Inclusive Conservation: Improving Collaboration with Tribes in the United States

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Duke University is located on the traditional lands of the Catawba and Shakori peoples. Although many Indigenous peoples have called land in North Carolina home, North Carolina recognizes 8 Tribal Nations today: Coharie Tribe, Eastern Band of the Cherokee Nation, Haliwa-Saponi Indian Tribe, Lumbee Tribe of North Carolina, Meherrin Indian Tribe, Occaneechi Band of the Saponi Nation, Sappony, and the Waccamaw Siouan Tribe. We would like to acknowledge, honor, and respect the diverse history of Indigenous peoples in North Carolina (NC DOA and Native Land Digital, 2020).

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Executive Summary

Collaborative landscape-scale conservation is a multi-jurisdictional approach that embraces community collaboration and ecosystem-scale practices. Over 95 million acres of land are under Tribal management in the United States; strengthening collaboration with Tribes will improve priorities and broaden the field of landscape conservation.

Although landscape conservation initiatives vary widely, the Network for Landscape Conservation compiled lessons learned from practitioners to produce *Pathways Forward – Progress and Priorities in Landscape Conservation (2018)*. This report outlines a framework that touches on integral elements of achieving landscape conservation: the central role of collaboration, what it takes to communicate and engage communities across a landscape, how to advance science to contribute to conservation efforts at a larger scale, the innovative investment strategies needed to sustain these efforts, and lastly, how to align policy to achieve landscape conservation (NLC, 2018). At this time, little research has been conducted on the collaborative conservation initiatives that have included or recognize Tribal partnerships. We examine collaborative conservation projects that have considered or are currently working with Tribes. We identify barriers to achieving the five themes presented in *Pathways Forward* and opportunities to combat these barriers. Our objective is to support the emerging efforts to create more inclusive collaborative conservation management strategies with Tribes. To that aim, we asked:

1. What practices can non-Tribal organizations adopt to better collaborate with Tribes?

2. How can Tribal priorities shape a landscape-scale conservation prioritization scheme?

The first section of this report provides a brief history of Tribal relationships in the context of land management in the United States. Then, we introduce and define large landscape conservation management strategies. We present collaborative landscape-scale conservation as a management strategy to achieve more inclusive conservation.

The second section defines the scope of our work, our research questions, and methods. This includes a description of our literature review, interviews, survey and GIS case study methods.

The third section reports our qualitative and quantitative findings. Using our interview and survey data we present our results, identify key barriers for each theme and recommend appropriate strategies and tools to overcome these barriers when working with Tribes.

- **Collaboration** examines what partnership structures exist and the internal decision-making mechanisms that are being used to combat barriers to partnering with Tribes on collaborative conservation projects. To strengthen collaboration, we recommend focusing on building trust, supporting equitable access to the decision-making table, and recognizing the impacts of colonial conservation management.
- **Engagement** focuses on how partners are creating opportunities to increase Tribal ownership of the conservation narrative. We advise facilitating knowledge sharing and community participation, while encouraging joint ownership, and committing to transparency throughout the project.
- **Science-based planning** investigates how traditional ecological knowledge and contemporary science are being integrated to support conservation outcomes. We note the importance of respecting the sensitivity of Tribal knowledge, describe opportunities

for creating and accessing data, and discuss monitoring strategies. Additionally, we encourage non-Tribal partners to strengthen their understanding of the cultural differences distinguishing Tribal knowledge and contemporary science.

- **Investing** explores the challenges and opportunities to improve sustainable funding sources for collaborative projects including Tribes. We recommend diversifying funding sources and strategically approaching the grant-making process while also taking into account how the legal status of Tribes can impede funding opportunities. For organizations providing grants, we recommend incorporating flexible funding structures and providing matching fund alternatives.
- **Policy** addresses the political and legal barriers that Tribal partners face and echoes the need to improve and create policies that address the specific and unique barriers to Tribal nations participating in collaborative conservation. We recommend supporting policy for Tribal sovereignty.

Additionally, through a case study of a Tribal climate adaptation plan using geospatial analysis, we provide an example of how geospatial tools can be used to center Tribal priorities in conservation planning. The analysis illustrates how cultural and ecological variables can guide conservation goals.

Pathways Forward offers landscape conservation practitioners a definition of collaborative conservation, while providing insights and benchmarks to support this growing field of conservation. Our research reflects on how the *Pathways Forward* framework applies to active collaborative conservation projects working with Tribes in the United States. There is no one way to achieve collaborative conservation at a landscape-scale with Tribes. While a number of strategies are similar to collaborating with any other partner, others are unique to working with Tribes. We identify various barriers to achieving effective collaboration, engagement, and science-based planning with Tribal partners. Furthermore, we note a lack of investment and policy tools geared towards supporting Tribal partners. We offer strategies and practices that can be undertaken to overcome these barriers in support of inclusive and collaborative landscape-scale conservation. In this era of unprecedented environmental change, it is more important than ever to promote our shared values of environmental well-being and preservation of cultural integrity. We hope to bolster the ongoing efforts made to effectively work with Tribes to achieve more inclusive conservation.

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INTRODUCTION

I. Tribal Relations with U.S. Government

Studying the history of the United States provides an opportunity to reflect on current conditions. While historical literature and data are cursory at best, they provide enough information to paint a stark picture of human relationships throughout time. We hope to offer insight into

relationships between Indigenous people of North America, referred to here as Tribes, and the U.S. Federal and State governments in the present day. The historical relationship between Tribes and the United States is complicated, contradictory, and violent in word and deed. This context cannot be glossed over, nor can it be fully addressed in the following report. We encourage our readers to educate themselves on this important history with comprehensive primary and secondary sources. We suggest exploring the Decolonizing Conservation Reading List created and managed by Sara Cannon, and we offer one book recommendation: *An Indigenous Peoples' History of the United States*, by Roxanne Dunbar-Ortiz.

Colonialism's legacy in the present-day United States is apparent in the legislation, agencies, and protocol that regulate and influence Indian Country. When the U.S. began an era of treaty making in 1778, Tribes were viewed as completely sovereign nations. By the time treaty making ended in 1871, the U.S. had ratified over 370 treaties (Wang, 2015) of varying lengths and conditions with Tribes (U.S., 2016). Tribes were viewed as dependent upon the U.S. government (U.S., 2016). One year after President Andrew Jackson signed the Indian Removal Act in 1830, Isaac Chapman Bates, a Senator and Representative of Massachusetts, said during the 21st Congress, "The policy seems to be, to consider [Native Americans] as independent for all purposes beneficial to us, and as citizens for all purposes prejudicial to them" (Bates, 1831).

By the end of the 19th century, the U.S. wanted to open what was seen as unused land in the West for white settlers migrating across the continent. In 1887, Congress passed the Dawes Act, which aimed to assimilate American Indians into the United States as independent residents, encourage higher production farming on reservations, and free up reservation land for white settlement (United States Congress, 1887). The Dawes Act began the period of allotment. American Indian households were allotted up to 160 acres of land on reservations and unallotted land was sold to non-Indians. Due to exorbitant land loss, Congress passed the Indian Re-Organization Act of 1934, ending the practice of allotment (United States Congress, 1934). Allotment caused the loss of up to two thirds of reservation land (National Archives Foundation, 2019).

Relationships between Native Americans and specific agencies of the U.S. Federal Government are complicated by histories of injustice. The history of the National Park Service (NPS) and its designation of National Parks and other NPS units is problematic. Preservationists pushed for the protection of "wilderness" at the exclusion of native peoples. The specific displacement of native populations from parks such as Yosemite, Yellowstone, and Glacier set precedent for removal and exclusion from additional national park units. Further, preservation by exclusion of human presence became the management strategy of land protection for decades to come (Spence, 2000).

"...the establishment of the first national parks necessarily entailed the exclusion or removal of native peoples" (Spence, 2000)

 Additionally, in 1999, Native American farmers brought a class action lawsuit, *Keepseagle v. Vilsack*, against the Secretary of the U.S. Department of Agriculture (USDA) that alleged Native American farmers were discriminated against for farm loan and farm loan servicing programs between 1981 and 1999 (USDC DC, 2011). Eligible claimants were Native American farmers who farmed, applied for a farm loan program, and have some written or oral record of filing a discrimination complaint with the USDA during the period. The case was settled in 2011 under the

Obama Administration and required the USDA to pay $680 million in damages to claimants, forgive $80 million in farm debt, and improve farm loan services (Cohen Milstein, 2018).

II. Large Landscape Conservation

The dramatic increase in human activity since the mid-20th century has altered our landscape, threatening both species and biodiversity (NRC, 2010). Estimates suggest that 10 to 20% of known species are now threatened with extinction (Pimm et al., 2014). Existing strategies of conservation, such as conservation actions on a single species or a single place are deemed ineffective at keeping up with unpredictable changes to socioecological systems (National Park System Advisory Board, 2012). Further, according to the 2000 U.S. National Assessment from the U.S. Global Change Research Program, non-climate environmental stresses such as habitat fragmentation and human development will be exacerbated by climate change (NAST, 2000). This message is echoed in subsequent assessments up to the current report published in 2014 (Melillo et al., 2014).

To mitigate current and impending threats, conservation at the landscape scale seeks to work across large ecosystems and jurisdictions to conserve land, water, wildlife and cultural resources. This new conservation management strategy enhances the overall health of the shared landscape, improves conservation potential, increases connectivity, improves links to communities and culture, and builds a scientific foundation on which to establish adaptation actions (Oliff et al., 2016). This model includes community-based conservation (e.g. Doyle and Decker, 2018), grassroots ecosystem management (e.g. Bixler et al., 2016), and collaborative conservation efforts through public-private partnerships (e.g. Brose, 2016 and Bixler et al., 2016) and watershed initiatives (e.g. Cronin and Ostergen, 2007). Landscape-scale conservation is a critical solution to the mounting environmental challenges we are facing.

Additionally, we believe it is important to cross and confuse jurisdictional lines in our analyses because borders have no bearing on ecosystems. An inclusive, landscape-scale approach to conservation will benefit more species and interests than focusing on one agency or interest's land at a small, parcel-level scale. In the United States, federal agencies have been moving towards this strategy of ecosystem and landscape-scale conservation. Environmental scholars and practitioners have been calling for inclusive approaches to management for years. One notable early proponent of ecosystem management was R. Edward Grumbine, who defined ecosystem management as a process that "integrates scientific knowledge of ecological relationships within a complex sociopolitical and values framework toward the general goal of protecting native ecosystem integrity over the long term" (Grumbine, 1994).

