influence OB30, which would in turn influence OB26. OB26, ensure that children have access to healthy and traditional foods, will have an influence on several fundamental objectives including OB29.

In Figure 6 there are 10 components including water security (access, quality and quantity), human health, ecosystem health, water-borne and water related disasters, water and food, family, responsibly, education, culture, and political and economic livelihood. These components represent all themes from each focus group.

In the next section, we'll discuss the PNW objectives and then the SW objectives. As stated above, Figures 2 and 3 illustrate the priorities of water security values that were discussed during focus group interviews. These priorities were quotes that were shared by focus group participants and written on easel pad paper for all participants to view. Using this prioritization method, we next describe the means-ends objective networks beginning with the most important water value picked by participants of both communities. In

parenthesis below the objectives are identified by their identification number as to distinguish them by focus group, and so they can be more easily be found in Figures 4 and 5.

Pacific Northwest focus group

Water and food safety

The PNW focus group indicated, “everything we eat relies on water” as the most important water value (Figure 2) and was subsequently organized under the fundamental objective OB37. Adequate nutrition and food security are dependent on water security. At the core of this value lies the fundamental objective “achieve water security because water sustains all life” (OB37) (Figure 4). The PNW focus group identified water security as pivotal to hygiene, health and wellbeing.

Many indigenous coastal groups make their living from fishing and harvesting shellfish, and these resources provide a large portion of their dietary needs; thus there is a strong dependence on safe water for their health and survival which was demonstrated in our analysis. A means objective to achieving water security includes “protect food gathering and harvesting locations from pollution” (OB22). Adhering to this responsibility of protecting food from pollution has a cascading influence on other means objectives including “ensure that children have access to healthy and traditional foods” (OB26), “protect and secure cultural and natural resources that are essential to the process of obtaining food” (OB19) and other means objectives. When discussing the link between water quality and safe food with participants it became clear that if their water was unsafe to support fishing or harvesting from the ocean, river or streams, then it would be a shame. As we discussed the importance of water and food in terms of culture and responsibility, one person stated:

“[That would mean] we didn’t protect the resources like our ancestors did...we have been here since the beginning of time. So for our future, we have to have these things.”

This statement also speaks to the significance of the environment to land-based communities by expressing their long-term connection and identity. Another person added,

“It’s about life. Living in our environment, in our space. This is our home, not like our house is our home, but this is our home. It’s our identity.”

Human wellbeing and health

Our data indicated that the ceaseless use of traditional medicines in ceremonies as daily tonics and remedies continue to support the physical, mental and spiritual wellbeing of tribal citizens. The objective “allocate water to grow traditional medicines” (OB28) is one means to the fundamental objectives “strengthening culture” (OB57) and “recognizing that water is necessary to hygiene, health, and wellbeing” (OB16). Allocating water for traditional medicines also secures the knowledge about the ecosystems where these plants grow.

Ecosystem and environment health

The environment provides many services to this community, as well as other indigenous communities who depend on nearby land and water for food, and for other resources. A noteworthy perspective was the appreciation for “the inherent value of water, environment and ecology” (OB1). Participants explained that in previous years the degradation of water from logging, reduced salmon populations and required decades of conservation to replenish and restore fish runs. Since this time it has become extremely important to “limit practices [such as logging] that degrade habitat” (OB35). The “spiritual connection with water,

environment and ecology” (OB8) is another reason to protect water from degradation. Spiritual bathing is extremely important to this group because it allows one to keep connected to their spiritual side and to receive songs that are important to culture, identity and health.

Education and culture

PNW participants expressed that it is important to share their knowledge by teaching and embracing “Indigenous epistemology” (OB32). They explained, passing this knowledge down to their children would be a sure way to “retain worldviews about earth” (OB11), “reinforce and strengthen the transmission of intergenerational knowledge” (OB12) and “reduce internally generated pollution through education” (OB34). An elder in the PNW focus group referred to the instructions embodied in such knowledge as “policies of conservations” (OB7). He stated,

“All of our resources were kept in a real strict policy of conservation. I’ve never heard of anything that we took more than we needed. Like if you go get shells, you only take a portion and you cover it back up. If you go pick cedar bark, you only take a little bit, because if you take too much, you’ll damage the tree or kill it... It wasn’t law; it was like an unwritten rule.”

Embedded in these knowledge systems are the instructions needed to make regalia, carve canoes, and learn cultural songs. An elder in this focus group emphasized the importance of seashells used in their regalia and the importance of protecting “regalia supplies by protecting ecosystems and resources such as seashells and trees” (OB4).

Family and community network

Trees were also mentioned because they can be carved into canoes, which in turn, provide a means for community members to keep strong relationships between relatives and

family (OB17). This allows for communities to adhere to their family values and to “maintain family relationships” (OB59).

Increase political network and economic livelihood

The community voiced their concerns regarding externally generated pollution and their inability to control the generation and migration of such pollution. This is indicated by the objective to “develop partnerships to gain control of externally generated pollution” (OB6). In particular, participants discussed their concerns about the 2011 Fukushima Daiichi nuclear power plant accident and the impact that it could have on coastal waters, shorelines and their health. They mentioned the additional burden to this fragile ecosystem due to the threats of oil spills from tankers and other human activity on the Pacific Ocean. Also, atmospheric CO₂ has resulted in the acidification of oceans. As stated by a focus group participant:

“Clean water is not always in our control. The world is polluting the atmosphere. And the atmosphere affects the kind of water we get. So that plays a big part on what kind of water we get and the future of our next generations. The atmosphere is a really big concern now.”

Southwest focus group

Human wellbeing and health

Among the SW focus group, the most important water value consisted of the community maxim “water is life” (OB.2.1), which captures the perspectives that water is important to all organisms and to human survival and health (Figure 3). A participant in this group mentioned the importance of discussing the human body’s need for water. This value is depicted in the middle of Figure 5 as, “water is needed for good health and hygiene” (OB.2.6). There are many factors that dictate the achievement of good health and hygiene including promoting and teaching about healthy diets (OB.2.21). One person mentioned that

the dramatic shifts from traditional diets to one that is dependent on the distribution of commodity foods has steered communities away from healthy food choices. For some this has been more severe than for others. In the SW focus group, one person stated the need to teach children to choose water over sweetened beverages and to discuss the roles water has in maintaining balance and health (OB.2.7).

Education and ecosystem and environmental health

The fundamental objective “honor and respect water because water is life” (OB.2.1) can be attained through a number of means surrounding the fundamental objectives in Figure 5, such as the objective “teaching children how to succeed as caretakers of the water and land” (OB.2.20). Participants articulated the need for children to obtain education because they would be the ones to protect the land. With an education these students can formulate solutions to protect aquifers (OB.2.24), springs (OB.2.27), and to lead innovations for water conservation (OB.2.8) methods in the arid southwest. An expecting mother in the focus group emphasized education:

“Our children are going to be the ones who will be securing water for us and their children. We’ll be grandparents by then. They are the ones who are going to learn how to protect and fight for our water. It’s good that they’ll understand why water is important to us.”

Culture

Participants emphasized that a cultural thread must be interwoven into these teachings in order to be consistent with the interest to retain and strengthen culture (OB.2.58). One means of doing this is to “restore, revitalize and retell indigenous water epistemologies through ceremony” (OB.2.5). This can be propelled into action by the objectives “stimulate local indigenous epistemology” (OB.2.19) and “learn and teach about the different types of water” (OB.2.9). In general terms both communities discussed the use of water in

ceremonies and prayer, such as for singing "traditional songs for water" (OB.210) and teaching "about the cultural significance of water to unborn and newborn infants" (OB.2.16).

Responsibility

When we asked participants if they had enough water for their uses, individuals mentioned it depended on where they lived. If they lived in areas with piped water, a main concern was keeping the water bill affordable. In areas where piped water was unavailable, and so people must haul their water, water conservation was necessary. For example, one person described that in areas lacking piped water, there isn't enough water for taking daily showers. For small families this might be bearable, but for larger households, they must be more careful with how they use water. Another person explained, though her family has enough for household uses, there hasn't been enough water for farming. There was a general agreement that surface waters, lakes, rivers and streams are drying up over time.

Planning "smart water futures" (OB.2.60) and understanding "the present and future state of water scarcity" (OB.2.50) are vital to the survival of all arid southwest communities, and are of particular significance to communities whose access to water are already compromised. The SW has been experiencing recurrent droughts since the turn of the century (MacDonald 2010); therefore the SW focus group expressed the urgency to "examine the indirect cultural consequences of droughts and lack of water" (OB.2.2). This was expressed as a particular concern. One participant stated:

"We don't have corn, melons, squash or beans the way we use to. In our extended family we planted and fed our family. That is how our food was used. Now we don't have that and the fields are fallow."

The consequence of droughts on farming practices also impact knowledge as is stated here:

"Our children and our grandchild are losing culture. We are not able to teach them how to plant every year and how to harvest, or about the right time to

harvest. For example, when corn, melon and squash are ripe. These are probably the biggest impacts on our family.”

Water and food

For this community, it’s important to “achieve food security of traditional foods” (OB.2.12) by implementing “traditional farming practices” (OB.2.13).

Access, quality, and quantity

Our data suggest that access to water is a growing concern for many households who must haul their water; thus it is high priority to “improve access to water” (OB.2.59). Within some rural SW communities approximately 40% of households haul their own water (Trujillo 2006). Climate change, increased temperatures and low rainfall make the water future of this region and community uncertain. Because of these changes it is crucial to “examine and address water-hauling issues” (OB.2.4), “recognize the urgency for piped water” (OB.2.26) and “prioritize the repair or replacement of dilapidated water infrastructure” (OB.2.14). Infrastructural needs include the replacement of waterlines that ruptured during a previous winter (OB.2.3), resulting in a state of emergency. Everyday challenges to water access are seen in the old and broken windmills that pump ground water intended for livestock use, but often used for human consumption. As we discussed the lack of precipitation and the urgency for water an elder stated:

“Before we had windmills. Now the windmills are all broke down. We try to have them repaired. They say they’ll [local government] do it, but they don’t...because there are some broken down wells, people have to haul water. That means more traveling.”

Repairing and replacing broken water systems is an expensive problem for any community but is exacerbated by the challenging socioeconomic conditions. An alternative and common household water source is bottled water. When water is limited or in emergencies, households rely on bottled water for drinking and for other uses including

showering and bathing. To better understand the reliance on this source of water, it's important to "examine the reliance on bottled water and the vulnerability this presents" (OB.2.53). In particular, it will be important to understand how and where elders and children are getting their water, and if they are getting enough to meet their needs.

Value trees

Drawing from the fundamental objectives we developed a value tree. Here we show an example of a value tree that can be further defined with community participants during the next iterative stage of this work. We picked this example because access to water is a key concern for the SW participants. At the lowest level of the hierarchy in Figure 6, we illustrate potential performance measures for achieving the goal to improve access to water. We show 3 examples of sub-objectives to demonstrate how this group might improve this fundamental objective. If we suppose that the SW community decides on the sub-objective to *ensure safe running water*, we can propose measurable attributes. In this example, we propose measuring the miles of water lines that distribute water as a way of determining the successful achievement of the overall objective and sub-objective. Another scale we propose is to determine the percent of households with running water in their homes. Under the subjective address water infrastructure needs, we have proposed 3 measurable objectives. Lastly, on the right of Figure 6, an additional sub-objective is to improve water-hauling efficiency for households, and propose 4 performance measures. Further development of performance measures will allow these communities to measure the success of achieving the fundamental objective.

Discussion

This study is a unique analysis of the importance of water by two indigenous groups in the United States. First, our results revealed water security priorities as indicated by participants of both focus groups. In the PNW the top priorities encompassed a phrase articulated by many participants, “everything we eat depends on water”, a notion of indigenous policies of conservation, spiritual bathing and some songs come from water. The SW participants prioritized the community maxim “water is life”, access is challenging, concerns about water availability, and teach children indigenous epistemology. Second, this work organizes objective networks that can lead to the achievement of culturally driven approaches to address water insecurity concerns. The means-ends objective networks shows a glimpse of the complexity involved in achieving the fundamental objectives such as water security, strengthening culture, health, and pollution prevention. Third, drawing from the fundamental objectives we developed value trees. We provide an example of the resultant performance measures by illustrating a value trees beginning with access to water. Lastly, we structured our focus group questionnaire so that we could better understand the cultural values affiliated with a general definition of water security including access, quantity and quality. Our work led to several additional emerging concepts of water security, which induced a modified definition of the UN-Water’s definition of water security.

Safe water and food, and everything we eat depends on water

The highest priority for the PNW was considering the relationship between food and water. Participants expressed a strong focus on the link between safe water and sufficient food. In general this community felt they were able to handle internally generated pollution

but felt it was more challenging to address external pollution events including radioactive contamination, oil spills and ocean acidification.

Access to water

The SW community extensively discussed daily barriers to water access, and their concerns about droughts that reduce water availability for household uses, farming, and to replenish surface and ground waters. The impact of low precipitation and increasing temperatures on the environment and ecosystem services are observed in the loss of pine trees from the invasive bark beetle, wildfires, sand dune shifts (Redsteer et al. 2011), and decreased agricultural yield. As expressed by participants, the latter directly inhibits access to traditional foods, such as beans, corn, melons and squash, and interrupts the social and family networks of food sharing. Additionally, knowledge transmission about planting and harvesting are negatively impacted.

Additional water access barriers include lack of running water in households, dilapidated or no water infrastructure and a heavy dependence on water hauling. For some of those who have running water, a major problem is the old, or lack of reliable infrastructure to deliver safe water to this SW community. Record low winter temperatures have recently caused water pipes to freeze leaving hundreds of additional households without running water. In fact, during our focus group interviews, several participants didn't have running water in their homes because of the rupturing of water lines. In addition, daily problems are broken down windmills, and inoperable contaminated wells that force people to drive greater distances to haul water. According to participants, vulnerable drinking water infrastructure in this community has resulted in dysfunctional kitchens and bathrooms, and the disruption of daily tasks, such as cooking and cleaning. Ultimately, this decreases the quality of health,

the potential for living productive lives, and forces communities to fight for essential resources.

A number of households in the SW community continue to haul water from water pump stations to their homes. Water hauling apparatuses such as tanks or 50 gallon barrels are placed in the back of long-bed pick up trucks and hauled for several miles. Some households must haul water for upwards of 100 miles in one trip. This can be problematic for a number of reasons such as the growing cost of gas, the dependence on capable help, operable vehicles, time and the availability of clean and sturdy portable water storage tanks. These factors disproportionately impact vulnerable people including elders who may have restricted mobility and health, and single-family households.

Similar to hauling water, using bottled water to meet household uses has several problems such as the distance, time and cost of transporting it from store to home, and the unsustainable dependence on the use of bottled water in the long-term. Nonetheless, some individuals in both communities are deterred from drinking tap water because of the unpleasant taste due to the high mineral and chlorine content and so continue to buy bottled water. Moreover, households with limited or no access to running water are at times completely dependent on bottled water for all uses.

Water, human health and ecosystem health

Human health is linked to ecosystem health in a number of ways. First, the appreciation for the inherent value of the environment and the essential need for safe water are drivers for these communities to protect the ecosystem from degradation and diminishment. Such stewardship was evident in the statements of responsibility that were

shared by many people. In order to meet this responsibility it is important to teach about the environmental issues prevalent in these communities in a culturally appropriate manner.

Second, environmental integrity is important to cultural identity. Examples include the use of ecosystem services³⁶ such as fish, shellfish, plants, seashells and trees. There are numerous sacred spaces on the homelands of indigenous peoples where individuals visit to collect particular items, to conduct ceremonies and to spiritually cleanse. Furthermore, regalia specific to indigenous communities embody elements of spirituality and identity, thus the loss of seashells, and the like, would contribute to the deprivation of rich cultures and heritages. For instance, basket weaving, seashell use and tree carving are culturally significant to Indigenous knowledge systems. Additionally, for coastal tribal communities, trees are carved into canoes, masks and used to build longhouses. Presently canoes are key to the revitalization and restoration of indigenous coastal cultures, they are part of the fishing process, and they provide a mechanism for coastal communities to keep connected to their relatives and families. Therefore, whenever the ecosystem health suffers, there is a negative impact on the people who depend on these spaces for wellbeing.

Third, particularly in the PNW, water quality and quantity are important to the availability of traditional foods such as salmon, shellfish and berries. Traditional food access supports healthy diets and contributes to the economic livelihood of fishermen. (to complete this paragraph, I'll draw from Elaine's paper).

