Towards a New Conservation Model:
Indigenous Knowledge and Decision-Making to Improve Conservation Efficacy

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Abstract

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In the United States, a lack of place-based, holistic knowledge and a failure to value Indigenous and local voices in decision-making perpetuates the existence of longstanding environmental issues. Furthermore, the policy process inadequately protects natural resources due to increasing political volatility, lacking value of alternative knowledge-forming processes, and inadequate engagement with local and Indigenous communities. In contrast, Indigenous communities use a different decision-making model than western entities, which generally results in a higher rate of achieving conservation objectives in natural resource management. While there is abundant literature calling for Indigenous co-management, it's important to understand the difference and value of Indigenous decision-making. The following analysis presents multiple examples of successful Indigenous management and examines the case of aquatic species management in Western Washington, USA. The presented case study highlights that Indigenous decision-making values longstanding place-based knowledge; exercises consensus-based decision-making; and provides open and transparent communication with tribal leaders.

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Introduction

Many socio-economic and ecological problems persist for decades in our society, highlighting challenges to our collective adaptability and resilience (Marchand et al. 2020). These challenges disproportionately impact marginalized communities, including Indigenous peoples and rural communities, who are excluded from the decision-making process on conservation issues that often impact the very land they live and work on. Who is included as a stakeholder in the decision-making process impacts the design and implementation of protected areas, especially on public lands. The current approach to identifying, establishing, and managing lands for conservation objectives (both ecological and cultural) typically occurs in a top-down process that does not meaningfully include the knowledge and perspectives of local and Indigenous communities. This lack of perspectives in decision-making has subsumed protected area identification and management to politicians, where evidence-based science formed at the broader landscape scale is being used to support decisions-making.

The following thesis has shifted the narrative to explore how the process for managing natural resources and protected areas would unfold if local communities and/or Indigenous people were responsible for designing conservation assessment protocols. In contrast to the landscape scale evidence being used in decision-making at the national/federal level, local theories for how to assess land are holistic and based on long-term knowledge of the land itself. This shift refocuses knowledge of the land and the decision-making process to the local level where local theories can be refuted and used to design balanced views of the ecological and social drivers of land-use change (Reason 1990). Shifting the narrative to a local lens also results in different decisions being made when compared to decisions using framework theories that are based on common knowledge of ecological processes that were developed elsewhere. These

framework theories are not sensitive to local conditions and knowledge of the environment that would result in more robust and nuanced decision-making.

The case study included in this research documents how Indigenous communities approach the decision-making process for a specific species within a holistic context of the entire ecosystem. It's especially interesting to highlight the difference in natural resource decision-making using a holistic lens that encompasses the entire landscape compared to the western process that is linear and focuses only on the resource being considered for management. The included manuscript (submitted for publication to the *Environmental Justice* journal) explores opportunities for co-management, focusing on how the meaningful incorporation of Indigenous perspectives in decision-making works to alleviate survival resilience in Indigenous communities as well as increases justice and resilience in natural resource management. While there is abundant literature calling for Indigenous co-management, it is important to understand the difference and value of Indigenous decision-making, which this research demonstrates through the presented examples and case study.

The included manuscript presents multiple examples of successful Indigenous management and examines the case of aquatic species management in Western Washington, USA. The presented case study highlights how Indigenous decision-makers value longstanding place-based knowledge; exercise consensus-based decision-making; and provide open and transparent communication with tribal leaders. These decision-making characteristics demonstrate inclusivity of the community, which contrasts with western decision-making that is often determined by an individual, or small group of individuals, at a management agency. Making decisions that are inclusive of community concerns and perspectives expands the decision-making focus in meaningful and creative ways. Management agencies frequently

focuses on a singular aspect or species of an ecosystem (e.g., salmon), assuming that species may serve as an umbrella to other species or characteristics of the ecosystem. However, such assumptions neglect broader connectivity and species relationships in any given ecosystem. Because Indigenous communities make holistic decisions that incorporate place-based, longstanding knowledge of the local system, their decision-making is unique from most western entities.

This research identifies how local people have a very different lens on conservation and natural resource issues, which results in the inclusion of many more factors across temporal and spatial scales. This holistic approach suggests that local and Indigenous perspectives and knowledge must be meaningfully and formally incorporated into our decision-making processes to increase justice and foster equitable resilience in our society, economy, and environment. Management agencies often fail to adequately incorporate the perspectives of an impacted community in their decision-making process since the focus is instead on evidence-based science – which is typically disciplinary focused and devoid of holistic or place-based information (Marchand et al. 2020). Such an approach forms knowledge of an issue using a narrow lens that excludes many relevant and knowledgeable stakeholders impacted by the decisions. This stakeholder exclusion contributes to environmental problems re-emerging decades later, since the local and impacted communities were not part of the decision-making process. Through multiple examples of successful Indigenous management and a case of aquatic species management in Western Washington, USA, the following thesis reframes the narrative of natural resource management around the importance of meaningfully incorporating local and Indigenous communities in the decision-making process.

The Problem with Conservation & Land Management in the United States

Conservation and land management in the United States is rife with political and socio-economic controversy. The current protected area designation process is not evidence-based and unbiased, which means political and socio-economic conflicts will continue to arise; this threatens the long-term viability of the U.S.'s current protected area model. The policy process is inadequately protecting natural resources due to increasing political volatility, lacking value of alternative knowledge-forming processes, and inadequate engagement with local and Indigenous communities.