Landscape-scale conservation is on the rise. In 2017, the Network for Landscape Conservation (NLC) conducted a survey, "Assessing the State of Landscape Conservation Initiatives in North America" covering 132 collaborative landscape conservation initiatives (NLC, 2018). The NLC established a professional network and platform for the landscape conservation community and works toward providing information such as tools and best practices for long-term success of human and ecological communities. Over the last two decades, NLC has noted a dramatic increase in these initiatives, stating that 90% of the initiatives surveyed have been founded since 1990, with 45% founded in the years since 2010 (NLC, 2018).

Although landscape conservation initiatives vary widely, NLC compiled lessons learned from the practitioners to produce "Pathways Forward – Progress and Priorities in Landscape Conservation" (NLC, 2018). We will refer to this report as *Pathways Forward*. The report consolidates insights and aspirations from experts across the country involved in landscape conservation initiatives into an

overarching framework (NLC, 2018). It specifically tries to answer: What is the current state of landscape conservation? What can we do together and in our own landscapes to shape this essential practice and ensure a healthy, sustainable future for people and all of nature? This report explores five major themes: collaboration, communications/engagement, science-based planning, investing/funding, and policy (Table 1). For each theme, *Pathways Forward* addresses key challenges, lessons from the field, and recommendations. Furthermore, *Pathways Forward* provides benchmarks for conservation professionals working towards effective collaboration (NLC, 2018).

At this time, little research has been conducted on which collaborative conservation initiatives have included or recognized Tribal partnership. The NLC report highlights the importance of including Tribes in landscape conservation and the need to highlight collaborative conservation projects on Tribal lands (NLC, 2018). Tribes own approximately 95 million acres of land across the U.S. and maintain traditional knowledge and values, key elements of the large landscape conservation conversation (Boyle, 2002).

Theme	Attributes
Collaboration	- Trust - Active engagement among partners - Strong backbone organizations or coordinators - Social capital - Shared landscape knowledge at multiple scales
Communication & Engagement	- Deep listening - Shared values - Storytelling about people and the land - Shared knowledge - Sustained, regular interactions
Science-Based Planning	- Technology and innovation - Dynamic solutions - Design for adaptation
Investment	- Quantification of ecosystem services - Investment in ecosystem services - Promotion of natural resource-based markets - Maintenance of traditional conservation funding
Policy	- Strength in existing conservation programs - Sources of sustained funding at all levels of government - Private landowners and new partners - Government programs that promote landscape-scale collaboration

Table 1. Five themes and attributes of successful implementation according to NLC Pathways Forward *report (2018).*

III. Tribes and Land Conservation

In the United States, federally recognized Tribes are sovereign nations and operate under a government-to-government relationship with the U.S. government. Tribes are recognized in the Constitution of the United States as domestic dependent nations under the protection of the federal government. This means that Tribes have the right to exercise independent powers over their members and territory. This legal relationship has been refined through legislation, such as Executive

Order 13175: "Consultation and Coordination with Indian Tribal Governments" (Federal Register, 2000). E.O. 13175 states that federal land managers "are charged with engaging in regular and meaningful consultation and collaboration with Tribal officials in the development of Federal policies that have Tribal implications, and are responsible for strengthening the government-to-government relationship between the U.S. and Indian Tribes" (Federal Register, 2000).

Tribe-specific policy related to land management and relationship with the U.S. federal government can be expounded upon across thousands of pages, both clarifying and confusing different parties' understandings of Tribal governance and individual and collective rights. Some examples from history include the Indian Citizenship Act in 1924, the 1934 Indian New Deal, the Indian Termination Policy of 1953 (House Concurrent Resolution 108 and Public Law 280), the Indian Civil Rights Act of 1968, and The American Indian Religious Freedom Act of 1978. All of these policies altered the relationship between Tribal governments and individuals and the U.S. Federal Government (National Archives Foundation, 2019). Examples that are more recent include the American Indian Agriculture Resource Management Act of 1993, the Indian Self-Determination and Education Assistance Act, the HEARTH Act, and over sixty provisions of the 2018 Farm Bill.

Federal policy in the U.S. continues to improve its recognition and advocacy for collaboration with Tribes while adding to the body of relevant policy. Ideally, U.S. policy is beginning to align with the understanding that conservation can and must be achieved in collaboration with Indigenous peoples (Colchester, 2004). Collaborative conservation practitioners from all sectors can join this movement. The limited recognition of Tribes in current collaborative conservation strategies provides a clear opportunity for research and progress (Cronin & Ostergren, 2007).

To understand why Tribes have not been represented in this conservation management strategy we have to understand the systemic obstacles that Indigenous peoples commonly face. Through extensive literature and field studies Colchester identifies five common Indigenous experiences (Table 2).

Denial	Rights to the land, access to natural resources, political rights, and the validity of customary institutions
Loss	Informal social networks and strength of the local economy as a result of disorganized settlement patterns
Undermining	Livelihoods, loss of property, little to no compensation and eventual poverty
Disruption	Customary systems of environmental management from forced resettlement that weakened leadership systems and cultural ties to the land
Weakening	Cultural identity as natural resources outside of protected areas are threatened

Table 2. Common obstacles facing Indigenous peoples in conservation policy (Colchester, 2004).

This chain of obstacles builds persisting, exclusionary conservation management strategies. Many point to the absence of reform of government policies and laws, resulting in cascading effects on state and local conservation agencies and organizations. These organizations may lack the appropriate training, staff, and capacity to work with communities and reform their existing conservation management strategies (Colchester, 2004).

Success of landscape-scale conservation relies on representative partnerships. The historic displacement of Tribes by the U.S. government from their ancestral homelands to reservations on

"marginal lands" has caused geographic remoteness and economic challenges. As a result, Tribes are among "the most vulnerable populations to climate change" (McCarthy et al, 2018). Identifying and evaluating Tribal involvement in conservation projects allows us to contribute recommendations for restoring and maintaining resilient landscapes. We have an opportunity to learn from each other in becoming better stewards of natural resources as we experience rapid environmental change (Berkes, 2004; Chapin et al., 2009, 2011). Recognizing and including Tribal voices will improve conservation management strategies for future generations.

IV. Progress: Collaborative Conservation

Although Tribes have been largely left out of landscape-scale conservation, we can change the narrative moving forward and prioritize inclusion in conservation (Cronin & Ostergren, 2007). Complex, varied, mounting environmental challenges lie before us. Existing environmental problems, such as habitat loss and degradation, declines in landscape connectivity, and loss of species are being exacerbated by the unprecedented threat of climate change (Jarzyna et al., 2019; Mestre, et al., 2017; Segan et al., 2016). Given this trend, current conservation strategies may prove inefficient or ineffective (Mantyka-pringle et al., 2011). The current contemporary science paradigm does not allow for a worldview rooted deeply in seeing the natural environment as inextricably linked to everything like ritual and culture. A new view, when incorporated into large landscape management initiatives, will effectively manage and restore the land while healing relationships and communities, achieving true climate resiliency.

The conventional conservation movement in the United States has historically adopted a top-down, hierarchical approach towards land management with federal land management agencies overseeing the preservation of large swaths of land (Cronin & Ostergren, 2007). For instance, the U.S. Department of the Interior manages one-fifth of the nation's land (Leong et al., 2011). Federal agencies, such as the National Park Service, have largely viewed humans and nature as separate from each other and have devised management systems that emphasize preservation devoid of human presence. Furthermore, these agencies have promoted designated wilderness areas devoid of Indigenous activities (Martinez, 2003).

Beyond agencies, the North American approach towards wildlife conservation is also rooted in contemporary perspectives that believes wildlife must be protected from human exploitation (Keyser, 2018). However, landscapes and their species are usually adjacent to human development. Consequently, developed landscapes frequently encroach upon undeveloped lands, bisecting habitats whose ecologies have no understanding of human-devised borders and jurisdictions. Non-human species do not recognize human development, leading to population declines (Benitez-Lopez et al., 2010). Further, climate change is already influencing plant and wildlife ranges and phenology as well as wildlife migratory and reproductive cycles (Jarzyna et al., 2019). The combination of human development and its cumulative effects on the global climate and ecological systems presents a prime opportunity to re-evaluate the current paradigm of land conservation.

Collaborative conservation has a history dating back to the late 1960s. The Tahoe Regional Planning Agency (TRPA), established in 1969, was the first agency in the U.S. tasked with managing natural resources at a regional scale across state lines and jurisdictional boundaries. It set precedent for the potential of collaborative, cross-jurisdictional governance in the Lake Tahoe basin (NLC, 2018). However, the larger movement did not begin to take shape until the 1980s. While federal agencies have incorporated public input in land management decisions since the 1940s, it wasn't until the 21st century that policy directives began considering collaborative conservation as a viable option to addressing emerging environmental management challenges (Leong et al., 2011).

The collaborative conservation movement is rooted in the principles of alternative dispute resolution. After years of gridlock, legal battles, and growing hostilities, environmental practitioners were ready to try a new approach (Cronin & Ostergren, 2007). Rather than battling one another, early successful initiatives began to realize the value in decision-making based on mutual interests. A new paradigm was born out of a collective desire to overcome long lasting stalemates within the land conservation movement (Snow, 2001). Daniel Kemmis was an early proponent of overcoming environmental conflicts through a shared identity rooted in place. He advocated for collaboration in his book, *Community and the Politics of Place*, noting that people who share a place realize that the best way for said place to reach its potential is through working together (Greear, 2005). Further, collaborative conservation promotes voluntary consent in land management decisions rather than the historical management strategy of mandatory compliance (Snow, 2001).

Collaborative landscape conservation presents an opportunity to create, collectively, new land management paradigms more efficiently and effectively while beginning to right historic wrongs. The United States has always occupied Indian land. Due to settlers' legacy of displacement and oppression, Tribes in the U.S. hold only a small fraction of their ancestral lands (Middleton, 1979). However, that legacy is beginning to shift. A budding movement in land reparations is allowing Tribes to sit at decision-making tables at which they have historically been excluded. From the Maidu tribe in California, to the Ute Land Trust, to the Sogorea Te Land Trust, land is being repatriated to Tribes (Anderson, 2019; Kenney, 2019; Moreno, 2019). The land trust movement has started to embrace collaborative conservation that incorporates Native American land management practices. Repatriation of lands once occupied by Tribal nations is providing Indigenous communities an opportunity to reclaim and manage their lands, while beginning the process of healing and reconciliation between Tribes and the settler state.