Ecosystem and human health were important components to both communities; albeit in this study they were central focuses for the PNW group. Together health within these two communities encompasses access and use of clean water, traditional medicines, spiritual bathing areas, traditional foods and ecosystem integrity. Attaining these needs allows for the

³⁶ Benefits supplied by nature (EPA definition)

enjoyment of ceremony, good hygiene, an adequate diet, so that balance and the lack of sickness can be achieved. Water supports the growth of traditional medicines and replenishes spiritual bathing areas that help to restore balance to one's life. Human well being also includes good hygiene, which requires enough water to bathe and shower without having to negotiate other competing water uses in the household such as cooking. Our results support the definitions of health that move away from the absence of disease to overall wellbeing (Millennium Ecosystem Assessment 2003; World Health Organization 2013).

Indigenous knowledge systems

Both groups explained the importance of teaching upcoming generations about cultural water epistemologies, water uses and water use efficiency. They shared a common perception about respecting water because it is necessary to humans and all life. For these groups, rivers and streams are analogous to arteries and veins in humans so water is responsible for contributing to life. In some cases, community members are taught to regard water as sacred and some cultural gatherings begin and end with water as a central element (Woody 2008). The specifics of this knowledge include pedagogies and epistemologies that have been developed over generations and are continually shared among community members. The retention and transmission of these Indigenous knowledge systems are taking a greater priority in Native communities (Battiste 2002; Simpson 2004). Teaching about indigenous epistemologies will influence the transmission of intergenerational knowledge and support the aims to retain worldviews about earth. The knowledge systems held by indigenous communities incorporates instructions for how to interact with all life. The

unwritten rules held by these communities such as taking only what you need and nothing more are examples of decision making guides long held by the PNW group.

Planning smart water futures

In addition, to understand how to achieve water security it is vital for indigenous peoples to transmit indigenous knowledge to other community members as well as incorporate western knowledge so that future generations can address these complex issues. (add more there)

Water security definition

Our research has led us to seek a better understanding about cultural values as they pertain to the foundational components of water security. We sought to understand water access, quality and quantity from two cultural perspectives. Building from the water security definition published by UN-Water (UN Water Analytical Brief 2013) we offer the following modifications³⁷: The capacity and responsibility of indigenous and non-indigenous governments, communities, households and individuals to safeguard and manage sustainable access to adequate quantities of and acceptable water quality for sustaining access to traditional foods and lifestyles, livelihoods, human well-being, and socio-economic development, for ensuring water and food safety, and for preserving ecosystem diversity in a climate of peace, self-determination, cultural revitalization and political stability.

Limitations

In this work, the focus on two case studies limits its generalizability so we caution against essentializing these voices, and instead we call attention to the diversity of indigenous voices held within the world. In the U.S. indigenous peoples are composed of 566 federally recognized Tribes and approximately 400 non-federally recognized tribes (U.S. GAO 2012).

³⁷ Modifications are underlined.

In the latter group, some tribes are seeking federal recognition such as the Little Shell Tribe of Chippewa Indians in Montana, and the Duwamish Tribe in Washington. Worldwide there is an estimated 370 million indigenous peoples that together make up approximately 5% of the world's population (International Labour Organization 2009). Indigenous knowledge systems within each community are variable, ever changing, and exist amongst the backdrop of profound scholarship about the revitalization, resurgence and self-determination of culture (Alfred 1999; Barker 2005).

The focus group interviews in this work were conducted in English. We note this because indigenous epistemologies, names, and most certainly the values held by these communities are encoded in language, and in some cases there are no English translations. The fact that our interviews were conducted in English limits the depth of this research. Just as the inclusion of indigenous knowledge is vital to the resurgence of indigenous nations and communities, so is the language and depth of knowledge that it holds.

To strengthen this work it is critical to continue working with each of these communities to develop a tribally-based illustration of the values shown in Figures 4 & 5. Such illustrations could take many forms, perhaps an expansion of the concentric figures showing the holistic relationships between systems such as humans, water and knowledge, or a social-ecological model such as those commonly used in public health. This would ensure that this research is of mutual benefit to the communities and researchers alike.

Conclusions

This work includes several unique aspects. First, rather than narrowly seeking to understand a single dimension of water issues (e.g. quality), we take a systems approach to understand water security and add to WHO's definition of water security as discussed above.

Second, we worked with tribal communities to list their water security values in order to develop performance measures that can be used to demonstrate the achievement of these prioritized goals. Third, we acknowledge the data gathered in this work to be the property of respective tribes and honor tribal IRB procedures.

The benefits of incorporating community and/or indigenous knowledge and values into decision making can result in improved management strategies, clarify problem formulation, identify culturally appropriate goals as to support community empowerment, and meaningful collaboration between governments, and communities.

Indigenous peoples value the natural functions of the ecosystems around them. Many live close to the land, water resources, etc. and are disproportionately impacted by pollution events and climate change. Also the socioeconomics of these communities present an added challenge to their ability to solve many of the water issues that are prevalent in their communities. For the wellbeing of indigenous communities, it will be vital to assist communities who are, or will be, impacted by change in water security.

This research is useful because it prioritizes water security goals articulated by indigenous community members. Laying out these goals may ease the process for decision-makers to effectively assess water security challenges we face today and in the future. Furthermore, these goals are important because they identify actions that tribes can take to address some of the issues voiced by their citizens. The actions we identified can be addressed at the individual, community and governmental level (e.g. Tribal and Federal).

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Figures, tables and boxes.

Table 1. The similarities and differences in water uses (top) and water sources (bottom) among focus group participants in PNW and SW.

Focus group participants listed their water uses and sources of water. This table shows the similarities and dissimilarities.

	Pacific Northwest (PNW)	Both	Southwest (SW)
Uses	<p>Traveling by ocean (e.g., canoe journey) Water sustains all life</p>	<p>Animals (e.g., pets, livestock and wildlife) Bathing (e.g., hygienic and spiritual reasons) Ceremony and prayer (e.g., sweat lodges) Construction Domestic (e.g., cooking and vehicle maintenance) Fire control Food security (e.g., harvesting berries, mutton, deer, elk, fish, shellfish, sea mammals, farming etc.) Health (e.g., maintaining balance) Indigenous knowledge systems (e.g., weaving, basket making, carving, dying, etc.) Recreation (e.g., swimming and kids playing) Traditional medicine (e.g., indigenous plants) Wastewater</p>	<p>Agriculture Industry Water is life</p>
Sources	<p>Desalinization of ocean water Fast moving creeks, streams, rivers and reservoirs Plants</p>	<p>Ocean water Public utilities (tap water) Purchase from store Rainwater Snow Well water</p>	<p>Neighbor's house Springs Water pumping windmills Water pumping stations</p>

Box 1. Example of data fields included in objectives database created for this project.

This box shows an example of the data fields included in the objectives database. Data fields included the identification number of each objective (ID), themes from coded transcripts, means objective (MO), the coded passage(s) from transcript, the corresponding prioritization value, and the a definition of each coded theme.

ID: OB7

Coded theme:

- Policy of conservation

MO:

- Promote and maintain Indigenous *policies of conservation*

Coded passage:

“All of our resources were kept in a real strict policy of conservation. I’ve never heard of anything that we took more than we needed. Like if you go get shells, you only take a portion and you cover it back up. If you go pick cedar bark, you only take a little bit, because if you take too much, you’ll damage the tree or kill it... It wasn’t law; it was like an unwritten rule.”

Prioritization value: 4

Definition (of coded theme): a course of action adopted to prevent ill health, waste, overuse or loss of resources.

Figure 1. The main steps to building a means-ends objectives network and fundamental objectives hierarchy.

This broadly illustrates the methodology used in this study beginning with focus group interviews and ending with the development of value trees.

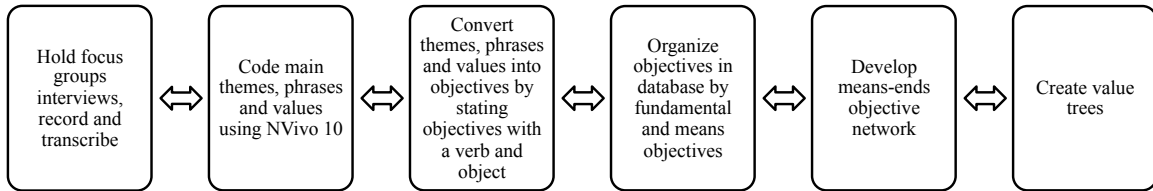


Figure 2. Prioritized water security values indicated by Pacific Northwest (PNW) focus group.

This figure illustrates the water security values discussed and prioritized during the PNW focus group interviews.

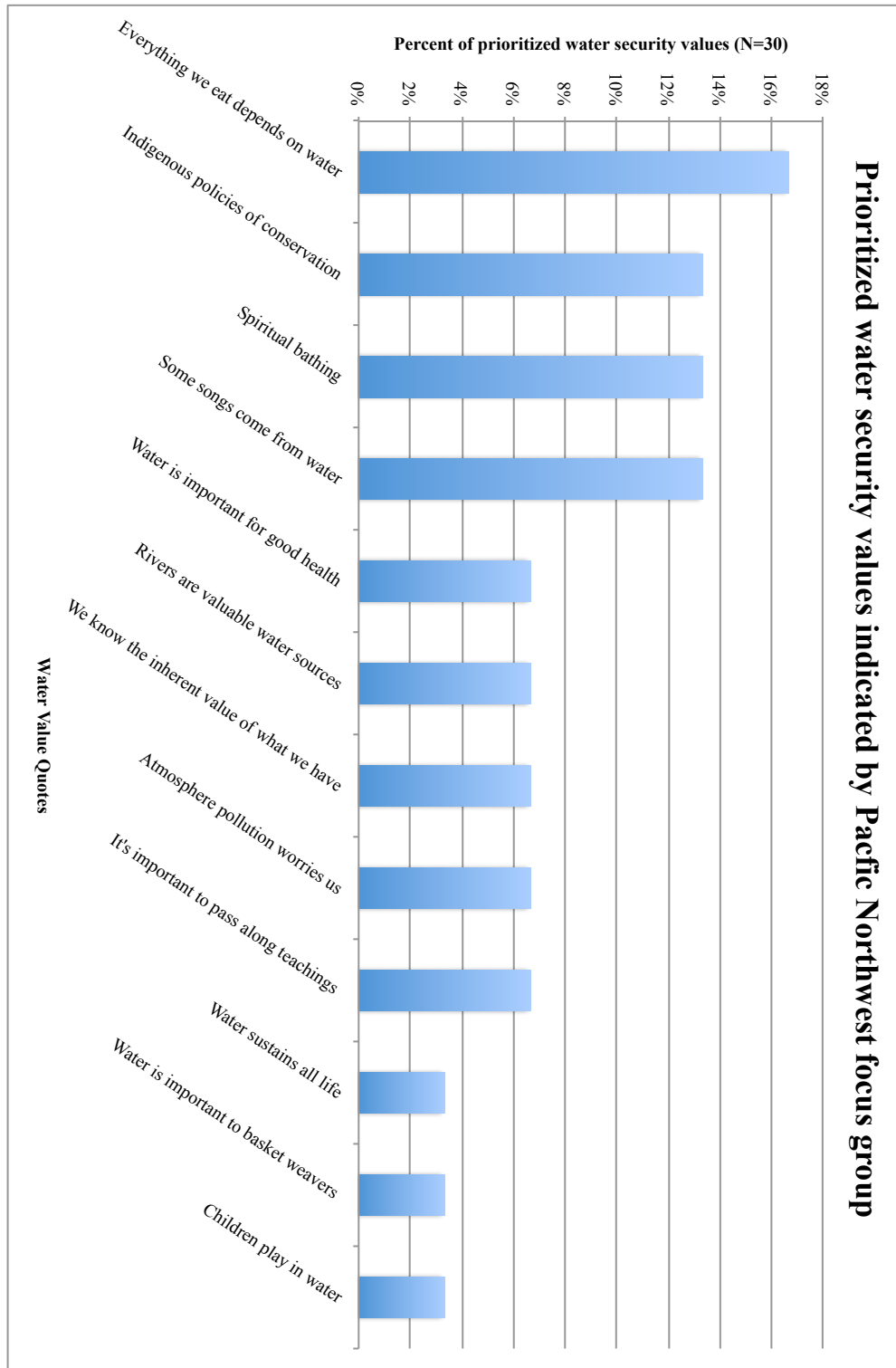


Figure 3. Prioritized water security values indicated by Southwest focus group. This figures illustrates the water security values discussed and prioritized during the SW focus group interviews.

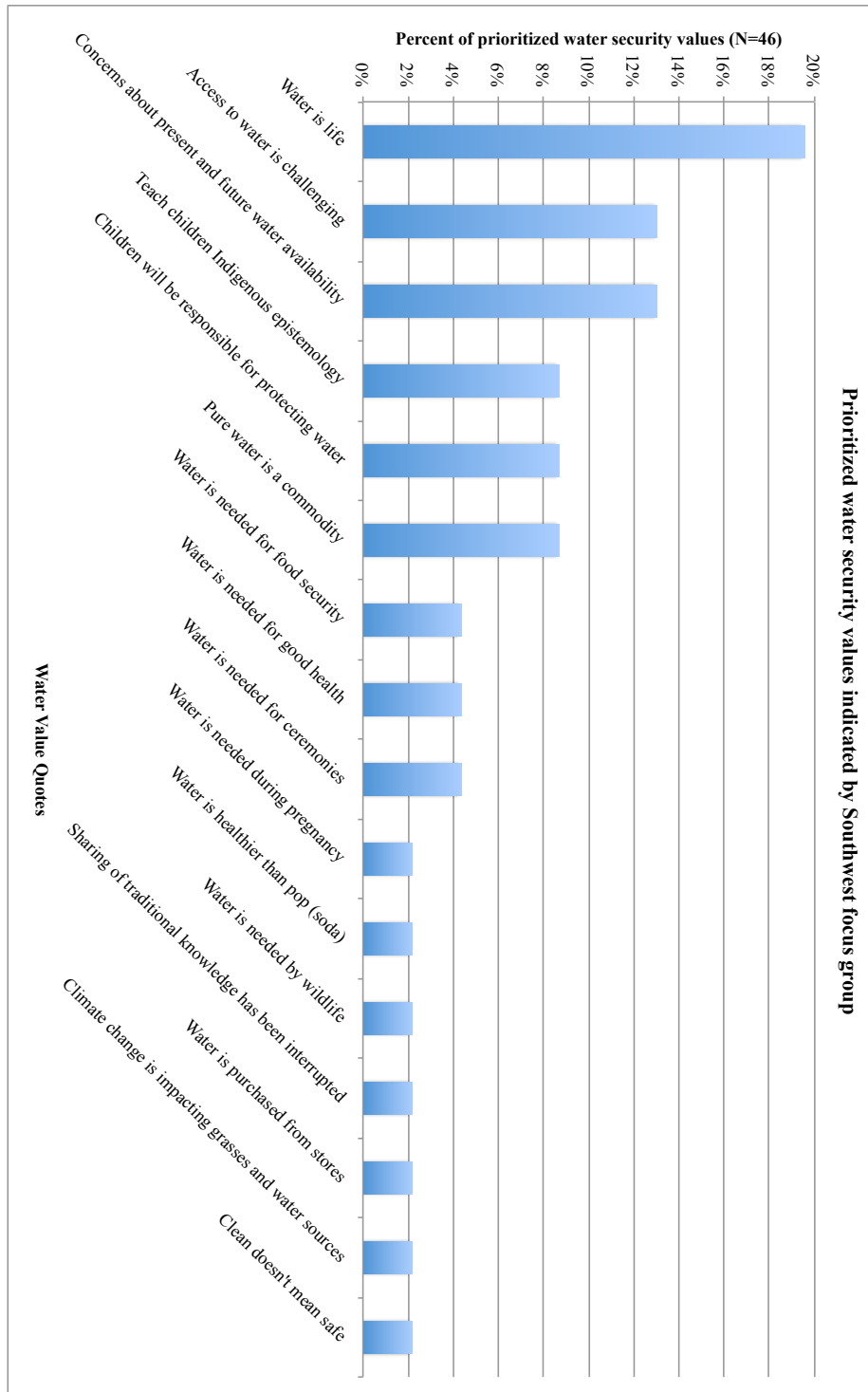


Figure 4. Pacific Northwest means-ends objective network.