From my research on federally designated Wilderness, I learned that the designation of Wilderness acreage is declining, yet the inclusion of special provisions in Wilderness designating bills is increasing, thus threatening the standard of protection being allocated to Wilderness areas in the United States. Additionally, the process of Wilderness designation is highly politicized (Figure 1), indicating that decision-making may be more reliant on political motives than achieving conservation objectives. This research suggested that Republicans are more likely to support smaller tracts of Wilderness, while Democrats propose and support larger Wilderness areas. In combination with the finding that from 1973-2016 Republicans have introduced and co-sponsored Wilderness bills less frequently, we know that Republicans are less likely to support Democrat introduced Wilderness bills because of each party's differing approach to Wilderness designation. Given this contrast between political party co-sponsorship of bills introduced and passed, in recent decades Republicans increasingly appear to be the gatekeepers of approved Wilderness legislation, controlling which Democrat-introduced bills are passed. These trends demonstrate broader political volatility indicating that the policy process is currently failing to protect and steward natural resources. It was these findings that forced me to re-evaluate my

graduate work and consider alternative elements of natural resource management that could be used to foster a more meaningful process that benefits both people and the land.

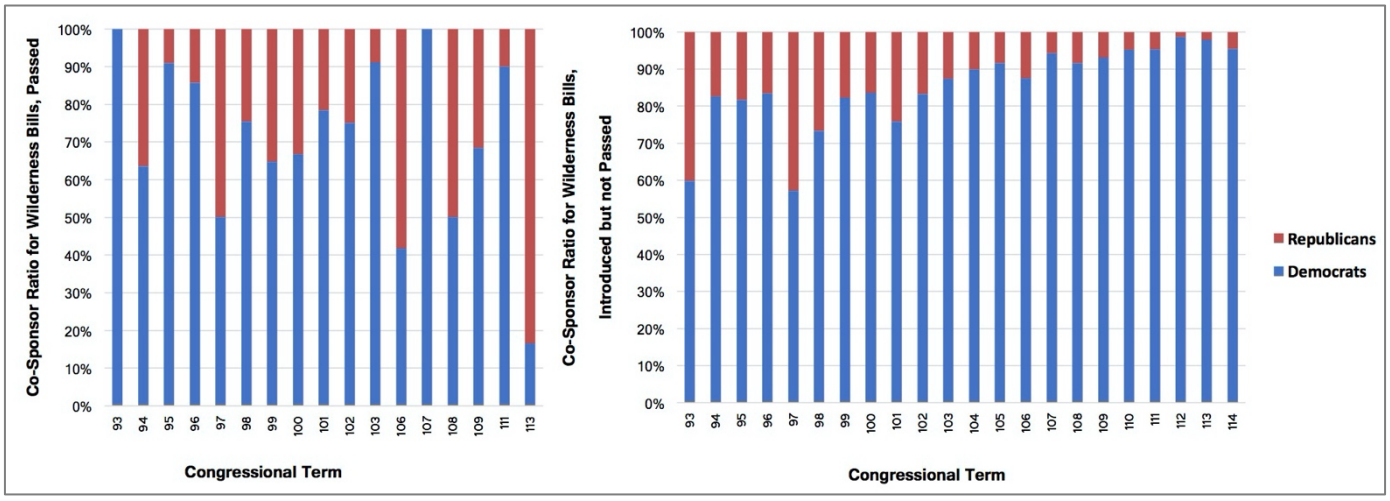

Figure 1. The figure above shows the relative proportion of Democratic co-sponsors to Republican co-sponsors of, first wilderness bills that became law by Congressional term from 1973-2016, and then Wilderness bills that were introduced but did not become law by Congressional term from 1973-2016. Of the terms with no results recorded for Wilderness bills that were passed, the 105th and 112th Congresses did not pass any Wilderness bills, and the bills enacted in the 104th, 110th, and 114th Congresses did not have cosponsor support.

As I began exploring the literature, another challenge— in addition to political volatility— emerged that needed to be part of my research, which is that evidence-based science developed by scientists in academia and management agencies provided the only scientific evidence and tools used to support environmental decision-making processes in the United States. Evidence-based science, however, may not include all the relevant stakeholders and the interconnected problems they introduce into a problem matrix. This process failure can be seen by examining the Northwest Forest Plan (NWFP), developed in the early 1990's during the Clinton Administration. The Plan called for a settlement of the conflicts between commercial logging on federal lands, rural communities dependent on revenue produced by timber cutting on public lands, and the Northern Spotted Owls endangered by the cutting of old growth trees. Development of the NWFP included over 600 scientists who put forth strategies for all forest

species and called for the use of ecosystem management on National Forest lands; ecosystem management explicitly links the natural and social systems (Vogt et al. 1997). Despite the high number of scientists and the use of a systematic management approach, the NWFP ultimately failed because it was designed to develop a solution only for federally managed public lands and did not address the landscape of diverse stakeholder communities impacted by the conflicts.