While many Tribes occupy reservations, especially in the Western United States, and these reservations undergo strategic conservation planning, evident interests remain in prioritizing off-reservation landscapes with Tribal collaboration. Further, many Tribes are not federally recognized, and not all federally recognized Tribes have access to reservation lands or have had any land repatriated. To protect important species and landscapes, some Tribes have formed land trusts that hold conservation easements, which protect land from development in perpetuity. One example is the Blackfeet Trust, formed with the Nature Conservancy to protect grizzly bear habitat both on and off the Blackfeet reservation in Montana (Guercio, 2009). Another example is InterTribal Sinkyone Wilderness Council (ISWC), a land trust in California whose goal is conservation and protection of ancestral lands of ten federally recognized Tribes. They have acquired almost 4,000 acres of land, and they collaborate with the North Coast Redwoods District of California State Parks to "conduct restoration projects, stewardship work, and cultural activities" (Rosales, 2010). Furthermore, native-led land trust organizations such as the Native American Land Conservancy and the Native Land Conservancy are protecting ancestral lands outside of reservation boundaries (Middleton, 2011; Native Land Conservancy, 2018). Tribes may have legal and immediate goals to manage reservation land, but effective ecosystem management off-reservation is also economically, culturally, and ecologically important.

By pooling resources and widening the net of entities involved in land management projects, collaborating entities can act in greater capacities than ever before, strengthening their ability to adapt land management priorities to a changing climate and associated ecological realities. As collaborative conservation work involving Tribes is becoming increasingly important and large landscape conservation projects are emerging, non-Tribal entities must implement new, adaptive, and unique best practices when working with Tribes. A lack of resources, training, and knowledge on how to work

effectively with Tribes creates a barrier to achieving shared conservation objectives. The research outlined in this report undertakes a creative, combined methods approach to gain insights from both Tribal and non-Tribal perspectives on improving collaborative relationships to support equitable, landscape-scale conservation.

V. GIS: A Tool for Conservation

A geographic information system (GIS) is a powerful tool that allows users to ask questions, process data, and run analyses related to space and time. A GIS includes hardware, software, a database, datasets, and more related to geospatial information (Ballas et al., 2017). Many environmental management practitioners use GIS to better understand spatial relationships across landscapes and identify priority areas for conservation planning. ArcGIS Desktop is a commonly used software for conservation GIS analyses, complemented by companion software, such as Marxan for reserve design, CircuitScape for assessing landscape connectivity, and Maxent for species distribution modeling (Baldwin, 2014).

One common tool in the toolbox of a landscape conservation manager is a conservation prioritization of a service area. This can be as small as a few hectares or as large as the entire globe. One main step of building a conservation prioritization is identifying stakeholder interests. Managers must ask, "Conserve for what according to whom?" A comparison of nine conservation prioritizations reveals that a goal of environmental protection and conservation alone is not enough to know what or how to prioritize large landscapes or local planning parcels (Brooks et al., 2006). Because conservation is broad and many different stakeholders are represented in management, the stakeholder preference process is extremely tedious and sensitive. One scheme focused on endangered species may look entirely different from a scheme dedicated to carbon sequestration. While the end goal is similar – protection of the earth's natural resources into the future – and many of the variables are co-linear, spatially, the schemes may be night and day.

In this project, we chose to highlight the preferences of vested parties that are often left out of the prioritization discussion. Doing a cursory literature review of conservation prioritization schemes and reviewing our own educational and work experiences, we note that very few prioritization schemes developed by non-Tribal organizations incorporate Tribal input. However, all landscapes in the United States can be considered ancestral lands of various peoples.

One example of a Tribe that has been consulted on off-reservation lands is that of the Lower Elwha Klallam Tribe working with the North Olympic Land Trust (Northwest Treaty Tribes, 2018). The Tribe was hired to generate a conservation prioritization scheme of salmon habitat for the land trust to help them identify priority parcels around the Elwha River for conservation easements. The Tribe benefits in the fee-for-service collaboration and in the long-term protection of valuable, ancestral cultural and ecological resources.

SCOPE OF WORK

Our research began within a geographical scope of Idaho, Oregon, Washington, and Montana. We quickly discovered collaborative conservation projects beyond that scope. Therefore, we extended the geographic scope of our project to the continental United States; however, much of our research centers on the Western United States because of our original geographic scope.

Our work is guided by two research questions:

1. What practices can non-tribal organizations adopt to better collaborate with Tribes?

We investigated existing collaborative conservation projects partnering with Tribes to assess how practitioners were actively collaborating, what barriers they faced, and strategies they used to improve collaboration. *We hypothesize that there are specific practices that non-Tribal organizations can adopt to improve collaboration with Tribes.*

Our research was undertaken in the context of *Pathways Forward* and their definition of the collaborative conservation management strategy. The report outlines five themes defining the collaborative conservation management strategy:

1. Collaboration
2. Communication
3. Advancing Science
4. Investing
5. Policy

Our research directly reflects on each theme. Confined by this framework, we discuss the barriers, strategies, and practices our research uncovered within the context of each theme.

2. How can Tribal priorities shape a large-landscape conservation prioritization scheme?

The second research exploration is a spatial conservation prioritization of the Confederated Salish and Kootenai Tribes Climate Change Strategic Plan (CSKT) (2016) across Bitterroot Salish ancestral lands (Figure 1). This analysis provides a methodology for generating priority indices and a menu of decision-making tools for environmental managers focused on collaborative conservation. The analysis reframes the traditional lens of conservation prioritization.

Conservation Prioritization Analysis Extent & Context
Ancestral Lands of Bitterroot Salish Tribe (Western Montana)*
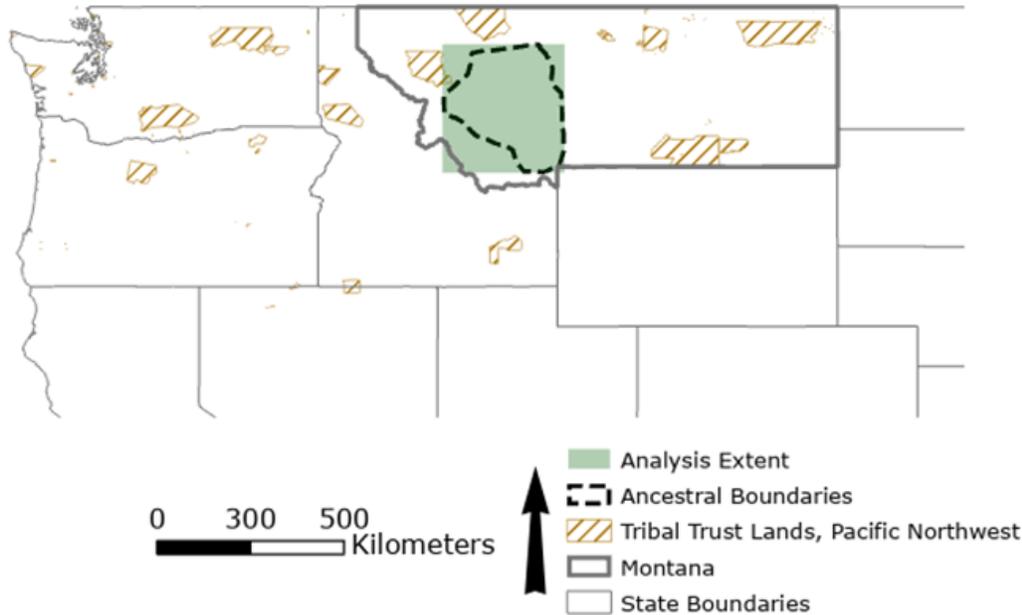
Legend:
- Analysis Extent
- Ancestral Boundaries
- Tribal Trust Lands, Pacific Northwest
- Montana
- State Boundaries

0   300   500 Kilometers

*"This map does not represent or intend to represent official or legal boundaries of any Indigenous nations." from Native-Land.ca

Data Sources: Esri, US Census Bureau, USDA USFS, Native-Land.ca

Figure 1. Geographic scope of conservation prioritization and ancestral lands of Bitterroot Salish.

METHODS

We chose an exploratory mix-methods approach to examine our research questions (Johnson & Onweugbuzie, 2004). The first question was answered through a qualitative approach while the second was answered through a quantitative approach. To begin this research, we first conducted a literature review. The literature review covered how to define and identify methods to examine collaborative conservation, identifying case studies of collaborative conservation projects including Tribes and identifying factors we need to consider when collaborating with Tribes.

I. Qualitative Approach

To begin the qualitative research, we used an exploratory case study method which allowed us to study the organizational and managerial framework described in *Pathways Forward*. We chose this exploratory case study approach because of the limited baseline information on collaborative conservation projects that include Tribes (Yin, 2018). We used this structure to identify collaborative conservation projects of interest, determine the relevant data to be collected, and how this compiled information applies to *Pathways Forward*. We utilized a combination of interviews, a survey, and an extensive literature review to learn the strategies that experienced practitioners are using to achieve effective collaborative conservation with Tribes. Our combined qualitative approach addresses the research question "What practices can non-Tribal organizations adopt to better collaborate with Tribes?"

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Literature Review

We performed an extensive literature review as the initial step in our mixed methods approach. We set out to build a foundational knowledge of Tribal realities in the United States, as well as the evolution and current state of the field of collaborative conservation. To conduct our review, we searched online scholarly databases through Duke Libraries and Google Scholar, using keywords such as "collaborative conservation," "landscape conservation," "Tribal lands," "NVivo analysis," "social surveys," "Native Americans," "GIS," "traditional ecological knowledge," and "qualitative analysis," to find pertinent literature. By compiling an initial list and summaries of related literature, our team laid the groundwork for developing interview and survey questions for subsequent phases of our research.

We supplemented our compilation with thorough examination of *Pathways Forward* (NLC, 2018). The report formed the basis of the questions asked to interviewees, in addition to the themes we used to conduct qualitative analysis on the interviews. As previously stated, the report identifies five primary themes (collaboration, communication/engagement, science-based planning, investing, and policy) that contribute to successful collaborative conservation projects and partnerships.

Events

One member of our team attended the Southwest regional summit, "Conserving our Diverse Tribal Natural Resources," hosted by the Indian Nations Conservation Alliance (INCA) and the Arizona Association of Tribal Conservation Districts (AATCD). The conference brought together partners to focus on conservation efforts managing Tribal natural resources, highlighting Tribal Conservation District case studies. The conference attendance allowed us to identify possible case studies, expand our relationships within the Indigenous community, and attend INCA's national conference in November 2019.