The center of this figure shows the fundamental objectives (FO) organized from the values and concerns expressed by focus groups in response to questions pertaining to the importance of water security within their community. There are 11 FO and 22 means objectives (MO). The MO corresponds to the water security components in the key (see Figure 6).

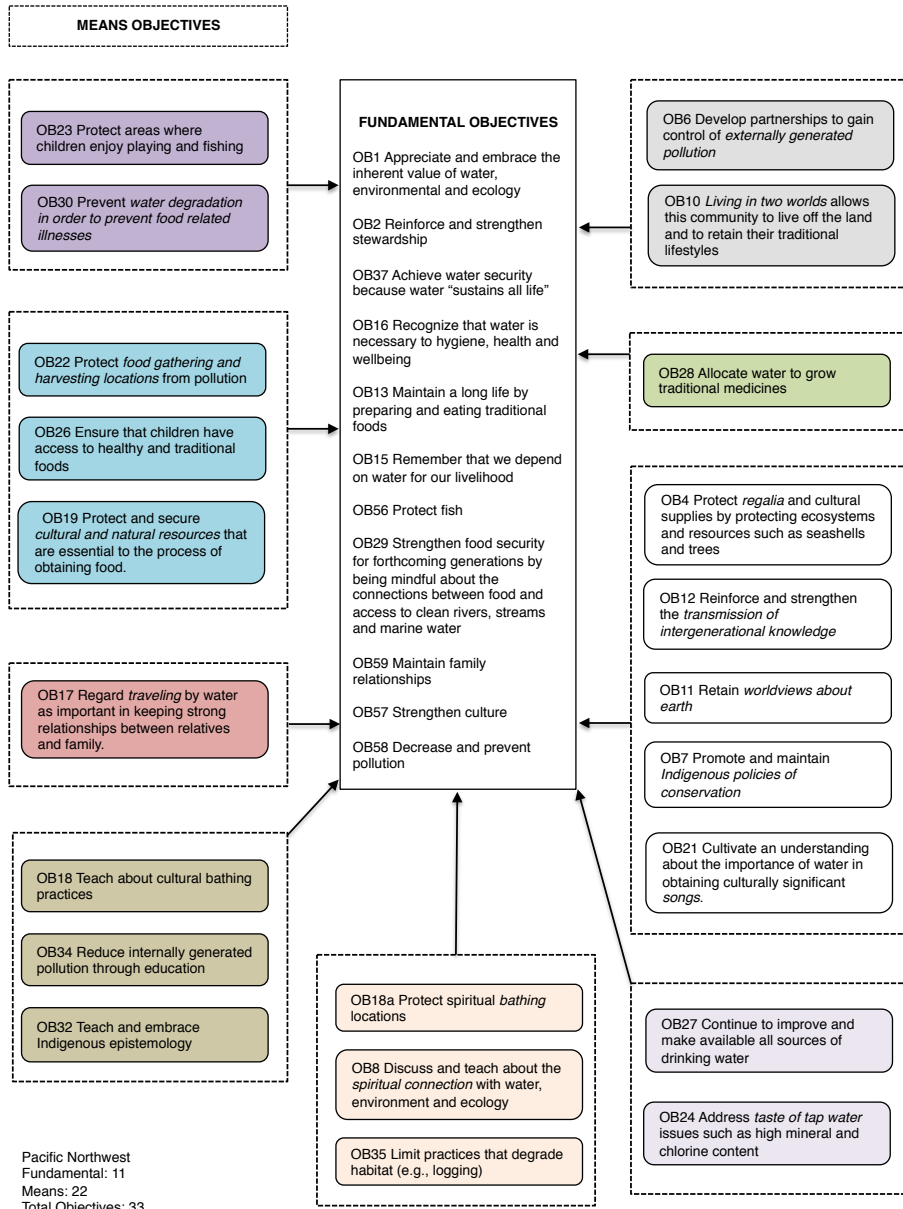
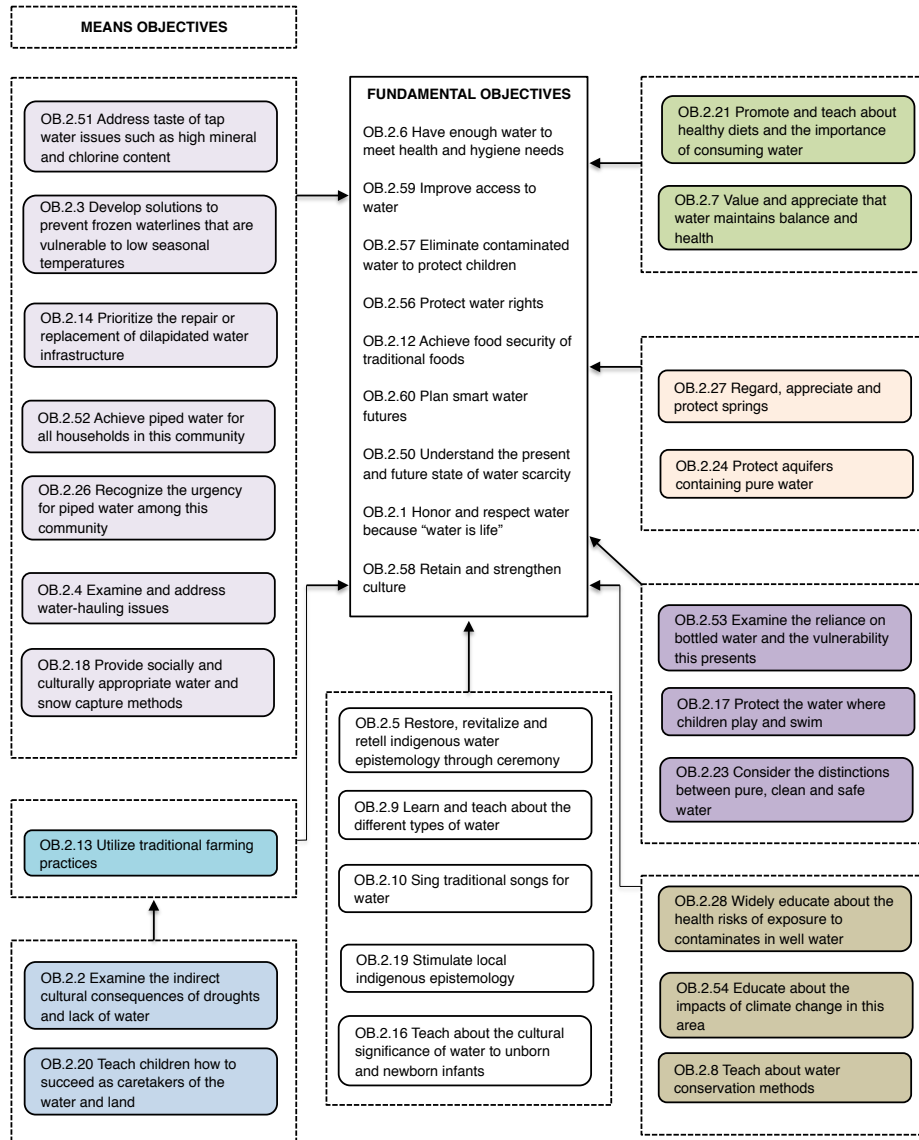


Figure 5. Southwest means-ends objective network

The center of this figure shows the fundamental objectives (FO) organized from the values and concerns expressed by focus groups in response to questions pertaining to the importance of water security within their community. There are 9 FO and 25 means objectives (MO). The MO corresponds to the water security components in the key (see Figure 6).



Southwest group
 Fundamental: 9
 Means: 25
 Total Objectives: 34

Figure 6. The key consists of 10 components represented in Figures 4 and 5.

The fundamental and means objective from the means-ends objectives network were categorized into 10 different components. The components included water security, human health, ecosystem health, food, family, responsibly, education, culture, and political and economic livelihood. The colors correspond with Figures 4 and 5.

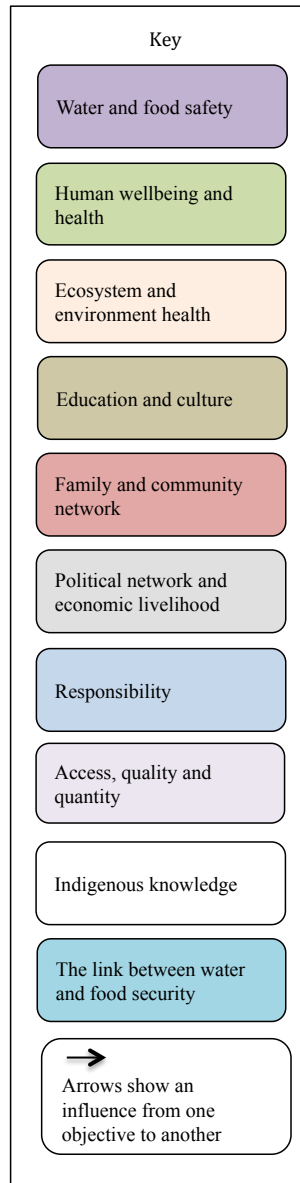
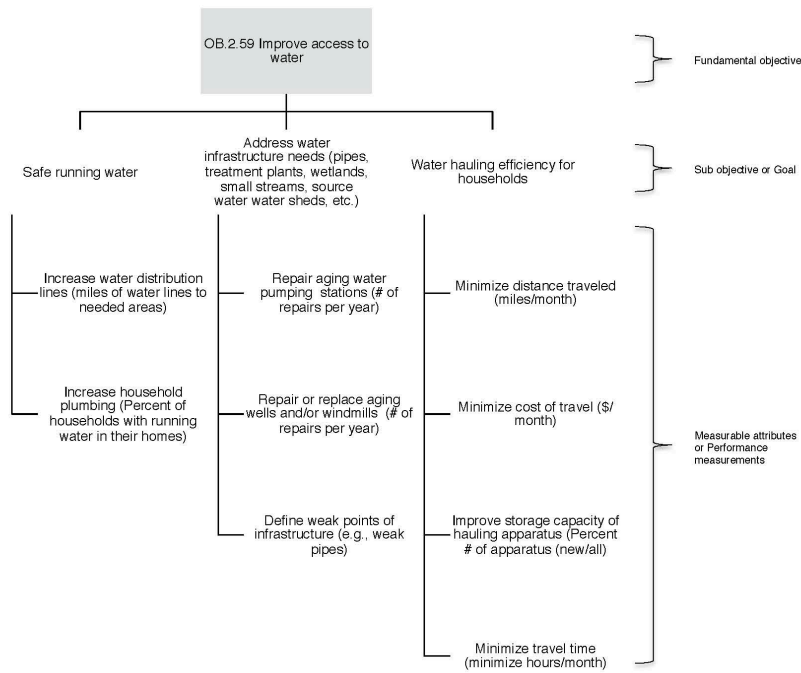


Figure 6. An example of a value-tree based on a fundamental objective developed by the SW community's concerns.

This figure shows 3 sub-objectives and several performance measures at lower levels of this hierarchy.



Acknowledgements

The authors are grateful to the tribal nations and individuals who generosity allocated their time for interviews. We are also grateful for funding through the Bullitt foundation (Bullitt Environmental Fellowship) and EPA STAR Grant.

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Chapter 5: Conclusions

Original contributions to environmental health

Chapters 3 and 4 consist of original contributions to the field of environmental health. As described in Chapter 3, we identified and ranked barriers and opportunities that tribes experienced when applying for Environmental Protection Agency's (EPA) treatment in the same manner as a state (TAS) and when developing water quality standards. This work was motivated by our observations that a low percentage (14%) of tribes with reservations seek to become TAS approved by the EPA, and an even smaller percentage (11%) end up developing their own water quality standards. Using a case study design we interviewed 5 natural resource employees from two tribal communities to better understand the barriers they experienced when undergoing EPA's procedures. In Chapter 4 we implemented Structured Decision Making (SDM) to organize the water security values expressed by citizens of two tribal communities during focus group interviews. One focus group was from the Pacific Northwest (n=8) and one was from the Southwest (n=11). This part of our research was motivated by our interest to examine a value-based approach to water management that could support a system-wide perspective on water.

Chapter 3: Our main finding and how it contributes to the literature

The main objectives of Chapter 3 were to discuss perceived barriers and opportunities of applying for TAS and developing WQS by two tribal natural resource departments. Two research questions guided the research in Chapter 3. They were:

- What are the most important barriers and opportunities in applying for treatment in the same manner as a state (TAS)?

- What are the most important barriers and opportunities in developing water quality standards (WQS)?

By interviewing 5 natural resource department employees, this study identified the top three perceived opportunities to be financial, protect health, and capacity building, while the top three barriers were financial, cultural and technical. Although we are cognizant of the limitations of our results given the small sample size (n=5), we highlight the value of the perceptions from employees who shared their in-depth knowledge about the TAS and WQS procedures within the tribes who employ them. No other persons would have been able to provide this depth of information for each tribe. The barriers identified in this work suggest potential reasons that only a small percentage (47%) of tribes have applied for TAS and seek to develop their own water quality standards.

Understanding the barriers in this process is important for several reasons. The ranking of barriers was an important start to understanding why tribes are not applying for TAS at the levels one would expect given the benefits. As described in Chapter 3, one of the greatest benefits for TAS approved tribes includes the recognition of a tribe's inherent tribal sovereignty by the Federal government. More specific to the two tribes in this work, the results will allow each tribal nation to focus their attention on the most important barriers identified and suggest areas to prioritize. Lastly, for tribes who plan on applying for TAS and to develop their own water quality standards, it's important that they understand the structures that may impede their progress in order to better strategize.

The work in Chapter 3 contributes to the literature in the following ways:

- The literature about TAS and WQS are meager in the environmental health field, despite the fact that the lack of access to water and sanitation are extreme issues in

Indian Country; however, we highlight the issues that are experienced among tribal communities.

- The ranking of barriers and opportunities by natural resource employees was unique to this work.

Chapter 4: Our main findings and how it contributes to the literature

In Chapter 4 our main aims were to identify the cultural values expressed by two tribes in order to develop a means-ends objectives network, value trees and performance measures. The research covered in Chapter 4 were guided by two research questions:

- Can cultural values be incorporated into a value tree for use by natural resource managers?
- Does the Environmental Protection Agency's (EPA) Clean Water Act (CWA) and water quality standards adequately protect the health of tribal members?

We explored these questions by examining the water security values held by two tribal communities in the PNW and the SW, and then applying SDM methodology to the concerns and values voiced by each group during focus group interviews. During interviews, participants articulated important water quality, quantity and accessibility values held within their communities, and described sources and uses of water. The concerns that emerged from conducting focus group interviews allowed us to examine our second research question.

In Chapter 4 our results revealed water security priorities as indicated by participants of both focus groups. In the PNW the top priorities encompassed a phrase articulated by many participants, "everything we eat depends on water", a notion of indigenous policies of conservation, spiritual bathing and some songs come from water. The SW participants prioritized the community maxim "water is life", access is challenging, concerns about water

availability, and teach children indigenous epistemology. Second, this work organizes objective networks that can lead to the achievement of culturally driven approaches to address water insecurity concerns. The means-ends objective networks shows a glimpse of the complexity involved in achieving the fundamental objectives such as water security, strengthening culture, health, and pollution prevention. Third, drawing from the fundamental objectives we developed value trees. We provide an example of the resultant performance measures by illustrating a value tree beginning with access to water. Lastly, we structured our focus group questionnaire so that we could better understand the cultural values affiliated with a general definition of water security including access, quantity and quality. Our work led to several additional emerging concepts of water security, which induced a proposed modification to the UN-Water's definition of water security.

This work contributes to the literature in the following ways:

- Our results revealed water security priorities as indicated by participants of both focus groups.
- This work organizes objective networks that can lead to the achievement of culturally driven approaches to address water insecurity concerns. The means-ends objective networks shows a glimpse of the complexity involved in achieving the fundamental objectives such as water security, strengthening culture, health, and pollution prevention.
- Drawing from the fundamental objectives we developed value trees. We provide an example of the resultant performance measures by illustrating a value tree beginning with access to water.

- We structured our focus group questionnaire so that we could better understand the cultural values affiliated with a general definition of water security including access, quantity and quality. Our work led to several additional emerging concepts of water security, which induced a proposed modified definition of the UN-Water's definition of water security.