Similar to issues faced in the development and implementation of the Northwest Forest Plan, local and Indigenous perspectives continue to be excluded from the identification, establishment, and management of protected areas in the United States. However, both local communities, particularly rural communities, and Indigenous Peoples are often the ones living, working, and observing the land, and are thus often the first to notice changes in natural systems that may indicate broader disturbances. By incorporating local and Indigenous perspectives into the decision-making process, there is a greater opportunity to act on indicators of larger change. For example, Indigenous and local people are often effective at identifying early warning indicators of climate change impacts before scientists recognize that an environmental problem is looming (Reyes-García et al. 2016; Jones 2020). This proactive action provides an opportunity to address the root cause of an issue, rather than reactively addressing the symptoms of a larger challenge that was not perceived. However, this incorporation of local and Indigenous voices requires that decision-makers value alternative knowledge-forming processes. Otherwise, the incorporation of local perspectives and even co-management will be in name only, as is, unfortunately, frequently the case when the reasons for co-management are not understood.

In addition to being acutely aware of changes in the local system, Indigenous communities use a different decision-making model than western entities, which generally results in a higher rate of achieving conservation objectives in natural resource management.

This success is in part due to longstanding tribal values being rooted in environmental reciprocity that have supported resilient Indigenous communities for centuries. The social-ecological relationships that Indigenous peoples maintain allows for a sustainable valuation of ecological integrity. Additionally, tribal decision-making is holistic, considering any implications within the entirety of the local system. This holistic decision-making is demonstrated by tribal governments valuing longstanding place-based knowledge; exercising consensus-based decision-making; and providing open and transparent communication with tribal leaders.

The following paper addresses some of my thoughts on how Indigenous knowledge holistically addresses environmental problems and has already been submitted to the *Environmental Justice* journal for review. In order to satisfy the requirement for my dual master's degrees, I am taking the one paper approach; the following manuscript satisfies that requirement.

Manuscript Submitted to *Environmental Justice*:

Justice through Indigenous Management Practices:
A Case Study of Aquatic Species Management

ABSTRACT

Many socio-economic and ecological problems persist for decades in our society, highlighting challenges to our collective adaptability and resilience. These challenges disproportionately impact marginalized communities, including Indigenous peoples. Therefore, local knowledge and voices must be meaningfully and formally incorporated into our decision-making processes to increase justice and foster equitable resilience in our society, economy, and environment. This analysis explores the opportunities for co-management to both alleviate the state of survival resilience in Indigenous communities as well as increase justice and resilience in the planning and management of natural resources. While there is abundant literature calling for Indigenous co-management, it is important to understand the difference and value of Indigenous decision-making. This analysis presents multiple examples of successful Indigenous management and examines the case of aquatic species management in Western Washington, USA. The presented case study highlights that Indigenous decision-making values longstanding place-based knowledge; exercises consensus-based decision-making; and provides open and transparent communication with tribal leaders. Each of these characteristics contributes to the holistic decision-making process used by many Indigenous communities, which is unique from most western governments.

Key words: Indigenous knowledge, Indigenous management, Indigenous decision-making, natural resource management, co-management, climate planning

Introduction

Marginalized communities are often notably resilient to the historical harms that perpetuate in our society. In particular, many subsistence and Indigenous communities have long histories of fostering resilient social-ecological systems (Lee et al. 2019). However, like many marginalized communities, Indigenous peoples have been driven into a state of survival resilience, which can be defined as the pressure to continually adapt and survive in the midst of systemically unjust circumstances. Survival resilience is necessitated by community allostatic load of building socio-economic and environmental triggers, often fueled by racism, poverty, injustice, and other societal traumas (Chandra et al. 2018). Actions must be explored to address survival resilience in marginalized groups. One potential action that can work to empower local and Indigenous communities is the formalization of local engagement and the incorporation of local perspectives into planning and management, which can be achieved through co-management (Pomeroy & Berkes 1997; Carlsson & Berkes 2005). This study seeks to explore the opportunities for co-management to both alleviate the state of survival resilience in Indigenous communities as well as increase justice and resilience in the planning and management of natural resources.

Resilience is not a static state, but rather a dynamic experience in which one is changed, and in many cases, one also changes their environment. For many Indigenous communities, resilience capacity is tied to their shared language, deeply held cultural values, and deep-rooted connections to the land and resources. Kirmayer et al. (2011) explain that "Indigenous concepts provide [alternative] ways to approach a dynamic, systemic, ecological view of resilience." However, resilience is not only about adaptive ability. Reyes-García et al. (2014) found that communities are most resilient when they're able to both hold space for historic knowledge as

well as incorporate new findings and observations from their surroundings. This ability to contextualize new information into historical knowledge is seen in practice throughout many Indigenous communities. One example is how Indigenous tribes change their stories over time; while the main takeaway and morals may remain the same, the characters and setting may change. This adaptability to incorporate new information into Indigenous knowledge is also seen in Indigenous management of natural resources. Tribes have used historic knowledge to successfully restore the integrity of ecological systems that have been altered by new disturbances of natural or human forces (Wilder et al. 2016). Though many Indigenous communities have been subject to survival resilience, they also use a holistic decision-making process that, if formally incorporated through co-management, could increase the resilience of social-ecological systems.