Two members of our research team attended the Indian Nations Conservation Alliance annual National Tribal Conservation Districts Conference in Tulsa, Oklahoma, November 5-7, 2019. They attended numerous sessions detailing USDA sponsored programs through the Natural Resources Conservation Service to assist Tribes with agricultural management on their lands. In addition, they participated in breakout sessions on topics including Indigenous fire management, conservation agriculture practices on Tribal lands, and expanding agricultural commodity opportunities for Tribes. They built relationships with various members of the Tribal and non-Tribal communities. The experience was eye opening, allowing us to witness the realities that exist in Indian Country as well as the dynamics between Tribal nations and the federal government.

Institutional Review Board (IRB)

To proceed with this research structure, we submitted a summary of our research to the Institutional Review Board for the Protection of Human Subjects in Non-medical Research (IRB) at Duke University. Due to the nature of our study, we received an exemption from IRB, meaning that our research did not meet the requirements to necessitate a review by the IRB. We developed a script for informed consent to notify the interviewees that their participation was voluntary and the information they provide would not be associated with their identity. We requested permission to audio record prior to the start of each interview. We accounted for the unique considerations that must be accounted for when working with members of Tribes, including disassociating identities of all of our interviewees for confidentiality.

Interviews

We conducted 14 semi-structured interviews with individuals who participated in collaborative conservation projects in the West. The interviewees were a mix of Tribal members and individuals

that have, or are currently conducting conservation work with Tribes. Non-Tribal respondents work in various capacities, including managers of Tribal and non-profit organizations, researchers, and government agency officials. Our aim was to gain insight from both Tribal and non-Tribal perspectives, as well as provide evidence from members working for public, private and Tribal entities. We utilized a semi-structured interview approach to keep standardized questions, while allowing leeway to ask additional questions pertinent to each individual and their respective work.

We identified existing collaborative projects of interest through the preliminary literature review and snowball method. As projects were identified, we conducted individual literature reviews on these projects to identify the amount of publicly available data. This preliminary research revealed that there was limited access to information and limited number of projects that included Tribes within our scope of interest. As viable projects were identified, a contact sheet was established in preparation for informal interviews.

To conduct the informal interview, we created an informal interview script and recruitment materials. The informal interview guide was created reflecting on the five themes of *Pathways Forward*. The objective of this guide was to have two or more questions to address each theme (see Appendix pg. 95). Interview questions were designed to highlight information that would be difficult to obtain through documentation and other publicly available sources. A qualitative specialist from the Center for Large Landscape Conservation reviewed this interview guide and questions were tested during the Indian Nations Conservation Association Conference in the summer of 2019. A centralized database was created to track the interview audio, documents mentioned by the interviewees, and pertinent documents derived from our literature review. In total, we spoke with representatives of 12 collaborative conservation projects.

Upon completion of the semi-structured interviews, we used NVivo 12 data analysis software to analyze the transcribed text from our conversations. We recorded our conversations, transcribed them into text format using Otter AI software, and then uploaded them into NVivo to code the interviews. We collectively created a master code "cheat sheet" that outlines each of our primary themes (otherwise known as "nodes"), with sub themes that fall under overarching themes (see Appendix, pg. 97). Each primary theme was based on the five aforementioned themes established in *Pathways Forward.* Aligning our coding with the themes presented in *Pathways Forward* guided our initial qualitative analysis, while building upon the foundation of best practices in the field that it established.

Survey
After analyzing initial interview results, we drafted an online survey in Qualtrics. The survey was intended to gather evidence to further inform findings related to the research question: "What practices can non-Tribal organizations adopt to better collaborate with tribes?"

The survey included questions on demographics, collaboration, and use of traditional ecological knowledge as described in the Appendix (pg. 97). Questions were formulated based on interview responses and were intended to verify interview findings by allowing collection of evidence from a larger sample size.

The survey was peer reviewed and revised following consultations with collaborative landscape conservation practitioners consulted at the Indian Nations Conservation Alliance Conference. Once the survey draft was finalized, it was reviewed and approved by Duke Campus IRB. We emailed the survey to contacts acquired through the interviewing process and additional contacts referenced to us by interviewees and professionals we met at conferences. We encouraged our contacts to forward

the survey to their colleagues working in collaborative landscape conservation; this snowball sampling allowed us to disseminate the survey to collaborative landscape conservation professionals working across the United States. Further, we incentivized survey participants with the option to enter a drawing for a $30 Amazon gift card. The survey was open from December 2019 – February 2020.

In total, 79 individuals responded to the survey, but thirteen responses were excluded due to incomplete information (completed less than 20%). Responses were prepared in Excel before being analyzed and visualized in Tableau. In Tableau, we created graphics visualizing responses to individual questions to summarize responses. Short response questions were coded in NVIVO alongside interview results.

II. GIS: CSKT Case Study

For a detailed description of geospatial methods, see the Appendix. We mapped the ancestral lands of the Bitterroot Salish by requesting maps from the Native-Land.ca API (Native Land Digital, 2020) and generated a buffered analysis envelope to mitigate edge effects (Figure 2). The general methods of analysis for developing priority variables include:
1. Variable development: species distribution modelling, reclassification, proximity tools.
2. Focal mean moving window ($20km^2$) and subsequent normalization to generate continuous priority indices ranging from 0 to 1, where 0 indicates low conservation priority and 1 indicates high conservation priority.
3. Combination of variables using Weighted Linear Combination (Drobne, 2009) for a cumulative prioritization of the landscape.
4. Reclassification of indices into low, medium, and high conservation priority using equal intervals.
5. Analysis of various landscape metrics such as core area and percent high priority cells across landscape for cumulative and variable prioritizations.

FINDINGS

I. Qualitative Analysis

The following discussion is based on our interview and survey results as well as relevant literature. We discuss our results in the context of *Pathways Forward's* five themes: Collaboration, Engagement, Advancing Science, Investing, and Policy. We use our data to identify barriers, propose key strategies to confront each barrier, and recommend basic tools and practices to implement each strategy. Overall, our discussion should be viewed as a starting point for how non-Tribal entities can improve collaboration on landscape-scale conservation projects with Tribes.

Collaboration
- Bringing individuals together to address a common interest -

To achieve collaboration, individuals must agree on priorities. Collaborative network structures are created by collectively defining the scope of work and the end goals of the project while including communities invested in the landscape. Collaborative projects often involve the creation of a strategic plan guided by a shared vision. A strategic plan includes methods and metrics to evaluate progress to determine if adaptation is needed to comply with the shared vision and goals (NLC, 2018).

We examine how strong partnerships develop to support collaborative work with Tribes. We conducted interviews with 14 individuals. Interviews were primarily conducted with one interviewee except for two that were conducted with two. All of the interviewees are members of collaborative conservation organizations or projects that are considering or currently working with Tribes. We interviewed a mix of Tribal members and non-Tribal partners working for Tribes (Table 3). All individuals had multiple backgrounds. For example, one individual was a Tribal member and worked at a Tribal non-profit that supports other Tribes across their region. Six of the interviewees were women and seven were men. The interviews took place from July 2019 to April 2020.

Pseudonym	Academic	Tribal Member	Non-Tribal Member Employed by a Tribe	Federal Government	Non-Profit Organization	Member of a Collaborative Conservation Organization and/or Project
Monica				x	x	x
Gail		x			x	x
Stephen			x			x
Karen					x	x
Raymond			x			x
Laura				x		x
Ronald			x			x
Anita	x	x				x
Tracie	x					x
Casey	x	x			x	x
Earl		x				x
Bradley	x	x				x
Donny				x		x
Madelyn		x				x
Mike			x			x

Table 3. Background information for each interviewee, identified by pseudonyms.

In addition to interviews, we analyzed 66 survey responses. Over 70% of our survey respondents were white with a slightly larger percentage of female respondents compared to male respondents (Figures 2 and 3). Respondents were distributed across all age ranges with the largest percent being 35-44 years old (Figure 4).

Ethnicity
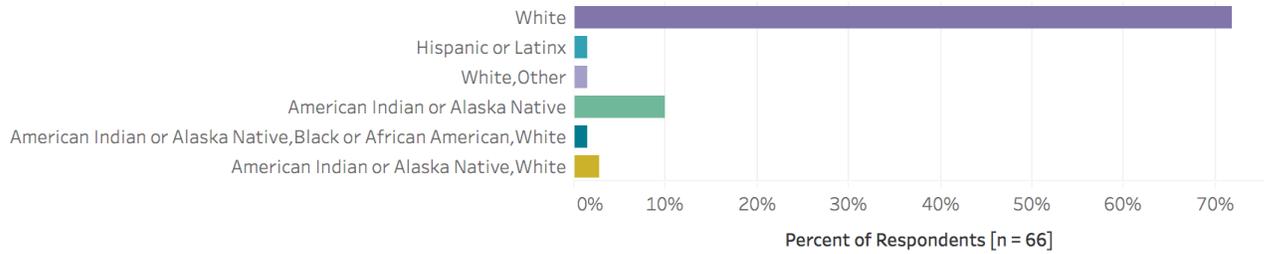
Figure 2. Survey response: Ethnicity.

Gender
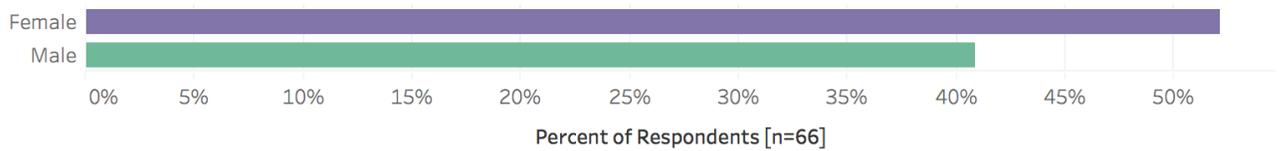
Figure 3. Survey response: Gender.

Age
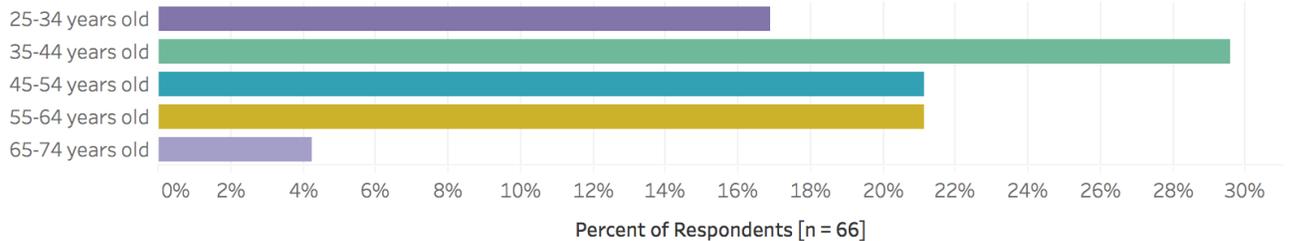
Figure 4. Survey response: Age.