A summary about significance of this research to environmental health

One of the SW elders who participated in our focus group interview stated that she supported this work because it would help her understand and strengthen the communities' notion of water. She cited the physical, mental and economic hardships experienced by people who must haul their water for several miles, who live in areas with ruptured water lines and about her concern for the future of her community and nation. She stated that if we are going to make the world a better place for our upcoming generations that we will need to move through the world with more balance and gentleness. Even though she worried that the youth in her community would not strive to learn about the valuable lessons held by Native communities, she was confident that the lessons held in traditional knowledge would teach them how to live in balance with the earth, not to trek so harshly and that these lessons would influence non-indigenous communities.

In the larger community, when we think about how to encourage and teach one another about improving our health, it's important to consider the knowledge systems that have existed for centuries and ask if there is knowledge there that can be respectfully used to alleviate the world from environmental pressures and harms. In this process, it's important to have the local communities at the decision making table so they can voice their strategies for how to incorporate their worldviews, values and knowledge to help address, or to take

responsibility for the issues locally defined. Utilizing these opportunities will help us to improve our children's lives.

When thinking about the regulatory procedures that tribes follow, and the barriers that inhibit them from addressing the most important environmental issues, we ought to consider the methods that tribes themselves have implemented and followed over time. For example, considering the system approaches to viewing the environment instead of thinking about in bits and fragments under the CWA, CAA, etc. In order to address problems like ocean acidification, this requires that we consider both water and air quality. The worldviews of tribes don't separate the water from air, instead they acknowledge the continuum between these two spaces and the influence each has on the other (personal communication with Lorene Legah).

Addressing these serious public health water issues will take action at all levels in the community, tribal government and federal government. By listening to the communities, we can learn a deeper understanding about the interactions between people and their environment, and perhaps learn about alternative ways to solve emerging and re-emerging problems that threaten the livelihood of these communities.

Indigenous research, presentations and reports to Southwest and Pacific Northwest communities

As an indigenous researcher, I am aware of the perceptions that some indigenous communities have toward researchers who come to their communities to *take knowledge* without giving back to the community. It has never been my intention to do this, and I hope that I have served the communities with respect and honor. Moving forward it will be important for me to keep connected to each of the generous communities that have welcomed me onto their homelands to ask questions about water security. I have asked these questions

both as a researcher and as an Indigenous person who is proud of my heritage, ancestors and who acknowledges my responsibilities as a relative. It has been a tremendous pleasure and I will continue to offer my support to those who shared their stories about water. It has been a life changing experience for me, and I hope that as I move forward in my career that I will be able to make a positive difference for the environmental health of indigenous communities.

In the upcoming months I will honor the agreements (IRB and MOU) I signed with each community who participated in this study. As I have wrapped up the data analysis of this research, I have contacted key informants from each community to provide them with a draft copy of Chapters 3 and 4 of this work and to request their feedback. Upon receiving feedback I will incorporate them into the dissertation and final report to each tribe. In addition, I have offered to present the results of this work to both communities. During the fall of 2013, at a research event hosted by the SW community, I presented our preliminary findings in a 20 min presentation. I have not presented this work to the PNW community, but the offer has been extended to two key contacts, and I will continue to reach out to them over the summer.

In addition to previous contact, during the summer of 2014, electronic copies of my final dissertation, a short summary of the results from Chapters 3 and 4, and copies of my doctoral defense presentation will be sent to in-depth and focus group participants. During my last meeting with each community, I will continue to work with them to consider how to apply the objectives and performance measures in a way that is useful to the community. Such future work is contingent on funding since the funds for this work ended in the beginning of 2013.

The strengths and limitations of using the Structured Decision Making Tool

Strengths:

This value-focused approach, or structured decision making (SDM) aims to identify values during the early stages of decision analysis (Keeney 1992). Objectives, as defined by Keeney, are what we care about. Clearly SDM can be a subjective approach to defining objectives. However, this approach creates a systematic mechanism to capture various classes of objectives including cultural, spiritual, economic, and uses of environmental resources. This can be a useful tool to environmental managers who are interested in locally and nationally representing community values as guides, policies or in environmental regulations. In addition, SDM can be easily coupled with research approaches that advance respectful interactions between multiple stakeholders.

Limitations:

The limitations of this methodology include that it is a time consuming and an involved process. Though one of the strengths is that it provides a structured way to illicit stakeholder values, doing so can take a lot of initial community engagement because of the nature of value-focused thinking. Depending on the community, problem context, and the person moderating the value elicitation process, it could be challenging to get participants to discuss their values. And doing so within 1-2 hours in a focus group setting, especially for a really complex issue, might not always be possible. Multiple stakeholder involvement at numerous levels of this process would be ideal, however, it would undoubtedly add time and demand more resources.

In this study, getting to the stage where I could begin interviewing focus group participants took several months. One reason for this was that I followed internal research review processes within both tribes. At minimum this required submitting a research proposal, application, attending several meetings, getting approval from several internal agencies and council members, and outlining the benefit that this research would have on both communities. Such internal review processes are emerging in many native communities to counteract unethical and what is called *helicopter research*. This latter statement has been applied to researchers who enter communities to gather research and leave without ever being seen again. Furthermore, unethical research practices, such as the use of DNA samples from the Havasupai community, have led to more proactive tribal nations who are now taking steps to protect their community from research that could inflict harm on their citizens (Brugge and Missaghian 2006; Garrison and Cho 2013; Harding et al. 2011; Pacheco et al. 2013).

When working with tribal communities it is important to consider the imposition of western methods. For those who question whether to incorporate western methods within a research project with tribal communities, a simple rule one can examine is 'whether using a particular method will lead to the betterment of the community'. Also it's important to consider how a tool can harm a community.

Using SDM has the potential to give voice to indigenous thought and ways of knowing, and can be used to inform environmental management. However the implications of how data is gathered (e.g., western approaches), stored, and used for immediate and long-term use by the researcher has to include a transparent process so that tribes can make the decision to participant in the research process, and the

decision about whether they want their knowledge to be applied to policies at each level of government. In general, like all other communities, tribes have adopted and incorporated tools that they deemed helpful to their communities and discarded tools that were not helpful. Deciding whether to use a western approach, or a combination of western and indigenous approaches is ultimately up to the sovereign community of interest.

A broad summary of this studies contributions

In summary, this research made the following contributions to the field of environmental health and other interdisciplinary fields:

- All natural resource employees of two tribes, who had the experience and knowledge about TAS and WQS, identified and ranked the most demanding challenges experienced when seeking to develop WQS under a federal framework.
- We take a systems approach to understand water security and add to WHO's definition of water security.
- We worked with tribal communities to list their water security values in order to develop performance measures that can be used to demonstrate the achievement of these prioritized goals.
- We acknowledge the data gathered in this work to be the property of respective tribes and honor tribal IRB procedures.
- Self-determination is a motivating force for tribes and is foundational to tribal success. Thus, understanding how tribes are building upon these concepts, and identifying what is important to tribes, are significant steps in

understanding how to establish procedures that will function effectively within tribal nations and their communities.

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APPENDIX

APPENDIX FOR CHAPTER 2

Appendix Table 2.1. Examples of court cases and other actions by states who were in opposition to EPA's approval of TAS or WQS.

Montana v. U.S. (1981): This case examined whether non-Indians in Montana could be prohibited from hunting and fishing on the Crow reservation and whether the State of Montana had the authority to the hunting and fishing of non-Indians. The Courts decided that the Crow Tribe did not have jurisdiction over land owned by non-Indians so they do not have the power to regulate non-Indians on these lands except under two conditions:

- A. when nonmembers enter into consensual relationships with the tribe or its members or
- B. when non-Indian's actions have direct effect on the health and welfare of the tribe, in which case tribes may exercise civil authority over the conduct of nonmembers on fee lands within the reservation (Sanders 2009; Kannler 2002).

City of Albuquerque v. Browner (1996): This was the first case where a state challenged a TAS-approved tribe's WQS, which were more stringent than the adjacent state and federal standards. The tenth circuit court of appeals "upheld the EPAs reading of the CWA as recognition of inherent tribal regulatory authority, concluding that the Pueblo could establish [WQS] that are more stringent than those imposed by the federal government...because it is in accord with power inherent in Indian sovereignty" (Sanders 2009). "Additionally, the court concluded that EPA had the authority to require the City to comply with such standards in its discharge permit" (Porter 2007).

Montana v. EPA (1998): This case examined EPAs granting of TAS to the Confederate Salish and Kootenai Tribes. Montana opposed the Tribes position to control discharged pollutants, via their established water quality standards, by non-tribal members. The courts upheld EPA's approval of the Salish and Kootenai tribes TAS status given the direct effect actions of non-members would have on the health and welfare of tribal citizens (see also Montana v. U.S.) (Sanders 2009; Kannler 2002; Porter 2007).

Wisconsin v. EPA (2001): In this case the state of Wisconsin challenged EPA's granting of TAS to the Mole Lake Band of Lake Superior Chippewa, because they argued "under the Equal Footing Doctrine, it held title to certain submerged lands within the Mole Lake Reservation, and was therefore the proper sovereign to regulate WQSs for those waterbodies" (Sanders 2009). "The Seventh Circuit found that although the CWA grants tribes the authority over waters within the borders of a reservation, the CWA does not discuss ownership rights of the waterbeds or the waters. The Court consequently upheld the EPA's finding that tribes have the authority to regulate all waters within a reservation in spite of state ownership of the submerged lands. The court's holding diminishes the states' argument, when challenging an EPA grant of TAS status, that the tribe lacks jurisdiction over the waters as required by Section 1377 because the state, and not the tribe, holds title to the waterbed" (Kannler 2002).

Pawnee Nation and the Oklahoma rider: This is another example of a State's challenge of EPA's decision to approve TAS status on a tribe. In this case it was the Pawnee Nation of Oklahoma. This case restricted EPA's approval of TAS by passing an Act that requires that tribes enter into a cooperative agreement with the State in addition to meeting TAS requirements. This ensures that the State obtain authority over all environmental programs in the state and limits tribal environmental program decisions.

Equal Footing Doctrine: "Establishes that a state, upon entering the Union will received the same rights, such as ownership of submerged lands, and be on equal footing with all of the states already admitted to the Union. Under the Constitution, however, Congress has exclusive authority over Indian affairs; therefore, state law does not apply to Indian affairs on the reservation" (Kannler 2002).

Appendix Table 2.2. Some EPA grant programs available to TAS approved tribes and states.

General Assistance Program (GAP): Grant program for Indian tribal governments and intertribal consortia to build capacity to administer environmental regulatory programs for the development of multimedia programs to address environmental issues on Indian lands.

Section 104: Water Quality Cooperative Agreements – Grant program to assist states and tribes in developing, implementing, and demonstrating innovative approaches relating to the causes, effects, extent, prevention, reduction, and elimination of water pollution through both permitted and non-permitted areas.

Section 106: Water Pollution Control Program Grants. Grant program to support states, interstate agencies, and tribes in administering programs for the prevention, reduction, and elimination of water pollution.

Section 319: Grant program to help states and tribes control non-point sources of pollution through development of assessments and management programs.

Performance Partnership Grants (PPG): Grant program for tribes and intertribal consortia to help them plan, develop and implement environmental programs.

From USEPA (USEPA 2009) (USEPA 2011)

Appendix Table 2.3. Ranked barriers of TAS and WQS by 5 natural resource employees of two tribal nations.

Barriers	Very Important	Moderately Important	Not Important	Not sure	Category
The end of financial funding from EPA for tribal programs once WQS are approved	4	0	1	0	Financial
The lack of funding to sustain environmental programs	4	1		0	Financial
Within this Tribal Nation, the insufficient funds to hire contractors	1	3	1	0	Financial
EPA's cultural competency when interacting with Tribal Nation	3	1	1	0	Cultural
The difficulty in understanding case law by Natural Resource Department staff	4	0	1	0	Technical
The insufficient understanding by EPA about treaties signed between the federal government and tribes	4	0	1	0	Technical
The insufficient understanding about federal trust responsibility by EPA	3	1	1	0	Technical
The insufficient understanding by EPA about usual and accustom lands	2	0	3	0	Technical
Within this Tribal Nation, the uncertainty about tribal jurisdiction over land	2	3	0	0	Technical
The difficulty of translating traditional knowledge into western science as a means to develop water quality standards	2	1	2	0	Technical

Within this Tribal Nation, the difficulty in recruiting expert staff	3	1	1	0	Capacity building
Within this Tribal Nation, the difficulty in retaining expert staff	2	2	1	0	Capacity building
Within this Tribal Nation, insufficient number of Natural Resource Department employees available to apply for TAS	1	1	1	2	Capacity building
Concern of increased disputes between state and this Tribal Nation as a result of applying or obtaining for TAS	2	1	1	1	Political
The lack of respect as a sovereign by EPA	2	0	1	2	Political
Concern of increased disputes between federal government and this Tribal Nation as a result of applying or obtaining for TAS	1	2	1	1	Political
Concern of increased disputes between neighboring counties and this Tribal Nation as a result of applying or obtaining for TAS	1	2	1	1	Political
Exclusion of this Tribal nation at the Federal level (but not by EPA) from decision making regarding environmental issues	3	0	1	1	Political
Exclusion of this Tribal nation at the State level (but not by EPA) from decision making regarding environmental issues	3	1	1	0	Political

Exclusion of this Tribal nation at the local level (but not by EPA) from decision making regarding environmental issues	1	2	1	1	Political
Exclusion of this Tribal nation by EPA from decision making regarding environmental issues	1	1	2	1	Political
Time allotted by EPA to Tribal Nation to complete requests regarding TAS	2	1	0	2	Institutional
Time allotted by EPA to Tribal Nation to complete request regarding water quality standards	2	1	0	2	Institutional
Changing of EPA's requirements, rules and regulations regarding water quality standards	1	1	2	1	Institutional
Changing of EPA's requirements, rules and regulations regarding TAS	0	1	2	2	Institutional
The involvement of multiple EPA statutes (e.g., CWA, CAA, and SDWA) in the development of water quality standards	0	0	4	1	Institutional
The involvement of multiple agencies in the management of issues pertaining to water quality	0	2	2	1	Institutional
The lack of EPA's transparency regarding tribal water quality interest	1	2	1	1	Communication
Difficulty in communicating with EPA	0	2	2	1	Communication

Appendix Table 2.4 Ranked opportunities of TAS and WQS by 5 natural resource employees of two tribal nations.

Opportunities	Very Important	Moderately Important	Not Important	Not Sure	No Answer	Category
Increased funding opportunities after TAS approval	4	0	0		1	Financial
Increased funding opportunities after the development of water quality standards	4	0	0	0	1	Financial
Enhanced protection of human health for this Tribal Nation subsequent to approval of TAS	4	0	0	0	1	Protect health
Enhanced protection of human health for this Tribal Nation subsequent to approval of water quality standards	4	0	0	0	1	Protect health
Increased technical assistance from EPA	4	0	0	0	1	Capacity building
Increased ability by this Tribal nation to address environmental issues for this Tribal Nation	4	0	0	0	1	Capacity building
Help from EPA with technical knowledge development	4	1	0	0	0	Capacity building
Training from EPA	3	1	0	1	0	Capacity building
Recruitment of expert staff within this Tribal Nation	3	1	0	0	1	Capacity building
Retention of expert staff within this	3	1	0	0	1	Capacity building

Tribal Nation						
Encouragement to take control of environmental decision making	4	0	0	0	1	Institutional
Increased inclusion by EPA as a government-to-government entity	4	0	0	0	1	Institutional
Encouragement from EPA to take control of environmental programs	3	1	0	0	1	Institutional
Encouragement to submit TAS application to EPA	3	0	0	1	1	Institutional
Encouragement to develop water quality standards	3	0	0	1	1	Institutional
Increased attention by EPA to federal trust responsibility	4	0	0	0	1	Political
Federal support of sovereignty	4	0	0	0	1	Political
Increased respect by EPA of tribal decision making as a sovereign nation	4	0	0	0	1	Political
Help with dispute resolution between industries and this tribe under the Clean Water Act	3	1	0	0	1	Political
Beneficial collaboration with EPA	3	0	1	0	1	Political
Help with dispute resolution between federal government and this Tribal Nation under the Clean Water Act	3	0	1	0	1	Political

Help with dispute resolution between state(s) and this Tribal Nation under the Clean Water Act	3	0	1	0	1	Political
Help with dispute resolution between neighboring counties and this Tribal Nation under the Clean Water Act	2	1	1	0	1	Political
Improved communication with EPA	3	0	1	0	1	Communication
Beneficial interactions with environmental consultants	1	3	0	0	1	Communication

Appendix Table 2.5 The number of informal interviews held with specialist and experts of TAS and/or WQS.