In order to achieve a just society that fosters resilient systems, our decision-making processes must incorporate local voices and perspectives. Tribal governments are already achieving these objectives by 1) valuing longstanding place-based knowledge; 2) exercising consensus-based decision-making; and 3) providing open and transparent communication with tribal leaders. Tribal governments are structured to engage tribal members and include historical and more-than-human considerations, which in turn holds the government accountable for their actions. These factors allow tribal governments to prioritize community needs in their decision-making. Top priorities include the environment, community health, culture, and economic development (IFMAT I 1993). These longstanding values are rooted in environmental reciprocity that have supported resilient Indigenous communities for centuries. The social-ecological relationships that Indigenous peoples maintain allows for a sustainable valuation of ecological integrity. In contrast, western governments don't have widely agreed upon priorities,

and decisions are instead often highly politicized or commercialized. When there aren't established and agreed upon priorities, nothing is "off the table" in negation and decision-making, which is critical for achieving just systems that foster resilience.

Increasing justice and resilience in both socio-economic and ecological systems require meaningful incorporation of local perspectives and knowledge, which can be achieved through formal co-management with marginalized communities. This study examines examples of successful Indigenous management across the world, making a case for co-management with Indigenous communities. In order to assess the value of Indigenous management in collaboration with western processes and systems, this study highlights the case of Indigenous management of aquatic species in Western Washington, USA.

The Issue and Theoretical Framework

Despite advances in technology, many socio-economic and ecological challenges persist for decades in our society (Vogt et al. 1997; Gordon & Berry 2006), highlighting challenges to our collective adaptability and resilience. One of the greatest barriers to addressing persisting challenges are the systems we engage to find solutions. As a society, we look for quick fixes that often only address the symptoms of an issue, rather than addressing underlying causes. Addressing problem symptoms only further perpetuates the issues at hand. This reactive approach is exacerbated by our loss of connection to ecological systems, making issues nearly impossible to anticipate and address proactively.

One method for proactively addressing the root causes of issues is using a holistic lens that deliberately and meaningfully incorporates multiple local and Indigenous perspectives. Local and, particularly, Indigenous communities are the ones living, working, and observing the

land, and are thus often the first to notice changes in natural systems that may indicate broader disturbances. By incorporating local and Indigenous perspectives into the decision-making process, there's a greater opportunity to act on indicators of larger change. For example, Indigenous and local people are often effective at identifying early warning indicators of climate change impacts before scientists recognize that an environmental problem is looming (Reyes-García et al. 2016; Jones 2020). This proactive action provides an opportunity to address the root cause of an issue, rather than reactively addressing the symptoms of a larger challenge that was not perceived. However, this incorporation of local and Indigenous voices requires that decision-makers value alternative knowledge-forming processes. Otherwise, the incorporation of local perspectives and even co-management will be in name only, as is, unfortunately, frequently the case when the reasons for co-management are not understood.

Indigenous people have traditionally used a knowledge forming process that provides solutions to environmental issues through historic knowledge and long-standing expertise. They use the knowledge passed down through stories inter-generationally and youth learn about sacred places, conservation, and wildlife (Conniff 2013). Because of the longstanding place-based knowledge they hold, "[. . .] Indigenous peoples play a significant role in maintaining locally resilient social–ecological systems" (Green & Raygorodetsky 2010). However, the meaningful incorporation of local and Indigenous voices into decision-making processes is underutilized because local and Indigenous perspectives are poorly understood and not valued as equally as data-driven science. Much of the western world only values information and data formed through the scientific process, which is linear and can take information out of context. Furthermore, this scientifically derived literature is only understood by, or accessible to, a subset of the population. Johnson (2018) wrote that science should not be owned by a select group of people who

indirectly control access to and assimilate knowledge simply because of the degrees they hold or their disciplinary-based jargon that few understand (Johnson 2018). Instead, we must value alternative knowledge-forming processes and use longstanding place-based knowledge to provide meaning and context to other sources of data and science. Decision-making process will not be just and will not foster resilient solutions until local voices and perspectives are meaningfully and formally incorporated into decision-making.

The Case for Indigenous Co-Management

There are many examples of successful Indigenous management, spanning time, scale, and geographic location. This study is particularly focused on cases of the Indigenous management of natural systems with an emphasis on climate planning, wildlife management, and biodiversity conservation, each of which Indigenous communities are uniquely equipped to address. Each of these three focus areas also plays an important role in increasing the long-term resilience of social-ecological systems. The following examples highlight tribal management successes, as well as identify key features of decision-making that contribute to each success.

Climate planning capitalizes on indigenous communities' use of long-standing place-based knowledge to identify early warning indicators. Many Indigenous communities are establishing their own climate adaptation plans, at times faster than western government agencies (Jones 2020). In many cases this climate planning is a product of survival resilience as Indigenous communities are more dependent on a constrained land base, which may be particularly vulnerable to climate change impacts. These risks are further heightened for Indigenous communities that engage in and rely on subsistence activities (Bennett et al. 2014). For example, Aboriginal communities in north-western Australia are likely to be

disproportionately affected by climate change impacts; however, the worldviews and knowledge of these Aboriginal people "can inform community-based adaptation (CBA) pathways to assist these communities address their vulnerabilities and specific risks in the context of the pending impacts of climate change in the Kimberley region of north-western Australia" (Leonard et al. 2013). Similar vulnerabilities and challenges are being faced by many tribes in Washington state, necessitating climate planning. For example, the Makah Tribe on Washington's Olympic Peninsula faces heightened risks to their traditional and accustomed lands due to sea level rise. In their climate planning, the Makah Tribe has prioritized the inclusion of cultural and longstanding knowledge as well as community engagement with tribal members (Chang et al. 2020).