Approximately 17% of respondents were Tribal members with over 80% categorized as non-Tribal members (Figure 5). We highlight that although our Tribal member response was low, 90% of non-Tribal member respondents are working actively with Tribes. Tribal members who participated in the survey were from the Confederated Salish and Kootenai Tribes, Oglala Sioux Tribe, Pahrump Paiute Tribe, South Fork Band of Te-Moak Tribe of Western Shoshone of Nevada, Pit River Tribe, Shasta Nation, and Dine'.

Tribal Membership

Percent of Respondents [n = 66]
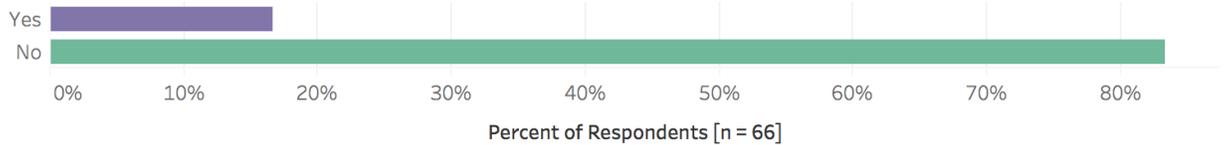
Figure 5. Survey response: Tribal membership.

Of those who reported being a Tribal member, 64% reported working in Tribal government or being a leader in their Tribal community (Figure 6).

Tribal Governance or Tribal Community Leader

Percent of Respondents [n = 11]
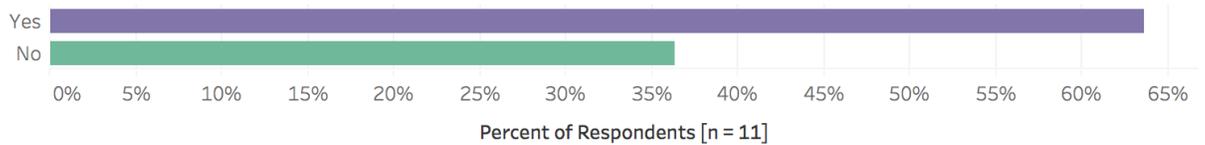
Figure 6. Survey response: Involvement in Tribal governance or Tribal community leadership.

A majority of our respondents are part of organizations that conduct work in the Western United States with the highest concentration of organizations working in Nevada and/or Wyoming (Figure 7).

Figure 7. Survey response: Geographic scope of organizations represented.

Only 12% of our survey respondents communicated that they were not collaborating with Tribes. Of those, over 70% had considered Tribal partnerships in the past (Figure 8). A variety of barriers can prevent these partnerships. The largest barriers mentioned include federal government administration, the challenges over the jurisdiction of land management and poor communication (Figure 9). Of the respondents who have previously worked with Tribes, less than 10% of our respondents state that collaboration with Tribes did not result in increased trust between partners (Figure 10).

Has the organization considering working with a Tribe?
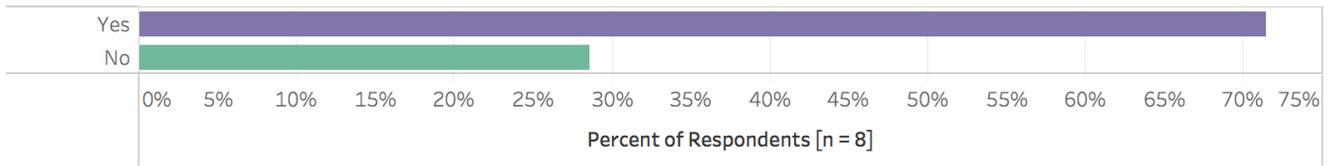
Figure 8. Survey response: Has the organization considering working with a Tribe?

What barriers prevented collaboration with Tribes?
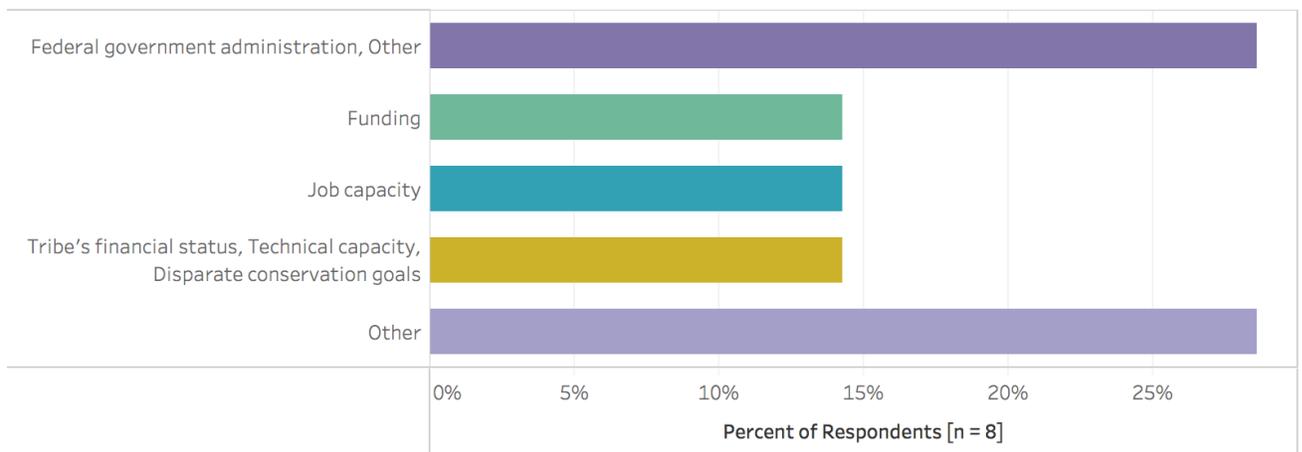
Figure 9. Survey response: What barriers prevented collaboration with Tribes?

Did trust increase as a result of the collaboration?

Percent of Respondents [n = 55]
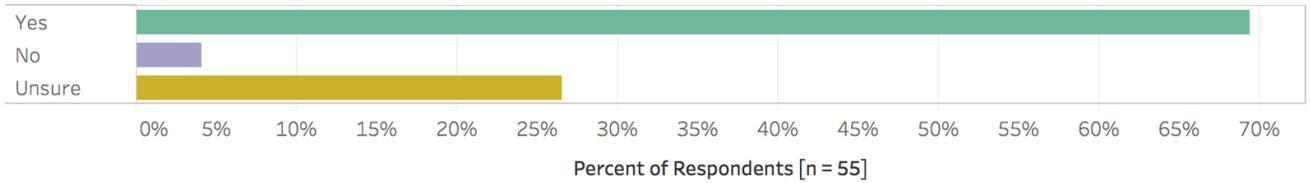
Figure 10. Survey response: did trust increase as a result of the collaboration?

To achieve collaboration, we need to understand the communities we are working with. The context and demographic results provide a portrait of the communities who supported this project. To achieve collaboration the first step is to identify communities you want to work with and what barriers may get in your collaborative's way. Trust is a foundational aspect of building these collaborative communities (NLC, 2018). This project recognizes that landscape-scale conservation takes long-term commitment. This work is not just for us, but also for future generations.

> *"It's about the future generations, it's about my grandchildren. It's about my great grandchildren."* – Earl

Barrier #1: Lack of Trust

To incorporate Tribes in a collaborative conservation management strategy, non-Tribal partners need to make a concerted effort to research and evaluate their personal gaps in knowledge. These gaps include general barriers that exist in working with Tribes. Tribes have unique attributes that need to be understood before decisions are made to collaborate with a Tribe. The objective is to break down the fear of failure and connect with communities to build trust and establish opportunities. We propose two strategies, "educate yourself" and "build personal relationships," and offer tools and practices to combat the larger barrier of lack of trust (Table 4).

Strategy	Tool(s) or Practices
Educate Yourself	• Training • Elder Committee/Civil Rights Committee • Respect Tribal Sovereignty
Build Personal Relationships	• In-person meetings and relational time • Break bread to build relationships • Build at the "Speed of Trust" (Forbes, 2018) • Seek Permission

Table 4. Strategies, tools, and practices to overcome lack of trust.

Educate Yourself

> *"Do your homework [...] don't show up not knowing who the leader of the Tribe is, how their government is organized. [...] people will turn up all the time asking Tribal councils to do things that the Tribes' constitution doesn't allow the Tribal council to do. And all these documents are freely available."* – Bradley

A lack of trust relates to a lack of understanding. Non-Tribal partners have the opportunity to overcome the mistrust held by Tribes by educating themselves thoughtfully and thoroughly. Informing oneself can be done in a variety of ways, but all require time and personally investing in understanding a Tribe's culture, history, government, and the U.S. policies that affect their governments, amongst other elements. It is imperative that partners take the time to read relevant documents and literature and participating in relevant trainings hosted by partner organizations, such as diversity, equity and inclusion (DE&I) trainings. Incorporating these tools and practices into collaborations will increase trust and lead to improved project outcomes.

> *"...we could be doing a workshop on cultural agility training with staff and agencies who don't know how to outreach to Tribes [...] we just try to keep those best practices of communication."* – Gail

To this day, numerous non-Tribal people and organizations fail to recognize the sovereignty, legal status, and authority of Tribes. This lack of understanding leads to some non-Tribal partners making inappropriate assumptions, such as believing that Tribes do not have equal footing at the decision-making table when developing and deciding on conservation initiatives. This has led to instances where the U.S. federal government has imposed its institutional ideas upon Tribes. Lack of respect for Tribal sovereignty can lead to an erosion of trust and deepening of fear held towards the federal government, hindering or preventing collaboration efforts. Non-Tribal partners must recognize the legal authority of Tribes and understand that every Tribe is different, with varying external relationships and differing needs. Non-Tribal partners must be open to adjusting their approaches on a case-by-case basis. There is no 'one size fits all' approach for collaborating with Tribes. Respecting Tribal sovereignty will promote deeper understanding and help build trust between partners.

> *"Tribes are not just another stakeholder and it's really insulting to pretend like the Tribal voice at the table is equal to the voice of the person who runs the NGO, or the person who is the district manager. It's not true. The Tribes have legal recognition as sovereign nations."* - Karen

Build Personal Relationships

Building personal relationships to overcome fear and lack of trust is paramount to developing strong partnerships between Tribes and non-Tribal entities. A crucial element to building personal relationships to overcome fear is open, in-person dialogue and honest discussion. Meeting in person is a simple step to build personal relationships. Nine out of fourteen interviewees acknowledged that face-to-face meetings played an influential role in building personal relationships and improving collaborative conservation initiatives between all partners. In addition, 56% of survey respondents used in-person meetings as a collaboration tool, and they were the most frequently cited tool (Figure 11). Intentionally incorporating relational time such as sharing food with Tribal partners in otherwise formal meetings can lead to deeper connections and understanding between individuals and increase the effectiveness of partnerships (Hurn & Tomalin, 2013). Face-to-face dialogue and incorporating relational time are paramount to building trust (Doyle-Capitman & Decker, 2018).