Interviewee	# of people interviewed	# of interviews
SW Tribal Natural Resource Department	2	>2
PNW Tribal Natural Resource Director	1	1
Professor of law at ASU	1	1
PNW Tribal leaders	1	>2
SW Tribal leaders (TN3)	1	1
Environmental Institute Director	1	1
EPA Seattle	2	4
EPA Headquarters	3	1
TOTAL	12	13

Appendix Chapter 2 Definitions

In this paper we define a **barrier** as a real or perceived restriction, limitation, or obstacle to the successful completion or process of an application of treatment in the same manner as state, or the development of water quality standards. Example of barriers includes the lack of funding, or poor communication. We use Oxford Dictionary to define opportunity. It defines an **opportunity** as “a set of circumstances that makes it possible to do something (8). Below are more specific definitions of each of the barriers included in this study. Several of these definitions have been modified from their original source to better fit their use in this work.

Financial barriers: The lack of financial resources or the lack of money as an obstacle to the development of certain projects, and to economic development (3 and 4).

Cultural barriers: Impediments to communication between mainstream culture and members of a societal subgroup that is culturally distinct in significant ways can have implications for environmental management. At a simple and obvious level, communication is impaired if the subgroup has language differences. Other important cultural barriers are imposed by major differences in values relating to customs (2).

Technological barriers: The insufficient technical knowledge or unavailability of adequate technology.

Capacity building barriers: Obstacles to the process by which individuals, groups, organizations, institutions and societies increase their abilities to: a. perform core functions, solve problems, define and achieve objectives; and b. understand and deal with their development needs in a broad context and in a sustainable manner (9).

Political barriers: Obstacles which groups of citizens, their political representatives, political parties or countries interpose to each other in order to hinder the actions of certain of their opponents. This may include: the prevention of a political minority group to achieving their aspirations by the politically dominant voting majority, in the legislative procedure; the blocking of the international political and economic influence of a country by a multilateral treaty or alliance between countries opposed to such influence (3).

Institutional barriers: Institutional barriers (IBs) are policies, procedures, or situations that systematically disadvantage certain groups of people. IBs exist in any majority-minority group situation. When an initial population is fairly similar (e.g., in male-dominated professions), systems naturally emerge to meet the needs of this population. If these systems do not change with the times, they can inhibit the success of new members with different needs. IBs often seem natural or “just the way things are around here.”

(Note: A Google search for “institutional barriers and environmental policy” yields many interesting hits.)

Communication barriers: There may be communication barriers operating between the parties of interest that impede an exchange of information and understanding. These may include language barriers, or cultural differences, or the impact of sensory impairments, or learning disabilities (1). In short, this type of barrier may impede exchange of information and understanding. This might include language barrier, or cultural differences.

Protect health opportunity: These are opportunities that lead to the protection of human health by preventing “adverse health effects in humans who may be exposed to chemicals in contaminated environmental media, now or in the future” (10). Health here was defined generally.

References for Chapter 2 Definitions:

(References need to be cleaned up in Endnote)

1. A Dictionary of Social Work and Social Care John Harris and Vicky White
Publisher: Oxford University Press Print Publication Date: 2013 Print ISBN-13:
2. 2. A Dictionary of Public Health Edited by John M. Last Publisher: Oxford
University Press Print Publication Date: 2007 Print ISBN-13: 9780195160901
Published online: 2007 Current Online Version: 2007 eISBN:
97801998913139780199543052 Published online: 2013 Current Online
Version: 2013 eISBN: 9780191744495
3. <http://en.wikipedia.org/wiki/Obstacle>
4. <http://ourworld.unu.edu/en/political-barriers-to-climate-change-adaptation>
5. http://www.elseviersocialsciences.com/transport/konsult/public/level1/l1_barrr.htm
6. <http://www.ncwit.org/resources/institutional-barriers-their-effects-how-can-i-talk-colleagues-about-these-issues>
7. <http://www.who.int/heli/decisions/barriers/en/#>
8. Oxford Dictionaries. "Opportunity". Oxford Dictionaries: Oxford University Press.
9. International Institute for Education Planning, and UNESCO. 2006. Guidebook for planning education in the emergencies and reconstruction.
10. Human Health Risk Assessment, Accessed on January 15, 2014,
http://www.epa.gov/risk_assessment/health-risk.htm

Appendix Chapter 4

Focus Group Research Question and aims

Research question(s):

List all relevant research questions here.

Definitions:

As an effort to clearly communicate your study to the community, succinctly define important terms in this space.

Checklist and Roles of Moderator and Moderator Assistants

Moderator:

- Train moderator assistants before conducting interviews
- Review facilitation notes
- Guide and facilitate the focus group discussion
- Follow questionnaire guide to ensure all important information and questions are covered
- Listen carefully to participants
- Make sure the rules of engagement are followed

Both Moderator Assistants:

- Sign a Statement of Confidentiality if Tribal MOU's require confidentiality from researchers
- Any specific questions from focus group participants about this project should be directed to the Moderator
- **IMPORTANT:** Check that audio recorders are on and recording before starting interviews—there will be two fully charged recorders
- Learn the focus group protocol
- Please wear nice clothes that are respectful and not distracting to participants
- Help to arrange chairs in a large circle, or facing the front of room, before interview starts
- Stay for 1 hour after the focus group interview to debrief, organize notes, and clean up room.
- Arrive to focus group location 1 hour ahead of scheduled interviews (e.g., if the interview starts at 1 pm, arrive no later than 12 pm)

Moderator Assistant 1:

- Scribe: On the portable easels and notepads please write the question number at the top of the flip board and write participants' responses.
- You are welcomed to ask participants to repeat their statements, or say, "can we go over that again so I can accurately write that down?"
- Scribe: Write down
 - Key quotes
 - Common themes
- As people are coming into the door, collect consent forms (if you emailed them to participants). If they don't have one please make sure we provide one to them, and ask them to sign it. If they have any questions, please have them talk to the Moderator.
- During the focus group interview, please do not answer the focus group questions, allow the participants to do that.

Moderator Assistant 2:

- Help to greet participants to the room, show them where the sign in sheet is located, the participant packets (e.g., name badges) and where the food is located. Help them feel comfortable and welcomed. Treat participants like a guests in your home.
- Keep an eye on the refreshment table. If coffee or tea or anything else needs to be replenished, please attend to that.
- If people come in late, greet them, have them sign a consent form if they haven't yet, give them a participant packet (consent form, FAQ, pen, clipboard, paper, name badge, questionnaire and sticky notes), ask them to grab a quick refreshment and find a seat.
- Act as the scribe's assistant: Make sure Moderator Assistant 1 has everything she needs to be successful.
- Help Moderator 1 note the key quotes if she needs your help.
- Before the interviews start, hand out participant packet:
 - 1- Consent form
 - 1- FAQ sheet
 - 1-Pen
 - 1-Clipboard
 - 5- sheets of paper
 - 1- Name badge
 - 1- Questionnaire guide
 - 10-Sticky notes or notepads
- Diagram seating arrangements of the focus group at the beginning of interview.
- During the interview, please note the group dynamics.
 - Were some people more vocal than others?
 - Did it appear that some people were more comfortable than others?
- During the interview pay attention to body language. If someone, especially an elder needs something, quietly help them.

Materials to read:

- [Please read this packet completely](#)

Other materials for you (but not required)

- Focus Group Interviewing, by Krueger: <http://www.eiu.edu/~ihec/Krueger-FocusGroupInterviews.pdf>

Focus Group Preparation Checklist

Day 0

- Reserve a room on each Tribal nation where focus group interviews can be held. Make sure there are chairs and tables available.
- Recruit participants; send them consent forms (See focus group consent forms), topics to be discussed, maps and contact letter.

Day 1

- Call contact of each community house, or location where focus groups will be held at least 1 week before date of focus group. Double check that time slot is reserved and that there are no anticipated problems. Rooms will be reserved for 4 hours as to ensure adequate time for set up, focus interviews, and breakdown/ cleanup.

Day 2 (day before focus group interviews)

- Buy refreshments (See list below)
- Charge 2 recorders in case one fails
- Review the protocol & interview guide
- Review each question
- Meet with Moderator Assistants for 2-2.5 hrs to review focus group questionnaire guide

Day 3 (day of focus group interviews)

- Arrive at least 60 mins before participants arrive to arrange the room and to take care of any details necessary (i.e., chairs, water, snacks, tables, etc.). Chairs will be placed in a circle with no tables in front of participants.
- Organize materials
 - Set up Post-it Easel Pad, Self-Stick Sheets with questions listed at top in large writing.
 - Place consent forms on each participant's chair to remind them what they have consented to
 - Place recorder on a small table or chair next to interviewer
 - There will be two recorders, so if it turns out that someone is soft spoken, one of the moderators will place recorder next to person.
 - Make sure to have research notebook and pencil/pen
 - Place sign-in sheet next to the door so participants can sign in as they arrive. This is also the sheet participants will initial once they receive their gift of \$40 cash.
- Each participant will receive \$40 cash at the end of interviews. Place \$40 cash in an envelop with thank you note.

Focus groups interviews will take up to 2 hours and consist of the following steps:

- Be respectful by showing that you are interested in everything each person communicates!
- Introductions of members and interviewer.
- A review of the purpose of the study, discuss consent forms, remind participants about digital recorder, and review the overall interview structure.
- Begin structured focus group interviews.
- Closing remarks
- Clean up of room
- We will diagram seating arrangements of the focus group at the beginning of interview. Also be aware of body language. This could help to compensate for the differences in communication style between moderator and interviewees.

Wrap-up after focus group interviews will include

- Post-focus group debriefings
- Copy recording onto a password protect external hard drive.

- Delete recording from iPod touch
- Clean up notes written during focus group
- Begin transcribing as soon as possible (expect 4-6 hours of transcribing for each 90 minute interview)

Focus Group Kit

- Markers
- Poster
- Post it notes
- 15 Name badges and sharpie
- 2 recorders with chargers
- Thank you cards with \$40 cash
- Clipboards
- Tape
- Money belt
- Packets for Participants: Consent Form, FAQ and Questionnaire, 10 sticky notes with their names
- Paper clips
- Stapler

Refreshments

- Table cloth and/or blanket
- 12 Bottles of water or pitcher of filtered water
- Cups, plates, napkins, stir sticks
- Nuts
- Fresh fruit
- Chocolate or a nice sweet treat
- Tea
- Coffee
- Creamer
- Sugar
- Hot water kettle, coffee maker, coffee filters

Rules of Engagement³⁸

- Acknowledge that all participants bring with them the legitimate purposes and goals of their organizations and communities
- Respect the agenda and accept our time limitations
- Actively listen and participate
- Be respectful by using considerate language and allowing others to express their ideas
- Express concerns in a manner that others are likely to hear, not in a manner likely to invite defensiveness

³⁸ Modified from Institute for Risk Analysis and Risk Communication

- Avoid attributions regarding the intentions, beliefs or motives of others. Inquire rather than assuming you know
- Ask genuine questions (to learn or clarify), not rhetorical ones (to persuade or argue)
- It is OK for the facilitator to remind us of these ground rules, and for us to remind each other

Focus Group Questionnaire and Guide

Normal font: Read aloud

[Italics]: Notes to self and moderators

SECTION A. INTRODUCTION (10 mins)

MAKE SURE BOTH RECORDERS ARE ON!

Before we begin the focus group interview, does everyone have snacks and drinks? Lets find a place to sit. Please make sure you have a badge and that you have signed in.

Before we get into the focus group session, I want to introduce myself, and my team of helpers.

[Add your introduction here]

Did everyone get a chance to read the consent form and sign it? Moderators 2, did we collect all consent forms?

Also we want to you know how much we appreciate your time. To say thank you, we are giving you a \$x cash incentive at the end of this session.

This focus group will last between 1-2 hours and include [add number of questions here] questions. There are no right or wrong answers, only differing points of view, so all your ideas are important to us!

I want to welcome you to let me know if you need a break, but we'll aim to break in about ~1 hr. For now, can everyone please turn off your cells phones? Thank you.

Are there any questions before we start?

SECTION B. ICE BREAKER (10 mins)

[Does everyone have a name badge on? Be ready to give participants your FULL attention!]

Let's take a moment for others to introduce themselves?

Please tell us your name, and for fun, briefly share your favorite type of water event or activity you enjoy during the summer, winter, fall or spring.

[Make some notes about the activities people are sharing, so we can use these activities later in the in focus groups—place a star next to the most impressionable shares]

[Example of my share: Sometimes, I get invited to raft down the Colorado River or to kayak. I love being on water so I try to raft, canoe or kayak as much as possible. Also, in the summertime, I love to hike, so I try to pick hiking trails that are next to or that lead up to water holes, springs or falls.]

SECTION C. KEY QUESTIONS (45-80 mins)

Some of these questions may seem similar, but we are going through this sequence of questions so I can understand these concepts in detail. Your answers are important to me, and I'll try to emphasize how each question differs as we go along.

We'll start by discussing cultural values of water and then think about water quality, quantity and accessibility. If I'm not quite sure about something you are saying, I might ask for clarification. And likewise, if there is something you are not sure about, please ask for clarification.

LIST FOR SET OF QUESTIONS:

1. Question 1.
2. Question 2, ...

[[Moderator Assistant 1: Please write participant's statements out, use quotes, or you can use pictures (e.g., draw a boat, or fish), if you don't know what to write, please, say "Can we get some clarification on this idea. I'm not quite sure how to write that."]]

Examples of probing questions:

- a. *Thank you for sharing that, can you elaborate on that experience?*

OTHER

2. Does anyone have additional comments about why water is important to you, your family, your children or your community?

[Look to my notes from the break or at the flip chart to point to notions to discuss in more detail.]

SECTION D. CLOSING REMARKS

3. Do you have anything more that you would like to add?

SECTION E.

Well, great job everyone!! I want to thank each of you again for your participation and time. What you have shared here is really fascinating and beautiful.

I'll be over here getting an envelop with \$40 cash out for each of you. When you are done placing your sticky notes up on the flip boards, please come see me to initial the sign in sheet to indicate that I have given you this gift of our appreciation.

And on your way home, please be safe!

Thank you!

Notes on facilitation

Encouraging participants:

- Tell me more about that idea?
- Can you give me an example?
- Can you elaborate?
- Does anyone else want to talk about that?
- Does anyone have a different opinion or experience?

Active listening (page 53 of extreme facilitating):

- Giving speakers your full attention
- Show genuine interest in their perspective
- Encouraging them to expand on what they have stated
- Demonstrate that you understand
- For example you can paraphrasing or summarizing what the speaker has said, reflecting back both feeling and content, and using body language or other indications of full attention and receptiveness.
- Leave arms and legs uncrossed, making eye contact, lean forward etc.

Curbing ramblers and drawing out the succinct:

- During the interviews, some people talk endlessly, even after they have expressed and relieved their emotions and have conveyed all important information. You may need to put your manners aside and cut the speaker off to ask your next question or to close the discussion. You may also need to avoid paraphrasing and summarizing, as anything you say will prompt a rambler to keep on talking.
- You may need to encourage some people to expand on the issues they find most important so that you can ascertain what issues will merit group discussion and how contentious they will be.
- One key is to follow up on topics that seem loaded with emotional energy—as indicated by tone of voice, body language, or repeated phrases. You can ask, what's meant by the phrase, ask for elaborations, or ask for an example—which often brings out the example, the real problem.

How to maintain balanced participation:

- For example, monitor your airtime; ask to hear the views of people who have not spoken.

How to refrain from personal attacks

- Be respectful, be civil, and seek to understand others' ideas before responding explain reasons for your disagreement, criticize ideas but not people, and don't take criticism of your ideas personally.

How to keep basic order:

- Avoid interruption, avoid sidebar conversations, speak only when acknowledged by the facilitator, turn off cell phones, and let the facilitator know if a break is needed.

Start up question:

- People often need to warm up, to get used to hearing their voices in the meeting setting, and to feel assured that their participation is welcome. An opening question to which each participant responds can meet this need.
- The start up question can overlap with other items. For example it could be an extended introduction that allows for some relationship building.