Tribal management of various wildlife species has been successful because of tribes' ability to use longstanding knowledge to set hunting, fishing, and harvest quotas as well as successfully restore the integrity of wildlife habitat that have been altered by natural or human disturbances. Indigenous voices are significantly contributing to landscape management issues such as salmon habitat restoration projects. These projects are being successfully implemented by multiple tribes collaborating to restore wetland areas for salmon habitat on their customary lands (Marchand et al. 2020). For example,

> *To protect salmon runs, the [Swinomish] tribe is working on the Skagit River to create better spawning beds and is planting trees to provide shade and reduce river temperatures. In addition, the tribe is fighting to block mining operations in the headwaters of the Skagit in British Columbia, which could impact waters downstream (Jones 2020).*

In addition to successful habitat restoration, an important facet of wildlife management is setting sustainable hunting, fishing, and harvest quotas. Quotas established by Indigenous communities

have helped to preserve and restored wildlife populations across numerous ecosystems, such as ungulate populations in Wyoming, USA (NAFWS 2019), elk populations on Washington's Olympic Peninsula (USFWS 2013), and shellfish populations in Western Washington (NWIFC 2016). An aspect contributing to the success of wildlife management by Indigenous communities is that many tribes consider the impact of their management actions on the entire landscape, rather than isolating one specific species. Schuster et al. (2019) found that "partnerships with Indigenous communities can ameliorate shortfalls in habitat protection for biodiversity conservation." Considering the networks of ecosystems at the landscape scale contextualizes management decisions more broadly, which also contributes to overall biodiversity conservation.

Indigenous communities have a long-standing history of maintaining biodiversity through a holistic lens of contextualized management. Settlers arrived in North America to an environment already benefitting from a mutual relationship of reciprocity with Indigenous peoples. Yet this managed biodiversity soon diminished as Indigenous management was displaced. Today, despite representing only 5% of the population, Indigenous communities maintain 80% of the world's biodiversity on only 20% of the world's land area (Toledo 2001; Schuster et al. 2019). Indigenous knowledge systems are critical to achieving and upholding biodiversity conservation. Kosoe et al. (2020) explain that "[Indigenous] communities have their own natural resource management systems, knowledge, and practices regarding flora and fauna which are learned and transmitted from one generation to the next by means of folklores, songs or oral education." For many Indigenous tribes, culture and identity are deeply intertwined with the natural world, so biological conservation is embedded within their decision-making on resource management (Wilder et al. 2016).

As outlined above, the literature highlighting examples of successful Indigenous management is abundant; as well, the literature advocating for an increase in tribal management and co-management is prolific (Alcorn 2010; Kenney 2012; Schuster et al. 2019). Co-management can and must be used across multiple foci of environmental planning and management. However, it's important to understand the elements of tribal decision-making that make co-management valuable to fostering resilient systems. The following case study of aquatic species management in western Washington by the Suquamish Tribe aims to provide such details.

Case Study: Indigenous Management of Aquatic Species in Western Washington

The management of aquatic species in Western Washington provides an exceptional case study to further understand the basis for tribal co-management because of the existing legal co-management mandate, the cultural importance of the resources, the complexity of the social-ecological system, and the high quantity of invested parties (CRITFC 2021). Aquatic species are of particular importance to Pacific Northwest tribes because of the species' significance to many tribal cultures and livelihoods. Billy Frank, Jr., a Nisqually Tribe member and chairman of the Northwest Indian Fisheries Commission (NWIFC), once wrote, "Fishing defines the tribes as a people. It was the one thing above all else that the tribes wished to retain during treaty negotiations with the federal government 150 years ago. Nothing was more vital to the tribal way of life then, and nothing is more important now" (Frank 1998). Indigenous tribes have been managing natural systems and aquatic species in the Pacific Northwest since time immemorial. While tribes in Washington ceded much of their land to the federal government, they retained the right to fish at traditional and accustomed locations. Due to state government infringement of

these rights, the 1974 Boldt Decision (United States v. Washington) reaffirmed the right of Native American tribes in Washington state to co-manage and harvest salmon (United States Department of Justice 2017). The case continued and in 1994 the Court ruled that the treaty right also included shellfish. This legal mandate provides a framework for examining the value of tribal co-management since there is a distinct point in time when the tribes began co-managing, providing a comparison with the outcomes of prior state and federal government management.

The following questions and answers are excerpts from an interview with Senior Biologist to the Suquamish Tribe, Paul Williams. Paul has worked with the Suquamish Tribe for 30 years, providing him with a unique perspective as a non-tribal member operating within and advising tribal decision-making on the management of shellfish populations.

Q: *Are there any examples of when tribes have made different management decisions than the state or federal government in a comparable situation?*

A: There are plenty. Puget Sound is unique because there is a legal requirement for co-management between the Tribes and the State agencies. The Tribes and State have to negotiate annual harvest plans and there are a lot of areas of disagreement. A recent disagreement is over the spot prawn quota for the west side of Bainbridge Island. Spot prawns are found in discreet beds, so we try to set harvest quotas for small areas to avoid overharvest on any bed. But small quotas are hard for the State to manage since they have a quarter million harvesters and they don't know how many will show up in each area. The State over-harvested in that area for several years and they have argued for a quota increase. But Suquamish didn't think an increase was justified. We thought they [Washington State] should limit their catch to their quota. We haven't found a feasible way to measure size of the population, so setting quotas involves a fair

amount of guesswork and how much risk you are willing to take. Over the past 50 years the Suquamish have seen a lot of fish populations disappear so they don't want to take any chances even though they might be missing out on some prawns now.