> *"It's not necessarily an efficient way of communicating, talking with individual community members. It's more personal communication, but it does a lot more to build trust than these more formal [meetings], like a townhall...maybe the most efficient way isn't the best way of handling these things... just building trust face to face goes a long way."* - Anita

What tools were used to support collaboration?

In-person meetings | 0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Percent of Respondents [n = 51]

Collaboration Tools
- Frequently Used
- Sometimes Used
- Unsure
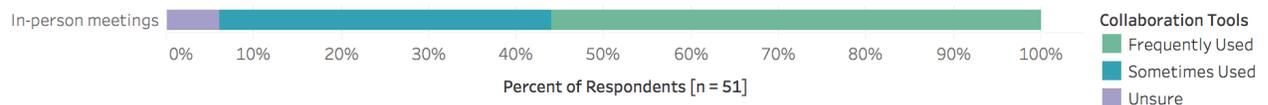
Figure 11. Survey response: What tools were used to support collaboration? In-person meetings.

Overcoming fear is an important step toward effective collaboration. Numerous non-Tribal interviewees and survey respondents cited fear of offending Tribal members as a reason why they have not partnered further with Tribes (Laura, pers. comm.). This fear can be overcome by building at the "speed of trust" and seeking permission. Building at the "speed of trust" recognizes that collaborative conservation strategies take time and social capital (Bradley, pers. comm.; Forbes, 2018). Listening and working slowly are key to developing trust and social bonds within a collaborative conservation partnership (Pretty & Smith, 2004; Gail, pers. comm.). Constantly seeking permission from Tribal members to incorporate their work in public relations materials is an important step in conservation planning. For some, it may mean consulting with Tribal elders to run ideas, drafts and proposed strategies by the community to ensure materials are culturally relevant and appropriate. One interviewee used this strategy to provide an opportunity for Tribal elders to review relevant materials that they hoped to showcase as an organization (Laura, pers. comm.). By building at the "speed of trust" and seeking permission, all parties can walk away knowing they did their due diligence to build trust and ensure success.

> *"It just takes time. [...] we're in a hurry up world, and we want to rush things. And sometimes we don't sit with that elder and drink coffee and breath in cigarette smoke long enough. And that's what it takes. And that's what folks don't want to do, you know, go visit with an elder outside of your eight to five. And that's when you start building relationships in Indian country. And there's a lot of agency folks that, you know, don't do that - won't do that. That's not part of their job description. And so, they fail."* - Gail

> *"Ask before you enter. Get prior consent and don't share information unless you have permission."*
>
> - Survey Respondent

Partnerships with Tribes

> *"We've got to invite Indian people to the table, organizations also need to invite non-Indians to the table. Because they're [non-Indians] the ones that eventually put the funding into these Indian organizations...and so we need to figure out ways to do that."* - Casey

To better understand how and why non-Tribal entities are partnering with Tribes we chose to examine what types of partnerships exist within collaborative conservation projects that our respondents are a part of. The type of partners involved in these efforts included private citizens, foundations, non-profit organizations, and State, Federal and Tribal governments (Table 5).

Collaborative Conservation Project Random Number Generator	Academia	Foundation	Non-Governmental Organizations	State Gov't	Fed Gov't	Tribal Gov't	Private Citizens	Industry
554		x	x	x	X	x	x	x
525			x		x	x	x	
453		x	x	x	x	x	x	
635		x	x	x	x	x		
422	x		x	x	x	x	x	
839					x	x		
218			x		x	x		
211	x		x			x		x
396	x	x	x			x		
776	x				x	x		
919	x	x	x	x	x	x	x	
884	x			x	x	x		

Table 5. Types of partnerships.

The majority of our survey respondents worked for a government agency or nonprofit/NGO (Figure 12). The proportion of respondents working at an organization with over 100 employees, almost 50%, is unsurprising (Figure 13). Most respondents' organizations are collaborating with one to fifteen Tribes, with the majority collaborating with five or fewer Tribes (Figure 14).
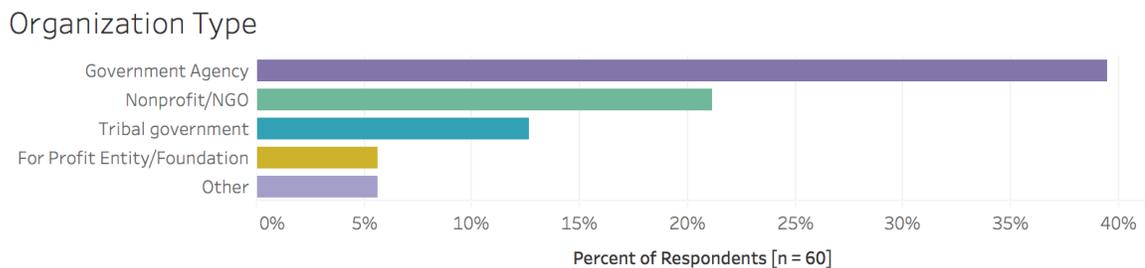
Figure 12. Survey response: Organization type.

Organization Size
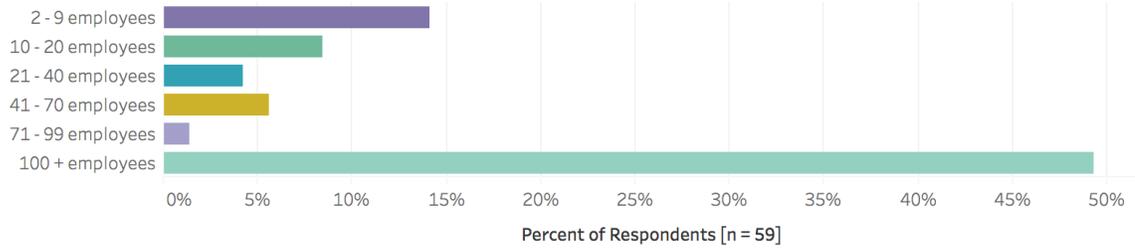
Figure 13. Survey response: Organization size.

Number of Tribal Partners
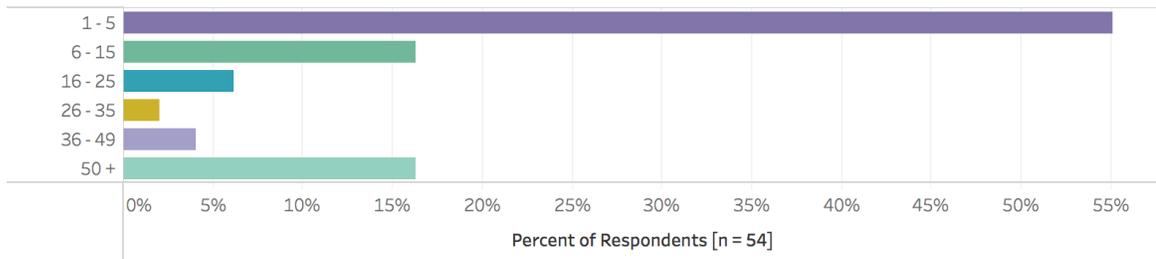
Figure 14. Survey response: Number of Tribal partners.

To support collaborative conservation work with Tribes, interviewees consistently pointed to the need for somebody to coordinate or staff the collaborative effort.

> "*...you gotta have somebody that's staffing for collaboration to really work. If you don't have that, if it's all equal, then everybody has to be responsible for their role and it's, it's a little more challenging.*" – Stephan

To effectively establish the network foundation of collaborative conservation, respondents mentioned cooperative agreements. Cooperative agreements mentioned include but are not limited to a Memorandum of Understanding or Agreement (MOU or MOA), Master Stewardship Agreements, and Mother Earth Agreements. Approximately 45% of our survey respondents used MOUs sometimes. Only 12.5% reported using MOUs frequently to support their collaborative efforts (Figure 15).

> "*...through a master stewardship agreement that we have with the US Forest Service, we layer in all these other trainings and employment opportunities and incubation of businesses and cobble together funding to really get a robust and comprehensive program out of everything that we do.*"
> - Gail

What tools were used to support collaboration?
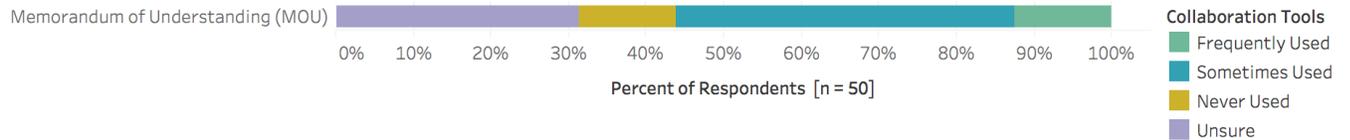
Figure 15. Survey response: What tools were used to support collaboration? Memorandum of understanding (MOU).

Of the projects that worked effectively with Tribes, survey respondents felt that Tribal input was adequately incorporated into the project (Figure 16).

Was Tribal input adequately incorporated in the collaboration process?
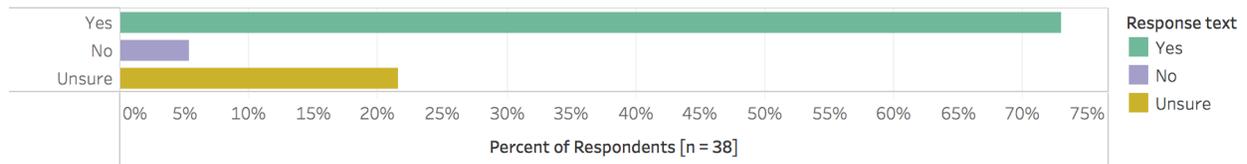
Figure 16. Survey response: Was Tribal input adequately incorporated in the collaboration process?

Barrier #2: Access to the Table

Reservation boundaries are often considered a "wall" for collaboration – Tribes are only consulted in instances where a project overlaps with Tribal lands, brought in last minute for token approval, or left out entirely. To combat this barrier, we recognize the need to provide "access to the table." This refers to providing opportunities to access the decision-making platforms or access to a meaningful partnership position. By building strong foundations and committing to long-term investment in partnerships (Table 6), these strategies will contribute to building bridges of collaboration, particularly with Tribes who have historically been left out.