The Language of Facilitation (page 16)

- Paraphrasing
 - “Do I understand you correctly that...”
 - “Are you saying....”?
 - “What I’m hearing your say is....”
- Reporting behavior
 - “I’m noticing that we’ve only heard from three people throughout most of this discussion”
 - “I’m noticing that several people are looking through their journals and writing.”
- Describing feelings
 - “I feel we’ve run out of energy.”
 - “I feel as if we’re facing a brick wall.”
 - I feel like a fly on the wall.”
 - Facilitators always need to be honest with group members by saying things like: “I feel exhausted right now” or “I feel frustrated”. This lets other people know that it’s okay for them to express feelings.
- Perception checking
 - “You appear upset by the last comment that was made. Are you?”
 - You seem impatient. Are you anxious to move on to the next topic?”
 - Perception checking is important tool. It lets the facilitator take the pulse of participants who might be experiencing emotions that get in the way of their participation.

The job of a facilitator is to help the participants to speak up. He also taught me that even though we were remaining neutral with respect to the substance of the participants’ work, our process was not neutral: it embodies values of openness, inclusion and collaboration (Adam Kahane, page 89).

Remember that some actors are in positions where they are usual not heard, and remember what it might have felt like when you were in a similar situation (adam kahane, page 89).

“We cannot develop creative solutions to complex human problems unless we can see, hear, open up to and include the humanity of all the stakeholders and of ourselves. Creativity requires all of our selves: our thoughts, feelings, personalities, histories, desires, and spirits. It is not sufficient to listen rationally to inert facts and ideas; we also have to listen to people in a way that encourages them to realize their own potential and the potential in their situation. This kind of listening is not sympathy, participating in someone else’s feelings from alongside them. It is empathy, participating from within them. This kind of listening that enables us not only to consider alternative existing ideas but to generate new ones.” (Adam Kahane, Page 90)

Sample Informed Consent Form

Research study [add title of study here]

Researchers:
Your name or PI name

Email:
clarita@uw.edu

Phone:
206-000-0000

RESEARCHERS' STATEMENT

We are asking you to participate in a research study as an interviewee. The purpose of this form is to give you the information you will need to help you decide whether or not to be in the study. Please read this form carefully. You may ask questions about the purpose of the research, what we would ask you, the possible risks and benefits, your rights as a volunteer, and anything else about the research or this form that is not clear. Please contact [Name of researcher above] with questions or concerns. When we have addressed all your concerns, you can decide if you want to be in this study or not. This process is called "informed consent". You may keep a copy of this signed form for your records.

PURPOSE OF THE STUDY

The goal of this research project is to understand cultural values held within your community. We are most interested in cultural values pertaining to water because we would like to consider ways to share and incorporate these values into the formation of water quality standards. Presently, Tribal nations have not been able to incorporate their specific values into the development of water quality standards, although there is interest in making policies and standards that are more reflective of Tribal, or Indigenous communities. By agreeing to take part in this study, you will be sharing your own experiences and views about interview questions asked by Clarita Lefthand during a 1-2 hour focus group.

STUDY PROCEDURES

Your participation in this research is voluntary. You can leave this study at anytime, you may refuse to answer any questions, or provide other information. If you decide to participate:

- We will ask that you attend a 1-2 hour focus group interview. This focus group will consist of 5-8 members of your community who are at least 18 years of age.
- During the focus group interviews, we will ask you questions about your perspectives on water quality surrounding your home and about your cultural values pertaining to water.
- We will call you to remind you about the time, date and location of interview.
- We will digitally record the focus group interviews, and later listen to the recordings to better understand what the focus group's environmental values are pertaining to water and the environment. Recording will not be shared with anyone other than Clarita Lefthand and Elaine Faustman.
- Quotes from focus group may be used in publications; however, your name, tribal identify or affiliation will not be used.
- Compensate you for your valuable time. You will receive \$40 in cash at the end of focus group interviews.

Risk, stress, or discomfort

None of your responses are connected to your name. Your identity is kept separate and we will make sure that everything you share with us is kept private.

Benefits of the Study

Although you may not experience personal benefits from this study, it will give you a chance to talk about your perspectives on water quality and about your values pertaining to water. This information will be used to inform water quality standards that are more reflective of tribal environmental values.

Other information

We have taken several steps to protect against the risks described above. Remember that you are free not to answer any question, and your participation is completely voluntary. You can stop participating at any time. We will make every effort to keep this research confidential. That means that we will not release your identity in any publications or reports about this research. We will create summaries of all the information you and others provide for general release. We have taken the following steps to protect your identity as a research participant:

- Your contact information will be destroyed in our files 12 months after focus group interviews have ceased. For this study your contact information will consist of a contact phone number and your name. You can refuse contact after the first interview if you wish.
- The digitally recorded interviews, your contact information and all documents with your contact information will be kept in a password-protected file. Only Clarita Lefthand and Elaine Faustman will have access to these files.
- All research team members have signed a confidentiality statement, agreeing never to release identities for research participants.

Taking part in this study is completely voluntary. You can refuse to take part or withdraw at any time. There will be no penalty to you if you decided to do so.

If you would like to see a copy of the final report once the study is finished, you can contact ___[Name, email or phone number_____.

Participant’s statement

This study has been explained to me. I have had a chance to ask questions. I volunteer to take part in this research. If I have questions later about the research, I can ask one of the researchers listed above by email or by phone. Additionally, if I have questions about the research and my rights as a participant, I may contact the UW Nation’s Tribal Council with the following information:

UW Nation
[add address]

I will receive a copy of this information statement.

Print Name _____

Signature _____

Date _____

Please identify a person to contact in the event of an injury.

Name _____

Phone number: _____

Other contact: _____

Methods

Study design, sampling, data gathering, data analysis, and plans for reporting the study results

Focus groups will consist of 5-8 consenting members of each of the nations who agree to participate in this study. This size is considered to be a smaller & manageable group sizes by Krueger, a professor who teaches extensively on focus groups. The focus groups will be held in a conference room in collaboration with our contacts from the UW Nation. These community centers will be reserved as soon as interview dates are confirmed. Focus group interviews will be digitally recorded using an electronic recorder. All recordings will be copied over to a password-protected external hard-drive. The external hard-drive will be kept in a locked drawer. Only the PI and Co-PI will have the password to this information. All identifying information will be removed from the saved transcripts to protect the anonymity of the participants. All electronic transcripts will be deleted (i.e., destroyed) after a 4-year period by June 2016 or less. The results of this research will be turned into publishable work, so the researchers will destroy the transcripts after each publication has been successfully published or within 4 years or by June 2016.

The reasons for conducting focus group interviews are to better understand community members' perceptions of water and tribal cultural values as they pertain to water. Focus group interviews will be used because of their ability to reach numerous participants, capture the collective and to compose a comfortable space where group members may feel more comfortable to share their experiences. Additionally, because it is less command and control it will synchronize better with the mode of communication (i.e., storytelling) within Native American communities. Cultural storytelling is a preferred communication method often used within Native communities.

A moderate degree of structure during the focus groups will be necessary for carrying out the goals of this work and to make the analysis smoother. The moderator will be provided with an interview questionnaire and guide consisting of questions and an approximate time to spend on each question. Discussants will be informed prior to the focus group interviews with a list of topics as to provide them with time to think about how they want to express their own views.

Focus groups interviews have also been recognized as a way to “give voice” to marginalized groups. Morgan et al. states that “Focus group interviews, when conducted in a nonthreatening and permissive environment, are especially useful when working with categories of peoples who have historically had limited power and influence”. In this same light, Indigenous research methodologies encourages researchers who work with Tribal nations and their community members to acknowledge the historical injustices encountered within these communities, and to apply methodologies that are respectful, empowering, and non-exploitative.

Focus Group Interview Protocol, Questions and Guide

Each interview will begin with an introduction that aims to introduce the moderators; discuss the purpose, length and structure of the interviews; address confidential protocols, and answer any questions or concerns. Clarita Lefthand-Begay will document each

conversation. All participants will be asked to speak retrospectively and prospectively about their experiences, knowledge, attitudes, and beliefs pertaining to cultural environmental values and their perceptions about water quality.

Data Collection During and Immediately After Focus Groups

We will be analyzing data at the group and individual level by examining data for emerging themes and enumerating the level of consent and dissent. By documenting the verbal and nonverbal levels of consensus and dissent we can quantitatively capture the proportion of participants who agree or disagree on topics discussed for each focus group question. These data can then be further analyzed for similarities and dissimilarities across focus groups.

It is important to understand what values and ideas individuals and groups more frequently support within each focus group. During focus group interviews, the assistant moderator will be responsible for filing in this data as much as possible while the moderator will be facilitating the focus group sessions. Additionally, taken together, these methods of analysis will allow our team to better determine the level of saturation reached for each question asked of all case studies.

Post-focus group debriefing

As suggested by Krueger, our focus group team will consist of a moderator (Clarita Lefthand-Begay) and an assistant moderator. The moderator will facilitate the discussion, take notes, ask group questions from an interview guide and encourage everyone to participate. The assistant moderators responsibilities are to make sure participants sign-in, record the sessions, take notes, create a comfortable environment, participant in the debriefing session and take care of late comers. The roles of each moderator assistant are included in this guide.

Data Analysis

The analysis process will begin during the data collection phase.

Transcripts and field notes

Digital recordings will be transcribed shortly after each group interview.

Data Managing and Data Analysis

To manage, analyze and interpret our data we will use a combination of three rather common techniques all known as: Krueger's long-table method, Framework analysis and a framework to show consensus or lack thereof. Krueger and Casey suggest a long-table approach.

To start we will begin with a process of familiarization. This requires that we read transcripts, read field notes and listen to recordings, and write down any initial ideas about emerging themes and key ideas.

Next two copies of line numbered transcripts will be printed, and different colored paper will be used for each focus group—in this study at least 1 color per tribal nation. Then a long table or wall, is sectioned off into “pages” where one of the focus group questions can be written at the top (thereby forming the first category), and below the titles quotes from transcripts can be cut and pasted.

The method of constant comparison and Ritchie & Spencer's framework analysis contain similar steps. The data are sorted as a means to identify a thematic framework by extracting key themes and sorting into distinctive categories. These categories will be created under each question inserted into the long-table described above to either create stand-alone categories or sub-categories. From this point we will follow Ritchie & Spencer's "Charting" step that requires rearranging quotes under the themes and categories in which they best fit.

Our group will use Coding Analysis Toolkit (CAT) software to analysis transcript data. Currently it is an open source, free web-based software. This presents the advantages of affordability and accessibility. The disadvantage is that it might not be as well developed as other competing software (i.e., Atlas.ti and NVivo).

Focus Group interview first phone contact protocol

Version 1/18/12

I am Ph.D. student in the Department of Environmental and Occupational Health Sciences in the School of Public Health at the University of Washington. I am conducting a research study entitled, "A values-based approach to identifying opportunities and barriers between Tribal community values and water quality standards in the Southwest and the Pacific Northwest". I am conducting focus group interviews with 5-8 members of the X Nation in order to understand the water values important to community members and to understand how tribal community members perceive water.

We would like to ask for your help. Since Tribal cultural values are specific to each Tribal nation and community, it is important that you define these values. In fact, you and this community are the only ones with this specific indigenous knowledge. We understand that some knowledge must be respected because of its sacredness, and cannot be shared. We are not asking that you compromise any sacred knowledge. We ask that you share knowledge about environmental values that you and your community know can be shared within the public domain.

I am recruiting individuals to be interviewed along with groups of up to 8 Tribal community members. Our conversations will be digitally recorded and transcribed. The interview will take approximately 1-2 hours.

Are you available to participate in a focus group interview on January 25, 2013 from 1-3 pm? It will be held at the Fort Defiance Chapter House and at the end of the interview we will give you a \$40 cash gift for your participation.

Great, is this phone number the best number I can contact you next week to remind you about this focus group on Friday, January 25, 2013? Can you be there at 12:45 pm to get refreshments and find a seat?

Thank you!

Your participation in this study is voluntary. If you have any questions concerning the research study, please call me at 206-856-7658 or send me an email at Clarita@uw.edu.

WHY IS THIS STUDY IMPORTANT?

This study is valuable and important to the field of Environmental Public Health, to Tribal communities, Tribal nations and the Environmental Protection Agency (EPA) for the following reason. One of our goals is to support Tribal sovereignty by identifying ways Tribal cultural values can be incorporated into the development of water quality standards. To our knowledge most tribal nations who are in a position to create water quality standards use EPA's science-based standards. While this is unavoidable, we wonder if it is possible to begin incorporating cultural values into this process.

EXTRA:

I am recruiting individuals to be interviewed along with groups of up to 8 Tribal community members. Our conversations will be digitally recorded and transcribed. The interview will take approximately 1-2 hours and may be followed up by an e-mail or phone call up to 12 months after the end of the focus group interviews. Reasons we may contact you include: request for clarification of comments from focus group interviews, or to send you a report on the outcome of this project. You are free to cease e-mail correspondence at any time by indicating in the e-mail message that you would like to do so, or by stating this on the phone.

Digital recordings will be stored in password protected files and computers. Only Clarita Lefthand and Elaine Faustman will have access to this password, and thus to these files. Transcribed interviews will not contain your name. In public lectures and in publications you and your Tribal affiliation will be anonymized.

The information you choose to share in the focus group interviews may be incorporated into value-based water quality standards. If successful such standards will be more reflective of the values Native communities define as most important. This information will be provided to the Natural Resource Department of your Nation and to the Tribal Council or Chairperson; however, none of these documents will contain your name or contact information. Additionally, please understand that this study is part of my Ph.D. dissertation work and will result in a published journal article and a published dissertation.

Your participation in this study is voluntary. If you have any questions concerning the research study, please call me at 206-856-7658 or send me an email at Clarita@uw.edu.

Thank you very much.

Clarita Lefthand
Ph.D. Student at the University of Washington
Department of Environmental and Occupational Health Sciences
University of Washington
4225 Roosevelt Way NE, #100
Seattle, WA 98105-6099

Elaine Faustman
Institute for Risk Analysis and Risk Communication (IRARC)
Department of Environmental and Occupational Health Sciences

University of Washington
4225 Roosevelt Way NE, #100
Seattle, WA 98105-6099

Focus Group Contact Letters

Version 1/1/2014

Focus Group: Tribal Nation

Date of Call: [Insert date here]

General Response:

Notes:

Hello. My name is [Add name here]. I'm a Ph.D. student at the [Add University or Institute name here]. I'm calling to remind you about our focus group interview involving indigenous health on [Add date and times] at the [Add location here]. The focus group interview will run between 1-2 hours and include up to 10 other individuals. We are asking all participants to arrive at least 15 minutes early so you can grab refreshments, and sign in before we start.

We are excited to have your participation in this important work and want to make sure that you can attend, answer any questions that you might have right now and make sure that you have directions.

Do you need a map to the location?

Remember that your participation is very important to our study—you are the expert, which is why we are coming to you. We hope that your contribution will be used to help inform work on future [Add research topic] and help strengthen tribal communities.

Again, I appreciate your time and your generosity. We'll see you on [Add date, time and location].

Thank you.

University Institutional Review Board Letter

Place copy of IRB letter here

Memorandum of Understanding

MEMORANDUM OF UNDERSTANDING³⁹

Name of University of Institution

Name of Department

Name of research study

Researchers:
Name

Email:
name@uw.edu

Phone:
206-000-0000

RESEARCH AGREEMENT

The named researchers agree to conduct the named research project with the following understandings:

The purpose of this research project, as discussed with and understood in the focus group community.

In less than 60 words explain the purpose of this study

1. Discuss the scope of this research project. What is the aim of this work? What events or activities are to be involved, and the degree of participation by community residents?

In <200 words describe the scope of this work.

2. The methods to be used as agreed by the researchers and the community, are:

In 200-250 words explain the types of methods that will be used in this work (e.g., focus group interviews, time, how many participants), content analysis, etc.

3. Information collected is to be stored, distributed and shared in these agreed ways:

Storage of Information:

- **Recorded interviews will be immediately transferred onto a password-protected external hard-drive.**

³⁹ Sample agreement provided by the Centre for Indigenous Peoples' Nutrition and Environment

- External hard-drive will be kept in a locked drawer. (List who will have access to this information)
- Transcripts of recorded interviews will have all identifying information removed from the saved transcripts to protect the anonymity of the participants.
- All electronic transcripts will be deleted (i.e., destroyed) by Month/Year.
- Names and phones numbers of interviewees will be kept in a password protected external hard-drive, kept in a locked drawer and destroyed by Month/Year.

Distribution of Information:

- As stated in the consent form, the final report will also be sent to focus group participants who request a copy from Moderator at name@uw.edu or by calling 206-000-0000.
- The information resultant of all interviews will lead to a Ph.D. dissertation for Moderator and may also be published in peer-reviewed journal articles.
- Written results of the study will be published, however participant's names and the names of specific Tribal nations will be kept confidential outside of the research group and among the University of Washington's Human Subjects Division.