Sea cucumbers are an example of management before co-management. The Tribes regained access to salmon in 1974, but it took another twenty years to win the shellfish case. Sea cucumbers became a valuable export fishery in the late 1980's and at the time, the Tribes were still in court trying to gain access to shellfish. The State managers opened one area at a time for unlimited harvest, then they'd close that area and go to another area. They took 2.5 million pounds the first rotation, a million pounds three years later, and only 50,000 pounds the third year. The Tribes got access in 1994 and we established a quota of 20,000 pounds per site, but the population never recovered so we closed it completely. Twenty years later a survey was conducted, and the population estimate was only 83,000 pounds. Suquamish is doing sea cucumber hatchery research to try to boost up and recover sea cucumbers.

Salmon is another example. One question is, what would have happened [to the salmon populations] if Tribes did not get co-management of salmon in Puget Sound. Would there be any salmon in Puget Sound now? Maybe not very many. One of the reasons is that before the 1974 Boldt Decision reaffirmed the treaty right to fish, the salmon were being harvested like they were one big population instead of many small ones. Salmon go back to the stream of their birth to reproduce. The risk of long harvest openings in a big mixed stock area is that too many of the salmon from a single stream [stock] might get caught and not enough would make it back to their

stream to reproduce. When the Tribes won the Boldt Decision and co-management began, salmon had to be managed so enough could returned to each stream.

As soon as the Tribes won the Boldt Decision, and the State had to share the salmon, the State looked for other species for the sport fishermen. They advertised the cod fishery in Agate Pass. Cod returning to spawn would bite on anything and there were reports of sport fishermen filling garbage cans to use fish as fertilizer. They held fishing derbies and in a few years that spawning population was completely wiped out.

Q: *Can you describe the decision-making process used by tribes when managing aquatic species?*

A: If you are referring to the State/Tribal decision process, there is a court ordered implementation plan development process that was developed in 1995 and updated in 2002. The last update failed. Shellfish planning is messy. It's extremely complicated and chaotic with lots of conflict. We have to establish 24 harvest plans each year and some involve a half dozen different parties. When plans don't get signed, we revert to the last years plan. Once there is a State/Tribal plan, the Tribes then need to work out how to fish together. The resource is scare so there is a lot of competition. We meet over and over until we reach consensus, often meeting right up to the opening.

If you are referring to fishing decisions within the Tribe, the biologists do their best to identify a sustainable harvest and the fishers decide when to harvest them.

Q: *Are there any defining features of the tribal decision-making that are unique from more western decision-making processes?*

A: I only have experience at Suquamish, but a little of what I've noticed might apply to other tribes. Tribal members seem to have a lot access to leadership and that could increase accountability. The small size helps. Also, there is a very deep sense of community and respect for the Elders. They teach their youth values of respect, responsibility, and maintaining a reciprocal relationship with the environment. In general, Tribes tend to consider future generations when making decisions. Another feature is that decisions are very often made by consensus. Leaders have to address many different challenges and that might provide a more holistic view. I think a more tribal members would view themselves as a part of the environment, whereas in the wider society more might view the environment as there for humans to use and even misuse. I guess that's pretty obvious if you look at the state of the environment today.

Lessons Learned

The examples and case study outlined above highlight the different ways in which Indigenous communities approach decision-making and natural resource management. Indigenous peoples have been successful in recognizing changes in natural systems to proactively adapt, as well as restoring integrity to natural systems and habitats, and managing for biodiversity across changing landscapes. Indigenous communities are deeply connected to a particular land base, which allows them to notice changes in natural systems that may indicate a larger change or disturbance. This placed-based knowledge is a form of science, as well as a way of life that has been validated through centuries of observation (Simpson 2002; Kimmerer 2013). Additionally, Indigenous communities have agreed upon priorities that are weighed in decision-

making, further contributing to the holistic nature of their management strategies. The holistic and place-based nature of Indigenous decision-making and management brings a unique and valuable perspective to natural resource management. Local and Indigenous perspectives must be incorporated into western decision-making and management processes in order to begin increasing the justice and resilience of our social-ecological systems.

While there are examples of successful co-management between Indigenous communities and government entities (Busiahn & Gilbert 2009; Diver 2016), there are also examples of failed co-management efforts (Castro & Nielsen 2001). The process of increasing meaningful co-management efforts will not be easy, but it is a necessary step in increasing justice and fostering resilient systems. When working to develop a co-management plan, it's important to clearly define terms, roles, and objectives, as well as discussing how different sources of information and knowledge will be used to inform decision-making and the management process (Tipa & Welch 2006). More research needs to be done to further identify which characteristics of co-management with local and Indigenous communities lead to success and failure.

A lack of place-based, holistic knowledge and a failure to value Indigenous and local voices in western decision-making perpetuates the existence of longstanding environmental challenges as well as the unsustainability of survival resilience experienced by many Indigenous communities. The incorporation of local knowledge has been shown to increase the resilience of our society and natural environment (Schuster et al. 2019). Local knowledge and voices must be meaningfully incorporated into our decision-making processes to foster equitable or inclusive resilience in our society, economy, and environment (Ensor et al. 2019; Cordaid 2020). However, it's not enough to simply "incorporate" local voices through informal consulting and conversation. Indigenous communities must be meaningfully and formally involved in the

decision-making process. Only then will we begin making progress to increase justice and resilience in our social-ecological systems.