> "*There was a big rush to get through the environmental review process as quickly as possible. And when you do that, you increase the probability that you're going to miss important opportunities for engagement. And my example... is not the only example by a long shot of where Tribes felt like they weren't engaged until the 11th hour….*" - Bradley

Strategy	Tool(s) or Practices
Build Foundations	• Include Tribal voices from the beginning • Cooperative Agreements
Long-term Investment	• Establish "Backbone Organization" (NLC 2018) • Build in Evaluation Tools

Table 6. Strategies, tools, and practices to overcome exclusion.

Build Foundations

> *"Coordinate early and often. Don't show up with the finished product and ask for input."*
>
> - Survey respondent

Inviting and incorporating Tribal input from the very beginning of a collaborative conservation project is key to getting Tribal buy-in, and overcoming the historic challenges Tribes have faced when trying to access the decision-making table (Bailey, 2018). Multiple participants in our interviews and survey note that, in their experience, Tribes were consulted at the midnight hour regarding a conservation project. This delayed inclusion created animosity and mistrust of non-Tribal partners, stalling or completely preventing a project from moving forward, leading to poorer conservation outcomes for a region. Formalizing partnerships is an essential practice to ensure that Tribes are proactively being invited to the table. Cooperative agreements formalize the role of Tribal partners within a collaborative. Approximately, 45% of our survey respondents reported "sometimes using" MOUs (Figure 15). These agreements can empower Tribes to take joint ownership of a project and minimize misunderstandings of partnerships roles within the greater collaborative effort. In addition, we found that 64% of survey respondents who identify as a Tribal member hold a leadership role in their Tribal community (Figure 5). Each Tribe is different, and it is important to consider including Tribal members who already hold a government or community leadership position. These individuals are currently invested in leadership positions and can contribute to providing Tribal partners with equitable access to the decision-making table. These practices and tools can help lay a strong foundation for collaborative conservation efforts to proceed in an effective way while ensuring Tribes carry equal weight in planning and carrying out a project for the benefit of all interested parties.

> "*The Tribal "consultation" happened after a major research project was designed and funded. Consultation was mostly a matter of sharing what was planned and the results, but not actually a process of true consultation in the design... Apart from the accuracy and cultural knowledge around a specific topic, there was not an opportunity for the Tribal consultants to actually influence or co-develop the resource that was being fact checked. And, there were no tribal contributors or major decision-makers re the content of the resource itself.*" - Survey Respondent

Long-term Investment

To partner with Tribes, entities must be ready to commit long term. Long-term investment can often be achieved through a "collective impact" organizational structure (Kania & Kramer, 2011). Partners from different sectors commit to a "common agenda for solving a specific social problem" (Kania & Kramer, 2011). This organizational structure works best when coordination, adaptation, and continuous learning are incorporated. Having one "backbone organization" that maintains a dedicated partnership coordinator or dedicated Tribal liaison creates a point of contact between organizations and exclusively commits capacity to partnership building (NLC, 2018). Incorporating this "backbone organization" practice shows a commitment by a collaborative to ensure that partnerships are not sidelined by other work. To adapt and continue to learn, building in regular partnership assessments helps to ensure all parties will stay informed and on the same page. Integrating these evaluation tools during the planning process enables the collaborative to slow down and give adequate time and input to review management objectives. These strategies help Tribes to maintain their access to the decision-making table, while reinforcing trust amongst all partners. Long-term investment will ensure quality partnerships and support Tribal partners in having a meaningful role.

Conservation Management

During our research, it became clear that there is not a one size fits all solution in Indian Country.

> "*First and foremost, don't assume that, that everybody in the Tribe thinks the same way and wants the same things. We have as much diversity of ideas in a Tribal community as is in a non-Tribal community, in a sense, it's a horrible fallacy to assume otherwise... Don't assume that one Tribe is it all like another; their individual sovereigns and they have different leadership, different ways of doing things, different histories, different treaties, different relationships.*" - Stephan

Additionally, conservation priorities may differ from non-Tribal priorities. As mentioned in our interviews, participants highlight the need to recognize the potential differences in priorities.

To examine this further, we asked survey participants what priorities on which their collaborative conservation focuses. For all respondents, wildlife conservation, landscape conservation, and working lands were the largest percentage of "high priority" work areas (Figure 17). Climate change was the largest "secondary priority" (Figure 17). Tourism, Food Sovereignty/Security, and Economic Development were "not a priority" for the largest proportion of all respondents (Figure 17). For Tribal members, water quality, cultural/heritage conservation and wildlife conservation were the largest percentage of "high priority" work areas (Figure 18). Biodiversity is the largest "secondary priority" for Tribes (Figure 18). Education was a "high priority" or "secondary priority" for Tribal members, whereas it was not considered a priority for all respondents (Figures 18, Figure 17).
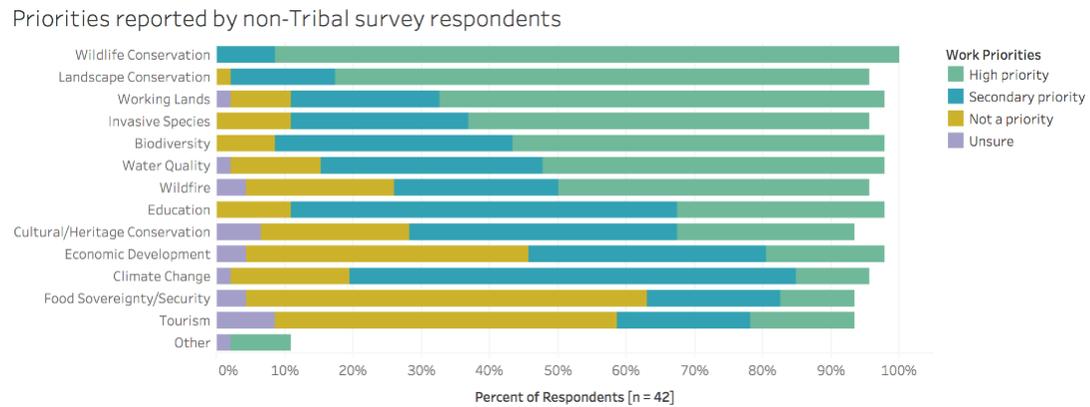
Figure 17. Survey response: Non-Tribal priorities.
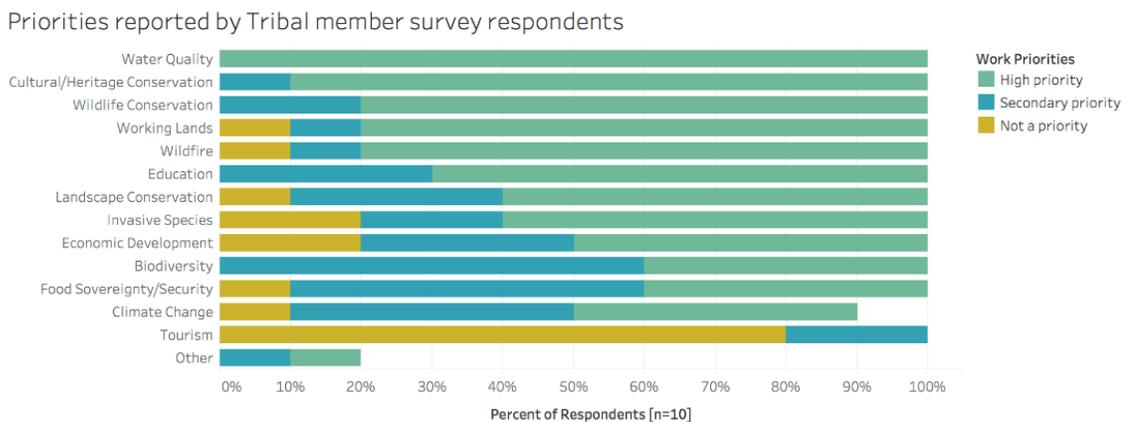
Figure 18. Survey response: Tribal member priorities.

To evaluate the long-term visions for a project, a collaborative conservation project must examine partner priorities. In our project, we learned the focus on restoration of natural resources in Tribal communities was often tied to restoring the community's identity.

> *"But there's few of us out here that need to figure out ways to, to bring back not only recognition, but bring back our own sense of identity, you know, sense of place. You know, that's important to me, and it's important to a lot of people..."* – Casey

Over 60% of our respondents stated that collaborating with Tribes influenced the project's methods (Figure 19).
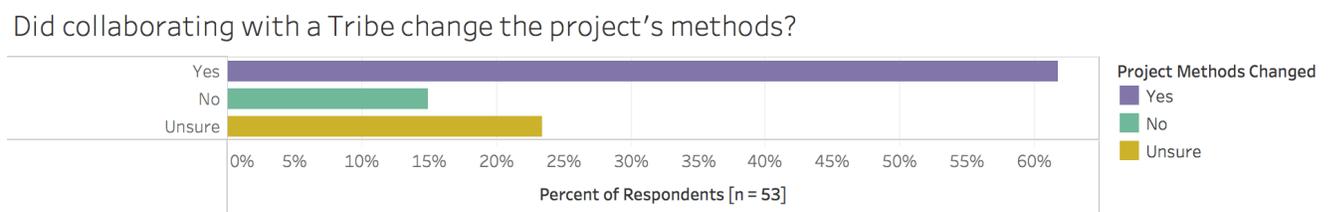
Figure 19. Survey response: Did collaborating with a Tribe change the project's methods?

Barrier #3: Colonial Conservation Management

> *"So, the extraction of natural resources, timber for money, water for money, again, it goes back to how I say the dominant culture, and capitalistic society is a dichotomy with how we should live on the land with traditional ecological knowledge. So even though that's the dichotomy, we're seeing areas that we can build bridges of understanding and trust, and start restoring."* - Gail

Colonial conservation management is often focused solely on environmental outcomes rather than incorporating human dimensions and cultural priorities (Domínguez & Luoma, 2020). Often, this management approach does not align with Tribal priorities (Johnson, 2019). In addition, we need to recognize the history of trauma caused by Tribes sharing knowledge with outsiders (Mathiesen, 2012). By focusing on adjusting attitudes and respecting proprietary information, practitioners can confront the barriers created by colonial conservation management.

Strategy	Tool(s) or Practices
Adjust Attitudes	• Facilitation Skills • Recognize and integrate conservation management strategies
Respect Proprietary Information	• Recognize data access reality • Subcontracting

Table 7. Strategies, Tools, and Practices to overcome the implications of colonial conservation management.