Sharing of Information:

- The researchers shall provide copies of research findings to persons listed in APPENDIX B of this agreement.
- The researchers shall maintain all information and make such information and data available to persons listed in APPENDIX B of this agreement upon request for inspection and review at any time.

4. Informed consent of individual participants is to be obtained in these agreed ways:

At the time of recruitment the interviewer will send an electronic or hard copy of a consent forms to the respondent. Also the interviewer will read aloud the consent form at the beginning of the focus group session or in-depth interview. A copy of the signed consent form will be given to the respondent. Each researcher can be contacted at any time, should the respondent need any additional information or clarification.

5. The names of participants and of the community are to be protected in these agreed ways:

As mentioned on the consent form, the interviews are confidential. In no instance will the name of a respondent be attached to a record. Before distribution of the final report, or any publication, persons listed in APPENDIX B of this agreement will be consulted once again as to whether they agree to share this data in that particular way.

6. Project progress will be communicated to the community in these agreed ways:

If the UW Nation request a progress report, Clarita Lefthand will draft a 1-3 page update explaining the current state of the project and estimated time to completion.

UW nation please state here if you would like a progress report to be sent. YES/ NO/Other, explain

7. Communication with the media and other parties (including funding agencies) outside the named

researchers and the community will be handled in these agreed ways:

The researchers do not anticipate media communication for this project. However, the researchers have signed a Confidentiality Statement that ensures the privacy of each participant and Tribal nation. When reporting to funding agencies such as the Environmental Protection Agency or the National Science Foundation the researchers will not disclose the names of participants or Tribal nations.

FUNDING, BENEFITS AND COMMITMENTS

Funding

The main researchers have received funding and other forms of support for this research project from:

The Environmental Protection Agency Star Graduate Fellowship and the National Science Foundation is funding this research.

The funding agency has imposed the following criteria, disclosures, limitations, and reporting responsibilities on the main researchers.

Clarita Lefthand is obligated to send an electronic copy of her dissertation as well as a short summary report of all work funded by the EPA Star Graduate Fellowship.

Benefits

The main researchers wish to use this research project for their benefit in the following ways (for instance, by publishing the report and articles about it):

- **Clarita Lefthand will obtain a Ph.D.**
- **Clarita Lefthand will submit a final report to the EPA in 2012/13.**
- **Scientific presentations at conferences will be made.**
- **The researchers will publish the results of the interviews in peer-reviewed journal articles.**
- **Community members prior to publication may review the final report and will be asked to send comments or corrections to researchers within 60 days.**
- **Scientific presentations will be made and articles published after discussion with the respective community leaders.**

The benefits likely to be gained by the community through this research project are:

- **In the process of incorporating tribal cultural values into water quality standards we will take a small leap forward in informing policies that are more reflective of tribal nations and that honor self-governance, tribal sovereignty and/ or self-determination.**
- **Subsequent to this study there will be a greater understanding for why tribal nations are not applying for Treatment in the same manner as State, and we can begin to develop strategies to address the limitations tribal nations face.**
- **The focus group interviews will provide us stronger insights for Native American cultural values that are important to water. Although several publications have been distributed about Native American values there are very few specific to water. In a time when many tribal nations are forecasting future challenges in water quality, accessibility and quantity, and are exercising self-**

governance more forcibly, it is important to conduct research that will be more pertinent to these communities.

- **The authors of this work intend to promote the use of Indigenous research methodologies while conducting this work. By following and publishing about these methodologies, we will be communicating the necessity of these methods in lieu of historically inhumane and disrespectful approaches of conducting research within Indigenous communities.**

Commitments

The UW Nation 's commitment to the researchers includes:

- **By signing this agreement the Researchers and the UW Nation agree to publish (at minimum) the following products within 1 year:**
 - **Clarita Lefthand's Ph.D. dissertation**
- **By signing this agreement the Researchers and this TRIBAL NATION agree to publish (at minimum) the following products within 2 years:**
 - **1 published manuscript on LIST THE RUNNING TITLE OF PAPER OR THE MAIN THEME OF PAPER.**
 - **1 published manuscript on LIST THE RUNNING TITLE OF PAPER OR THE MAIN THEME OF PAPER.**

The researchers' main commitment to the community is to:

- **Inform this TRIBAL NATION about the progress of the project in a clear, specific, and timely manner.**
- **Seek consultation and feedback from Tribal Council, or signatory of this agreement when appropriate.**
- **Present findings of results to the Tribal Council, and/or signatory of this agreement.**
- **Protect the privacy of participants, and this TRIBAL NATION.**
- **Enter Tribal community in a respectfully manner.**

The researchers agree to interrupt the research project with the UW Nation in the following circumstances:

- **If community leaders from the UW Nation decide to withdraw their participation.**
- **If the researchers believe that the project will no-longer benefit the community.**

Signed by:

Name of Researcher

Signature of Researcher

Signature of Tribal Contact Person

APPENDIX A
LIST OF MATERIALS FOR TRIBAL NATION

At the end the study titled [INSERT TITLE], the TRIBAL NATION will receive the following materials:

- A final report of the research findings
- An electronic copy of a PowerPoint presentation summarizing research findings.
- Both published manuscripts listed under “Commitments” above.

APPENDIX B
CONTACT INFORMATION FOR THE UW NATION MAILINGS

All materials specified in APPEDIX A shall be sent to:

Primary Contact

Name(s) of Tribal Council Member(s) responsible for receiving this information:

Mailing Address:

Fax:

Phone Number:

Email.

Secondary Contact

Name(s) of Tribal Council Member(s) responsible for receiving this information:

Mailing Address:

Fax:

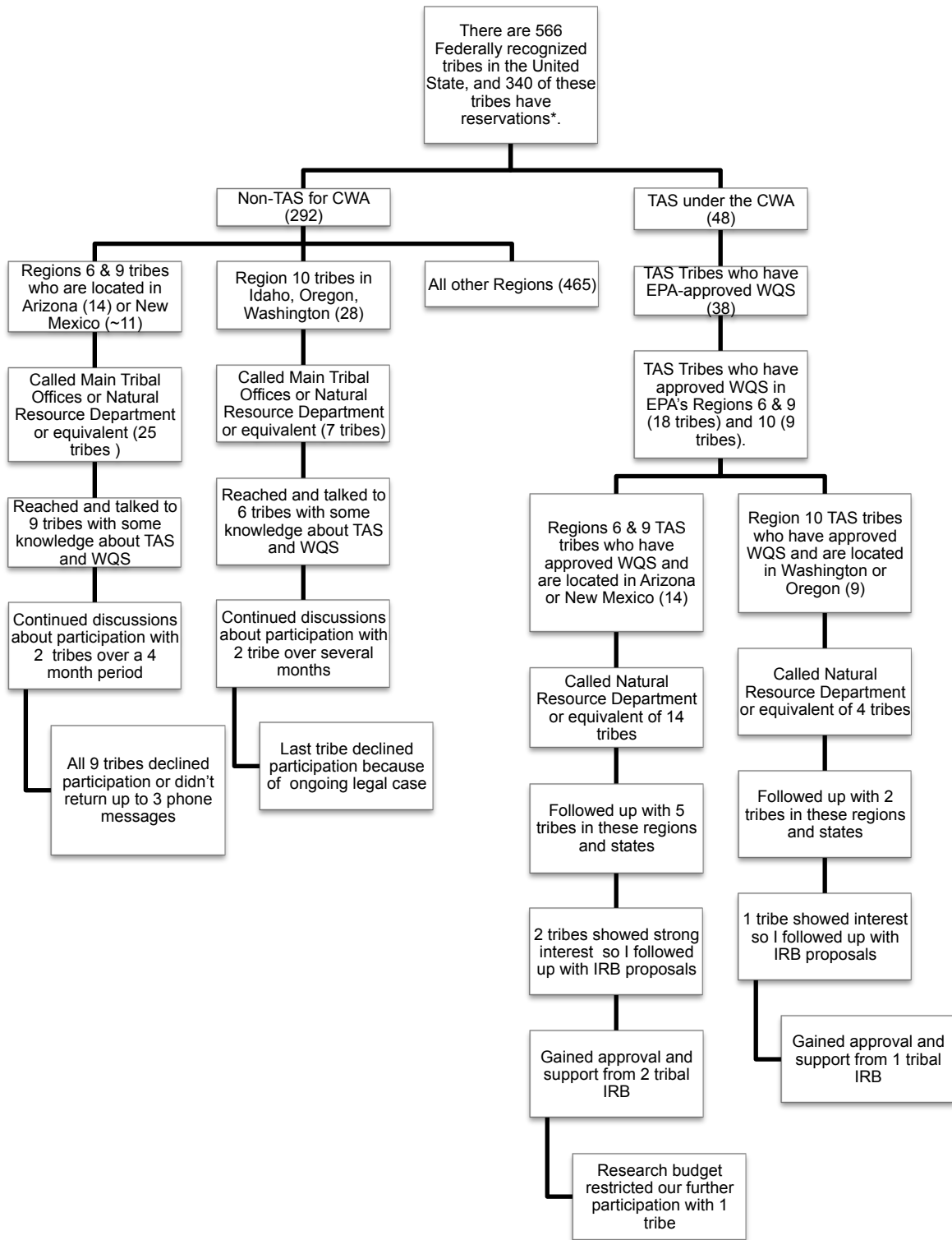
Phone Number:

Email:

Appendix with clarifications on 7 points.

Clarification 1. Below is a diagram showing how many tribes were eligible, what the selection process was, and how the study participants were sampled.

Please refer to Clarification 2 for a description of this flow chart.



Clarification 2. A description of our sampling frame and the recruitment of participants.

See the flow diagram on page 2: During my proposal writing stage, I proposed to recruit 4 tribes from the Pacific Northwest (PNW) and the Southwest (SW): 2 with TAS and 2 without TAS. Initial recruitment consisted of calling a list of TAS and non-TAS tribes in Washington, Oregon, Arizona and New Mexico. These states were picked because of my location in Seattle, WA and because of the water issues that I am familiar with in the arid lands of Arizona and New Mexico.

This figure shows the number of federally recognized tribes in the United States to be 566, of which, 340 of them have reservations. 48 tribes have TAS under the Clean Water Act (CWA) while 292 of the eligible tribes do not have TAS for the CWA. Note that only tribal communities with federal trust land are currently allowed to seek TAS. This requirement immediately eliminates all but one Alaskan Native community. More detail is given in Clarification 3b.

EPA's Regions 6 & 9 are located in the SW and include Arizona and New Mexico. In Arizona there were 14 tribes with reservations who did not have TAS for the CWA, and 11 tribes in New Mexico without TAS for the CWA. Of these tribes, we called 25 tribes and we reached a staff member from 9 tribes who had knowledge about TAS and water quality issues on their respective lands. In the SW, I continued recruiting 2 tribes and made in person visits. Over time communication became difficult so I stopped leaving messages after about 2 months.

EPA's Region 10 tribes are located in the PNW and include the states of Alaska, Idaho, Oregon and Washington. Within these states there are 28 tribes with

reservations that do not have TAS for the CWA. In 2012 I called 7 of these tribes from a list of tribes that I listed from EPA's website. I was immediately able to talk with staff members of 6 tribes who had some knowledge about TAS and water quality standards (WQS). Of these 6 tribes, I continued talking with 2 tribes over several months. One of the 2 tribes showed interest, so I made 2 person-to-person visits. After talking to a tribal council member, it was clear that this tribe was not able to participate because of a legal case pertaining to a water issue.

Clarification 4a. A description about how I was able to get participants from tribes with TAS but not tribes without TAS.

Of all federally recognized tribes, 48 have TAS under the CWA and 38 have WQS that are approved by the EPA. In this work we focused on SW tribes in Regions 6, 9 and PNW tribes in Region 10. Regions 6 & 9 include 14 tribes in Arizona and New Mexico. In this work, we called all 14 of these tribes in Arizona and New Mexico during our initial recruiting stage. We then followed up with 5 tribes who showed some level of interest. After 5 months, 2 tribes continued to show strong interest, so we moved forward to talk to Tribal Council members, and other key decision makers within the respective tribe. Over a 12-month period I sought approval from these two tribes' IRB committees and tribal councils. This process was extensive and required a lot of person-to-person meetings and approvals from multiple agencies. After 12 months, I received approval from both SW tribes with TAS and EPA approved WQS to carry out this project. However, because of research budget limitations, I was not able to continue with the proposed research with one SW group.

In Region 10, there were 9 tribes with TAS and EPA approved WQS. In our recruitment, we included tribes located in Washington and Oregon. Of these 9 tribes we called 4 tribes and didn't go further because it appeared that of the 4 tribes, we would have interest in this study from at least 1 tribe. After 5 months, we continued to recruit 2 tribes, and 1 tribe showed interest so we followed up with letters of support and presentations to their Tribal Council and other decision makers. After 7 months, we received approval from the tribal council, the tribes'

internal General Manager and the community center to conduct this study.

After approximately 12 months of recruiting tribal nations and their community members, we received approval from two tribes with TAS. No tribes from the SW, who did not have TAS, were interested in participating in this project. Reasons for this are not entirely clear, but in one case, a tribe's water manager stated that they were not interested in a value-based approach to thinking about water concerns and thought that it would be hard to recruit participants for in-depth interviews, so our conversations ended. In another case, the Tribe's water manager was recently retired and there was no other person with knowledge of TAS or EPA's water policies. In other examples, we left messages and followed up but contact was not made.

In the SW, tribes with TAS had environmental or water management offices that could be called, and when we made contact to introduce this study, managers were interested in describing their experiences with TAS. As stated above, I identified two SW tribes that showed the strongest interest and sent them both IRB proposals and made contact with their internal IRB boards, councils and committees. To get approval to do this work, I had to attend numerous community meetings, present this work to the community and councils, and submit numerous official documents to show that I would protect the interest of the tribes and not disclose any sensitive information. These documents are in the Appendix of this dissertation. The tribal IRBs were by far the most demanding part of carrying out this study, but I was happy to follow and support the protocols of each sovereign

government. And I appreciate the time that each tribal member contributed to this dissertation.

In the Pacific Northwest, of the tribes without TAS, I narrowed my focus to the recruitment of one tribe that showed strong interest, but over 3-4 months it was unclear who I would discuss the project with in-depth. For each community I had worked with this far, it was clear that having a community members who was strongly interested and willing to support the research project was important for the success of the work. In this community, I spent time trying to identify this person by talking to tribal council members, employees at the Natural Resource Department and the community. I was finally able to identify a Council member who took interest, but the tribe had decided to stop all research projects in their community out of fear of jeopardizing a court case. At that point, I ended my recruitment of this tribe.

When I begin recruiting TAS tribes in Washington for this study, 2 of the natural resource departments were inundated by concerns surrounding the proposed changes to increase fish consumption standards in Washington State. So not surprisingly, when I attempted to recruit these tribes, they were less concerned about my proposed project, and more concerned with gearing up for what many felt was going to be a battle with Washington industries. From my conversations with 2 other tribes, there was initial interest, but the scope of the project needed further explanation before proceeding forward. To recruit 1 PNW tribe, I followed up with a number of departments, leaders and even volunteered for their community in order to become better acquainted with more people who might be interested in

this study. This was necessary to get initial support in order to submit a proposal. After gaining enough support, I felt comfortable submitting a proposal and asking for permission from their tribal council to carry out this study.

Clarification 4b. The number of non-TAS tribes I contacted?

I initially contacted 32 non-TAS tribes. See Flow Chart under Clarification 1.

Clarification 4c. Explanation about how someone might contact or survey non-TAS tribes to survey their views?

As explained above one would have to follow the steps listed in the flow chart in Clarification 1. Broadly the steps include identifying non-TAS tribes within the state of interest, then recruiting each of them by first explaining the research objectives and proposed research approach. A person can start by researching the phone numbers of the non-TAS tribes. One can do this by researching tribes who have TAS (Goto EPA's website) and then generating a list of all tribes with reservations (Goto Wikipedia or search on Google). The person can then call each tribe to identify a person who has knowledge about the TAS procedures and invite them to participate in a survey. For tribes who agree to participate, the person would have to determine if internal or external tribal IRB's are required for the survey they wish to conduct.

Clarification 3a . A brief description about the “big picture” (e.g., Why is TAS status so important to tribes, and “so what” if a tribe attains this designation from EPA or not?)