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Future Research Directions

As outlined above, there are numerous flaws in the environmental decision-making process as well as the integration of natural resource management into the policy process. In addition to these challenges is the concern that many ecosystems are unrepresented on public land in the United States. Spies et al. (2019) highlights that "threats to biodiversity lie beyond the control of federal land managers" and there is a clear need for collaboration among the multi-stakeholder communities. Additionally, distrust of the federal government has complicated land management in the western United States. Such a high percentage of federally owned land in the West has created resentment in local communities who wish to have greater control of the land within their states; this resentment has contributed to anti-protected area sentiments in many rural communities throughout the West (Switzer 1997). In conjunction, these disparities illustrate a need for increased collaborative effort between public and private landowners in order to achieve conservation objectives.

We are at a crossroads in deciding how to move forward to pursue conservation in the United States. Around the world, protected area designation and expansion are recognized as successful and key methods of conserving biodiversity, protecting threatened species, and supporting the production of ecosystem goods and services, including a multitude of cultural and economic benefits (Mittermeier et al. 2003; European Commission 2013; Venter et al. 2014; Cerqueira et al. 2015). Yet, the United States' protected area model has failed to mitigate political volatility, meaningfully incorporate the perspectives of local and Indigenous communities, and holistically consider implications on the broader landscape beyond designation boundaries. The Biden Administration has declared their intent to bring the United States' amount of protected area to a total of 30% (which requires designating 400 million acres of land

and water) (Gibbons 2021). This political intent has created a policy window to reimagine the way protected areas are identified, established, and managed in the United States.

Next Steps

As outlined above, the policy process is inadequately protecting natural resources from political volatility. My plan for the PhD is to explore opportunities to mitigate existing risks to protected area designation and natural resource conservation through the increased involvement and decision-making of Indigenous peoples in the establishment and management of protected areas in the United States. One method for achieving this goal is to develop a new framework to assess lands being considered for protected area status that is evidence-based and independent of specific stakeholder groups. An alternative model— such as the IFMAT process (US Congress 1990)— should be explored for its utility in establishing future protected areas. IFMAT is a federally mandated assessment that provides an independent, unbiased review of forests, which could be considered as a model to assess future protected area designations.

Related Work and Publications

During my graduate career at the UW, I've had the opportunity to contribute to multiple projects that have developed my perspective and knowledge which allowed me to construct the included manuscript above. Four projects I've been involved with that are of particular significance include:

1. Serving as the Project Coordinator at the William D. Ruckelshaus Center on a situation assessment for the long-term management of the Spirit Lake/Toutle-Cowlitz River system.

2. Working with Dr. Mike Marchand (former Chairman of the Colville Tribes) and Dr. Kristiina Vogt, on the book, *The Medicine Wheel: Environmental Decision-Making Process of Indigenous Peoples*.
3. Collaborating on a project called the Holistic Learning Collaborative, which was an inaugural recipient of the University of Washington's (UW) EarthLab's Innovation Grants.
4. Working as a Predoctoral Instructor in the UW's Program on the Environment.

Working as a Project Coordinator at the Ruckelshaus Center provided me with a strong foundational understanding of collaborative governance and the opportunity to use collaboration as a problem-solving tool. The situation assessment we completed on long-term management of the Spirit Lake/Toutle-Cowlitz River System included conducting 31 interviews with 51 individuals from local, state, federal, and tribal governments, as well as individuals who identified as local business owners, land managers, and community members. These interviews provided me with experience designing and conducting interviews while also giving me an in-depth understanding of the nuances of designing and managing collaborative efforts. This process led to the publication of the following professional report:

*Page, C. & **Schreier, A**. (2019). Situation Assessment for the Long-Term Management of the Spirit Lake/Toutle-Cowlitz River System. William D. Ruckelshaus Center. https://s3.wp.wsu.edu/uploads/sites/2180/2019/03/Spirit-Lake-Report_final-on-website.pdf*

My contributions to *The Medicine Wheel: Environmental Decision-Making Process of Indigenous Peoples* (Marchand, Vogt, . . .**Schreier**, . . .2020) included interviewing multiple tribal members about their perspectives on decision-making and leadership. After each interview

I worked to transcribe the interview recording for inclusion in the final book. These interviews provided me an opportunity to further develop my interview methodology skills as well as the opportunity to hold conversations with multiple tribal members that I may not have otherwise had the chance to interact with. The following citations outline the specific chapters I contributed to:

Schreier, A. & Vogt, K. (2020). *Becoming a "leader without borders": Interview of Dr. Mike Marchand. In Marchand et al., The Medicine Wheel: Environmental decision-making process of Indigenous peoples. (pp. 21-49). East Lansing: Michigan State University Press.*

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Schreier, A., Fawcett, P., & Vogt, K. (2020). *Loss of Huckleberries and Tribal Culture: Interview of JD Tovey. In Marchand et al., The Medicine Wheel: Environmental decision-making process of Indigenous peoples. (pp. 113-116). East Lansing: Michigan State University Press.*

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Schreier, A. & Vogt, K. (2020). *Making business decisions: Interview of Cal Mukumoto and Dr. Mike Marchand. In Marchand et al., The Medicine Wheel: Environmental decision-making process of Indigenous peoples. (pp. 224-241). East Lansing: Michigan State University Press.*

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***Schreier, A.**, Fawcett, P., & Vogt, K. (2020). Digitizing native stories without pickling culture: Interview of JD Tovey. In Marchand et al., The Medicine Wheel: Environmental decision-making process of Indigenous peoples. (pp. 375-384). East Lansing: Michigan State University Press.*

Additionally, Sarah Neilson reviewed *The Medicine Wheel* book as one of the "11 of the Most Anticipated Books by Indigenous Authors for the First Half of 2020." (January 15, 2020) (accessed at: Hosted on Book Marks by Library Hub):

> *"Marchand is the former Chair and Council Member of the Confederated Tribes of the Colville Reservation and President of the Affiliated Tribes of Northwest Indians Economic Development Corporation. Together with eight other editors, most of whom are Indigenous and all of whom are deeply involved in ecological and Indigenous rights fields, Marchand has assembled a formidable (nearly 500-page) volume of essays that explores the inherent connection between people and environment. Using Indigenous frameworks of thinking and approaching ecology, ecosystems, and ethics, the book is a comprehensive tool for trying to define the problems and solutions around climate change. The kind of narrative and broad, interconnected knowledge this book brings to the table is essential as humans reckon with the consequences of the colonialist, imperialist, capitalist actions that are at the root of the climate crisis."*

During the 2019-2020 academic year, I also collaborated on a project called the Holistic Learning Collaborative, which was an inaugural recipient of the EarthLab's Innovation Grants. This project resulted in the development of a University of Washington's School of Environmental and Forest Sciences (SEFS) course exploring how to teach people to holistically contextualize and communicate environmental issues using storytelling. The goal of the Holistic Learning Collaborative is to provide K-12 educators with information to teach holistic storytelling methodology in the classroom and enable youth to begin telling their own stories about their local communities and the world around us. This research and pilot course resulted in the construction of a manuscript (submitted for publication to the *Nature and Culture* journal). The submitted manuscript focuses on how storytelling can be used to foster environmental literacy, which prepares decision-makers to make more robust, holistic, informed decisions that

address the root cause of an issue rather than an issue's symptoms. I significantly contributed to the development and construction of this manuscript, which can be cited as:

*Vogt, K.A., **Schreier, A.**, Orloff, A., Marchand, M.E., Vogt, D.J., Fawcett, P., De Abreu, S., Purty, T. & Murphy-Williams, M. (2020). Building environmental literacy through holistic storytelling. Nature and Culture (In review).*

This Holistic Learning Collaborative was also featured in an interview by the Voices Unbound storytelling podcast series, focused on "sustainable holistic solutions for complex and multi-disciplinary environmental problems." I participated in this interview, summarized below:

> Storytelling for sustainable holistic solutions for complex and multi-disciplinary environmental problems!
>
> September 4, 2020
>
> What is the connection between storytelling and the science of the environment? It turns out there are a lot of connections being explored by a research group seeking to translate complex scientific understandings of ecosystem health into stories that families and communities can understand and be activated by. We discuss how stories do not have to have a beginning, middle, and end to have an impact; and how the story of COVID-19 is continuing to shape our relationship to the environment.
>
> **Date: July 23, 2020**
>
> **Facilitator**: Robin Evans-Agnew + Madison Thakera, RN Summer Volunteer Research Intern
>
> **Speakers:** Kristiina Vogt, Samantha De Abreu, Daniel Vogt, Phil Fawcett, & **Alexa Schreier**

Additionally, the Holistic Learning Collaborative spawned the organization of an Earth Day event centered around connecting with community members on social and environmental issues in their communities and lives. Just before Covid forced the UW and the rest of the state into a shut down, I was one of the coordinators and planned speakers for this panel, which was going to be hosted at El Centro de la Raza in Seattle on April 16, 2020. This was a partnership comprised of undergraduate and graduate students from the University of Washington's SEFS, Program on the Environment (PoE), iSchool, and Built Environment, as well as the Colville Tribe, and the Umatilla Tribes of Oregon. The event was to be hosted by the University of Washington's EarthLab, the Office of Sustainability, and the College of the Environment,

through the Office of Diversity, Equity, and Inclusion. I was scheduled to talk in the introduction of the event on how environmental decisions are increasingly political, rather than focused on people. This event has not been rescheduled because of the continuing impacts of Covid.

The fourth project that has contributed to my growth and ability has been serving as a Predoctoral Instructor in the UW's Program on the Environment. I am the primary instructor for UW's ENVIR 480: Sustainability Studio; Sustainability Studio is an experiential learning course where students work in small groups of 3-5 on different projects with clients from the UW and Seattle community. This class allows students to gain experience working with clients and to improve the state of sustainability in our community, all while learning about efficient and effective project design and management. In addition to managing the student experience, I am also responsible for identifying, securing, and managing the client contacts each quarter. Particularly relevant to my research, this opportunity has allowed me to strengthen my own communication and storytelling skills as I help the students define and conceptualize what it means to make a valuable contribution to their client and how to communicate that progress through storytelling and contextual framing.

The aforementioned projects have helped me to re-evaluate my research interests and re-focus my work around the importance of meaningfully incorporating local and Indigenous communities in the decision-making process for natural resources and land conservation.

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