In the 1970s and early 1980s the relationship between tribal communities and the EPA had not been clearly established, so there was a gap in how environmental regulations applied to tribal communities. In 1984, in response to a congressional mandate, the EPA established nine Indian Principles. In these principles EPA reinforced their pledge to work with tribal nations from a government-to-government foundation, and in that process it would encourage and assist tribal nations in creating environmental standards that are equal to or more stringent than EPA’s standards; support tribal nation’s participation in decision-making and managing; and remove legal and procedural impediments (USEPA 2009).

Beginning in 1987, under section 518(e) of the CWA, all federally recognized tribal nations became eligible for a classification initially known as “Treatment in the same manner as a state” (TAS) (USEPA 1990, 2008). Section 518 described the relationship between tribal nations and states, and defined the role of tribal nations in resource management. In essence it acknowledged a delegation of federal authority to tribes to take control of their water resources. This is a clear recognition by the EPA of a tribe’s inherent authority to exercise sovereignty to protect the health and welfare of their citizens. Under EPA only tribes that attain TAS approval from the EPA can set WQS within their tribal jurisdiction.

Over the years, TAS has presented a way for tribes to exert tribal sovereignty when it comes to the environmental protection and health of their communities. Tribes

who have been approved for TAS under the CWA have the authority to set WQS, which are needed for enforceable pollution control measures. In 1987 the Pueblo of Isleta was the first tribe to be approved for TAS under the CWA. With TAS status the Pueblo of Isleta set new arsenic water standards that were more stringent than the adjacent state of New Mexico. The City of Albuquerque is located upstream from the Pueblo of Isleta along the Rio Grande River and was required to meet the Pueblos' new standard. This led to a case known as *Albuquerque vs Browner* wherein the City of Albuquerque sued the EPA and Administrator Browner for approving the Pueblo's WQS. The courts determined that tribes with TAS standing have the authority to set WQS that are more stringent than the status quo (Dussias 1999; Mojtabai 1995; USEPA 1990). This case set precedence for all tribal nations with TAS status, and supports the decisions of tribes who create WQS for their reservation.

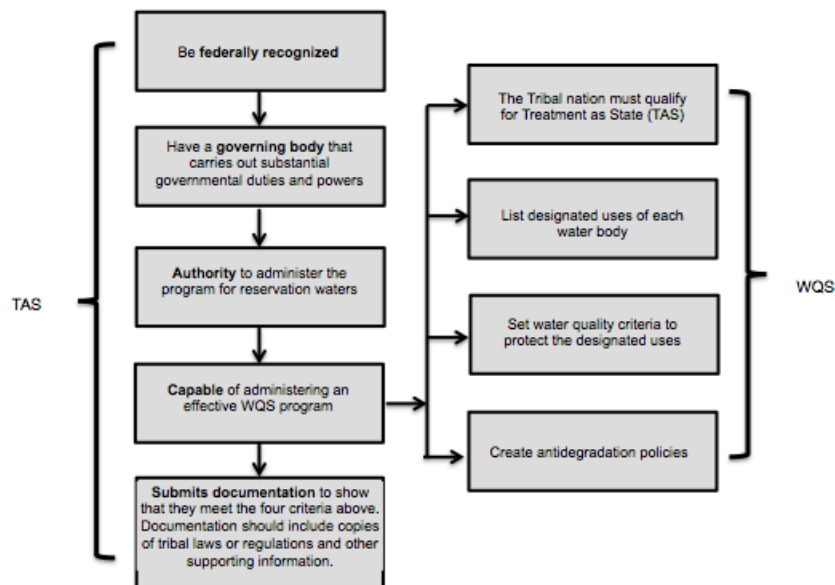
TAS is an important procedure for tribes who are interested in developing WQS to protect their citizens. In this study, we allocate our attention to TAS because without it, natural resource managers cannot create WQS to meet the needs of their communities or begin to incorporate their values into decisions pertaining to water management. TAS is an important procedure for tribes who are interested in developing WQS to protect their citizens. In this study, we allocate our attention to TAS because without it, natural resource managers cannot create WQS to meet the needs of their communities or begin to incorporate their values into decisions pertaining to water management. Without TAS and WQS, EPA is the responsible authority to protect federal trust lands. EPA recognized they do not have the staffing, local expertise and ability to address Native lands by themselves. Furthermore without a procedure for tribes to ultimately develop

WQS for trust lands, EPA is left with using adjacent States' WQS to review and issue permits (i.e. NPDES). An example is the current Washington State fish consumption rates, where Washington State WQS do not adequately address the public health and welfare protection of local Native or other minority communities or address their traditions or values.

Clarification 3b. Description about why some tribes are not eligible (e.g. Alaska) and other tribes can't get TAS because they are too fragmented or don't have a large enough reservation.

This figure is a slide from my doctoral defense.

The steps to applying for Treatment in the Same Manner as State (TAS) and developing water quality standards (WQS).



- There are presently 566 federally recognized tribal nations and 340 reservations. Of the tribes with a reservation:
- 48 have obtained TAS for the WQS program (14%).
 - Among those who have gained TAS, 38 of these same Tribal nations have approved water quality standards (11%).

Sources: Lewis, J. 1986, USEPA. 1984, USEPA. 2001.

Section 518(e) of the CWA states the criteria tribes must meet in order to be eligible for TAS. To gain approval for TAS under the CWA, tribes must show that they (See also presentation slide above for flow chart):

- are federally recognized by the Secretary of the U.S. Department of the Interior;
- have a governing body carrying out substantial governmental duties and powers over a reservation;
- are proposing to carry out WQS functions that pertain to the management and protection of water resources within a reservation and has authority to regulate water quality; and
- are reasonably expected to be capable of carrying out the functions of an effective WQS program.

There are 566 federally recognized tribes in the United State, and 340 of these tribes have reservations. At present, if a tribe cannot provide these documents, they do not qualify for TAS.

Some indigenous groups in the U.S. are not federally recognized by the Department of Interior. For example, in Alaska land claims are recognized by the Alaska Native Claims Settlement Act passed by Congress in 1971. This Act awarded 44 million acres (or 10% of the state of Alaska) to Alaskan Natives, and monetary compensation for indigenous land claims. Further, instead of allocating reservations, corporations were created. There are 229 tribes in Alaska, but the Annette Island Reserve is the only reservation; therefore the majority of tribes do

not qualify for EPA's TAS. All other Federally recognized tribes who meet the requirements of Section 518(e) may qualify for EPA's TAS.

Some tribes have checkerboarded reservations, where there is a mix of federal trust lands and fee simple lands held by non-tribal members, but within the federally recognized reservation boundaries. Tribes who have a large number of checkerboard lands may have a greater challenge showing that they have the authority to regulate water quality on lands owned by non-tribal members. This doesn't make a tribe ineligible for TAS; however, a tribe must decide if the time and cost of showing their authority is in their best interest.

Clarification 5a. A summary about my current and future plans.

In the upcoming months I will honor the agreements (IRB and MOU) I signed with each community who participated in this study. As I have wrapped up the data analysis of this research, I have contacted key informants from each community to provide them with a draft copy of Chapters 3 and 4 of this work and to request their feedback. Upon receiving feedback I will incorporate them into the dissertation and final report to each tribe. In addition, I have offered to present the results of this work to both communities. During the fall of 2013, at a research event hosted by the SW community, I presented our preliminary findings in a 20 min presentation. I have not presented this work to the PNW community, but the offer has been extended to two key contacts, and I will continue to reach out to them over the summer.

In addition to previous contact, during the summer of 2014, electronic copies of my final dissertation, a short summary of the results from Chapters 3 and 4, and

copies of my doctoral defense presentation will be sent to in-depth and focus group participants. During my last meeting with each community, I will continue to work with them to consider how to apply the objectives and performance measures in a way that is useful to the community. Such future work is contingent on funding since the funds for this work ended in the beginning of 2013.

Clarification 5b. A brief explanation about how I could validate my selections of the fundamental and means objectives from each focus group.

This can be done with continued partnership with each community who participated in this work in order to valid each objective. During our initial focus group interviews, a moderator assistant wrote the concerns stated by each participant on an easel pad that was visible to everyone. In a workshop type of setting, these notes can be re-introduced to the community along with a description about the structured decision making methodology that describes how to transform a concern to an objective.

Thus far, I have presented the objectives to the SW communities' natural resource manager. Her response showed enthusiasm for developing the objectives hierarchy into an education and outreach tool. The exact details of this have not been defined, but I imagine that this will be carried out in partnership with this manger, and community members and has the capacity for materializing local policy. This will be an important step to ensuring that the objectives are accurate and meet the water security goals of each community.

Here are a few examples where other investigators have used SDM in cases where culture was important to decision making and environmental management.

A study by Failing et al. examined alternative approaches for the water allocation of several major hydroelectric sites in Canada (Failing et al. 2007). SDM was used to incorporate both scientific data and local and traditional values into the decision process. The authors illustrate the use of a value-tree to connect objectives with performance measures. In this example they showed “hard-to-quantify” objectives such as a First Nation’s concern to protect a heritage sites. In addition, “First Nations participants were instrumental in linking fish and wildlife into a more fundamental “ecological health” objective. They also linked ecological health and heritage protection into a broader fundamental objective of “First Nations Culture”. According to Failings, the indigenous groups “rejected the notion of placing value on heritage sites and making trade-offs about a resource of such deeply spiritual value, but agreed to use performance measures (# site days of exposure per year). Failings further explains that heritage sites was a key driver in the selection of a alternatives (Failing et al. 2007). The results of this work influenced how research funds would be allocated and what species environmental managers would consider in their research agendas. Overall this work led to environmental and social improvements and to mutual agreements between multiple stakeholders.

Other investigators have examined how to incorporate cultural values into decision making and environmental management. For instance, Satterfield et al. discussed the use of SDM in a cases study (Satterfield et al. 2013) whose goal was to develop a new flow regime for a river in Canada. The SDM process was implemented to develop an adaptive decision making framework to evaluate the release of river water from a dam in southeastern British Columbia. A number of

objectives were generated from a group of stakeholders including First Nations. An objective of the representatives of a nearby First Nation group was “their shared sense of responsibility toward the long-term protection and viability of the Bridge River.” The values identified in this work led to a number of alternative choices in river flow and illustrated how the concerns of stakeholders could be factored into the decision process (Satterfield et al. 2013).

Agencies such as the Environmental Protection Agency and the National Oceanic and Atmospheric Administration (NOAA) are shifting their environmental management and decision making focus to ecosystem-based management (NOAA 2014) and core notions of sustainability (National Research Council 2011). At the EPA, SDM has been used to identify the concerns of stakeholders in order to identify community values relevant to ecosystem services and wellbeing. For Yee et al., the aim of developing an SDM framework under EPA is to integrate stakeholder values and science, and to develop decision models that clearly present alternative choices to meeting community well-being (Yee et al. 2013).

In a British Columbia study, SDM was used to understand the values of multiple stakeholders in order to gain some direction for how to implement an ecosystem-based management (EBM) model developed by NOAA (Espinosa-Romero et al. 2011; NOAA 2014). First Nations were among the stakeholders who expressed their values. For example, notions of reconciliation and relationship strengthening, respect for aboriginal and treaty rights, participation in decision-making, and access to natural resources were objectives of First Nations participants (Espinosa-Romero et al. 2011). In addition, stakeholders defined a number of other objectives. This

process of defining objectives and performance measures by this group will lead to ways to implement management actions that are part of the EBM framework.

Each of these studies used structured decision making to systematically incorporate the concerns of stakeholders and scientific knowledge into a decision framework. The outcome of these studies included stakeholder satisfaction because of the inclusion of their needs into the decision process, water-planning agreements of mutual benefit to stakeholders, and more clear direction about how to achieve sustainability and wellbeing. In addition, with SDM in each case, alternative choices were generated based on values articulated by multiple stakeholders.

References

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- Failing L, Gregory R, Harstone M. 2007. Integrating science and local knowledge in environmental risk management: A decision-focused approach. *Ecological Economics* 64:47-60.
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- Yee S, Fulford R, Carriger J, Russell M. 2013. Structured decision making as a framework for linking quantitative decision support to community values. Available: http://cfpub.epa.gov/si/si_public_record_report.cfm?dirEntryId=265036 2014].

Clarification 5c. What could one do to include the communities in defining objectives and performance measures?

This study included the concerns of stakeholders at the beginning by holding focus group interviews. When I facilitated each focus group interview I made sure to create an environment where the participants would feel comfortable to share their experiences. For example, I provided food for participants to eat during the interviews (and to take home), I hired moderator assistants who were from the community (and in the case of the PNW were approved to attend), I was careful to check in with participants during the interview to make sure they were comfortable, and I had a moderator assistant whose only role was to support participants. In reflection, setting an environment that was comfortable was key in holding successful interviews and will be key for future community inclusion.

For my doctoral work, now that I translated the communities' concerns into objectives, we can begin a process of identifying alternative choices or solution, and wherever appropriate, measurable attributes. Community participation will be key to providing clarification and accuracy to how the objectives were translated and for the type of measurable attributes that are developed to determine the success of achieving a given objective. The initial steps that I'm taking to continue working with the community include providing a report to the IRB committees and other community members who requested copies, presenting back to the community (e.g., Powerpoint presentation or other more culturally inspired communication methods) and scheduling meetings with key informants. Presently, I have plans to meet with an environmental manager to determine how the objectives can be used as an education and outreach tool. During this same visit I will reach out to the focus group participants and hold a small community meeting to determine their

interest level in the objectives. I believe this can be an extremely engaging process; however, whether we proceed forward at the community level will be dependent on how useful the community perceives the results of this study.

6. Cleaned-up coding & definitions of the fundamental objectives in Chapter 4.

See Figures 6 and 7 of Chapter 4.

7. The strengths and limitations in the application of the Structured Decision Making Approach.

Strengths:

This value-focused approach, or structured decision making (SDM) aims to identify values during the early stages of decision analysis (Keeney 1992). Objectives, as defined by Keeney, are what we care about. Clearly SDM can be a subjective approach to defining objectives. However, this approach creates a systematic mechanism to capture various classes of objectives including cultural, spiritual, economic, and uses of environmental resources. This can be a useful tool to environmental managers who are interested in locally and nationally representing community values as guides, policies or in environmental regulations. In addition, SDM can be easily coupled with research approaches that advance respectful interactions between multiple stakeholders.

Limitations:

The limitations of this methodology include that it is a time consuming and an involved process. Though one of the strengths is that it provides a structured way to illicit stakeholder values, doing so can take a lot of initial community engagement because of the

nature of value-focused thinking. Depending on the community, problem context, and the person moderating the value elicitation process, it could be challenging to get participants to discuss their values. And doing so within 1-2 hours in a focus group setting, especially for a really complex issue, might not always be possible. Multiple stakeholder involvement at numerous levels of this process would be ideal, however, it would undoubtedly add time and demand more resources.

In this study, getting to the stage where I could begin interviewing focus group participants took several months. One reason for this was that I followed internal research review processes within both tribes. At minimum this required submitting a research proposal, application, attending several meetings, getting approval from several internal agencies and council members, and outlining the benefit that this research would have on both communities. Such internal review processes are emerging in many native communities to counteract unethical and what is called *helicopter research*. This latter statement has been applied to researchers who enter communities to gather research and leave without ever being seen again. Furthermore, unethical research practices, such as the use of DNA samples from the Havasupai community, have led to more proactive tribal nations who are now taking steps to protect their community from research that could inflict harm on their citizens (Brugge and Missaghian 2006; Garrison and Cho 2013; Harding et al. 2011; Pacheco et al. 2013).

When working with tribal communities it is important to consider the imposition of western methods. For those who question whether to incorporate western methods within a research project with tribal communities, a simple rule one can examine is 'whether using

a particular method will lead to the betterment of the community'. Also it's important to consider how a tool can harm a community.

Using SDM has the potential to give voice to indigenous thought and ways of knowing, and can be used to inform environmental management. However the implications of how data is gathered (e.g., western approaches), stored, and used for immediate and long-term use by the researcher has to include a transparent process so that tribes can make the decision to participate in the research process, and the decision about whether they want their knowledge to be applied to policies at each level of government. In general, like all other communities, tribes have adopted and incorporated tools that they deemed helpful to their communities and discarded tools that were not helpful. Deciding whether to use a western approach, or a combination of western and indigenous approaches is ultimately up to the sovereign community of interest.

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