Adjusting Attitudes

When entering into a collaborative effort it is important to determine strategies to achieve mutually beneficial outcomes for all parties. Collaborative conservation brings together individuals who have a variety of professional backgrounds as seen in Table 5 – Types of Partnerships. Often our experiences and positions within an organization shape our expectations and priorities of projects. We cannot assume that one partner's priorities are another's. To combat these challenges, flexibility is needed to integrate partners insights, values, need and interest to shape the planning process (Doyle-Capitman & Decker, 2018). To integrate partners' perspectives, it is important to create a neutral space for collaboration. Partners should consider incorporating mediation and/or conflict resolution strategies. We found that 34% of respondents were unsure if they had used facilitated conflict resolution; however, 28% of respondents said they used this strategy sometimes. Often, facilitation skills are considered an effective tool to build trust in a variety of environmental planning processes (Clark & Braus, 2017; Gail, pers. comm.). Given these responses, we believe there is an opportunity for collaboratives to learn and integrate facilitation skills into their priorities. Incorporating other conservation management strategies is needed, specifically when priorities might differ across communities (Figures 17, 18). Often, non-Tribal conservation practitioners refer to Tribes' holistic planning methods (Mike; Stephan pers. comm.). These methods vary across Tribes; however, this approach often applies specific indigenous knowledge and values to conservation planning (Johnson, 2019).

"We wrote out the pillars of what it means to be [a member of the Tribe] ...and we use that to inform really everything we do and really holistic planning is that, indigenous way of planning. We use these [pillars] to frame our planning process. So, it's really just kind of weaved throughout the whole process as well as the evolving contemporary and traditional land users throughout the planning process. We ensured that all the inferences are there and it's not coming from us, it's coming from a true reflection of the community." - Mike

When non-Tribal partners involve Tribes early and often there are more opportunities to incorporate and learn from one another to integrate a variety of conservation management strategies to achieve mutually beneficial outcomes (Doyle-Capitman & Decker, 2018).

Respect Proprietary Information

Respecting proprietary information addresses the fraught history of Tribal knowledge being used inappropriately. Historically, Tribal knowledge has been shared without permission and misused (McCarthy et al., 2018). Thus, Tribes are often protective of their knowledge (Donny; Gail pers. comm.). Contemporary conservation managers must respect a Tribe's choice to withhold information they hold sacred and recognize knowledge may not be as openly generated and shared as in non-Tribal partnerships. By respecting a community's knowledge, non-Tribal partners can preserve culturally sensitive information, while strengthening the trust between partners (Laura, pers. comm.).

It is important to note that respecting proprietary information does not prohibit future information sharing, but should lay the foundation for future mutually beneficial relationships.

The lack of partner capacity can also hinder outcomes of a project. Tribal partners may lack capacity because of the centuries of injustice that have dismantled Tribal communities (Dominquez & Luoma, 2020). Interviewees mentioned that sub-contracting experts helps to alleviate lack of information or can increase technical expertise to achieve the objective of projects. One interviewee noted that a subcontractor was used to complete products and that information was shared back with the community, allowing the community to determine the appropriate use of their information, while completing the objective of the project (Ronald, pers. comm.).

> *"So, we contracted with [a professional educator group] to help write curriculums for schools. And so, we've been working to develop a curriculum based on the [collaborative project] ...we just had a workshop, where we brought all the after-school programs and educators from the Tribes and went over the draft curriculum."* – Ronald

Reflection on Collaboration

To examine the theme of collaboration in the context of Tribal collaborative conservation projects we examined what partnership structures exist and the internal decision-making mechanisms that are being used to achieve collaborative conservation work with Tribes. As mentioned in *Pathways Forward,* trust and "backbone" organizations were both recognized as important elements of collaboration (NLC, 2018). Our findings intentionally focus on practical ways to address the historic lack of trust that is felt by many Tribal communities toward non-Tribal partners (Table 4). Creating a collaborative with intentional governance structure such as a "backbone" organization was also relevant to collaboratives working with Tribes (Table 5). To aid in creating intentional governance and combat capacity issues we suggest a variety of tools including cooperative agreements building in evaluations tools, and subcontractors (Tables 5, 6).

The need to provide services to practitioners to increase collaboration skills was an important point noted in *Pathways Forward* (NLC, 2018). We echo the importance of these skills such as communication and compromise, but would like to highlight that diversity, equity, and inclusion trainings are of particular importance to increase collaboration skills, particularly when considering partnership with Tribal communities (Table 4). *Pathways Forward* emphasizes the need to share ecological, cultural and other information at multiple scales (NLC, 2018). This idea of sharing knowledge is important; however, it is imperative that partners keep in mind that communities differ in their openness to share knowledge and it is the responsibility of the partner to evaluate and respect partners' proprietary information (Table 6).

Social capital and "multi-generation focus" are highly important in supporting a collaborative's work (NLC, 2018). Our research reflects on the importance of the enduring power of generational support as an external practice to support engagement and communication of a project, rather than as an internal decision-making mechanism within collaboration. A common challenge to collaboration is the difficulty in measuring and demonstrating success (NLC, 2018). For Tribes, often, success is viewed at a generational scale not confined to a short timeframe (Survey Respondent, 2019). In our

research, we did not find strong evidence to agree with *Pathways Forward's* challenges of "meeting/collaboration fatigue" (NLC, 2018). This brief reflection on the similarities and difference of our findings and *Pathways Forward* is to help guide non-Tribal partners to consider how they can tailor this framework when working towards collaborating with Tribal communities.

> *"Collaboration only occurs among partners. It's not about giving or receiving but sharing. All parties must trust and have some level of respect for each other. Building a relationship of mutual trust and respect with Tribes takes time, commitment, and perseverance. You must communicate with them face to face on the landscape and ask them what they need from you, not what you want from them. Work with them, eat with them, live with them. Just like any other successful collaboration outside of Tribal country."* - Survey Respondent

Engagement
- Build a community to support solutions -

Communication takes both champions and supporters to disseminate the conservation story and contribute to a cause. A foundation of trust must be fostered, mutual understanding must be cultivated, and inclusion must be prioritized to allow partners to take ownership of the conservation story (NLC, 2018). To achieve effective engagement, communities must feel welcome to share their perspective. Additionally, participants within a collaborative must value shared knowledge. To examine this process of engagement when working with Tribal communities, we focused on how collaboratives support Tribal communities through self-determination. By examining external communication strategies, we hope to shed light on opportunities that other collaboratives are using to increase engagement and joint ownership of a conservation project with Tribes.

> *"I need champions to be with me and to help me and really believe that we can make a change, and we can make a difference."* - Earl

Facilitating Coordination and Communication

Relationships of trust, reciprocity and exchange and connectedness in groups is referred to as social capital (Pretty & Smith, 2004). Social capital is integral to achieving effective coordination and communication. Social capital can affect the power to influence communities to enhance collaborative management of natural resources. To build this social capital, common interest must be established and relational structures must be integrated into the partnership (Pretty & Smith, 2004).

We asked survey participants to highlight what drove their organization to work with Tribal partners. Approximately 87% of our respondents stated that they were motivated to work with Tribes because they share a similar geographic region or overlapping resource interests. Approximately

78% noted that they had similar issues or goals of interest and wanted to broaden their conservation network (Figure 20).

Motivation for collaborating with Tribe(s)
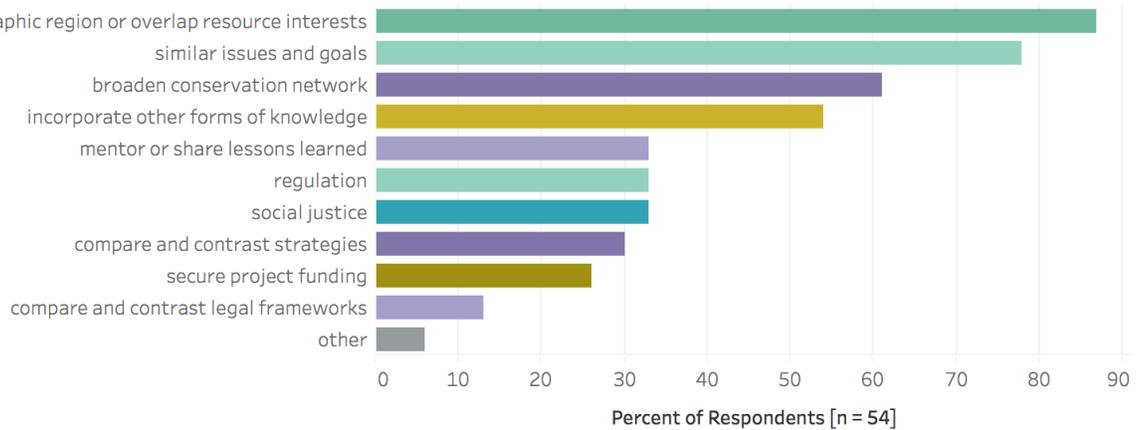
Figure 20. Survey response: Motivation for collaborating with Tribe(s).

Common interests can be further integrated across partnerships through sharing information across trusted networks. Approximately 47% of our survey participants frequently use peer learning networks and information sharing to increase collaboration and engage across networks (Figure 21).

What tools were used to support collaboration?
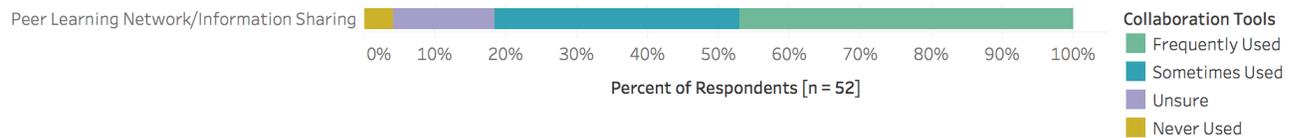
Figure 21. Survey response: What tools were used to support collaboration? Peer Learning Network/Information Sharing.

The use of partnership networks can foster common interests and influence priorities across collaboratives; however, incentives are needed to get people in the door. As a society, we are often motivated to act when something affects us personally (Kollmuss & Agyeman, 2002). Some of the interviewees mentioned that working with Tribal communities is not any different. It is often difficult to get communities to participate in natural resource planning (Earl; Casey, pers. Comm.).

> "...a lot of Indians aren't really worried about conservation and natural resources because they, they're not dependent upon that anymore. But they used to be..." - Casey

Often the motivation and interest in sharing knowledge is present, however it takes investing in understanding the challenges that a community faces to build better connections and increase incentive among all partners. By evaluating the challenges that a community faces, a partner can define where their project can fit to support a community's needs. Approximately 48% of survey respondents sometimes use education materials or activities when engaging communities (Figure 22). Education materials that showcase how a program directly addresses barriers a community may

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face are one way to encourage engagement. By dispersing these materials, partners can increase incentive for participation in their program (McKenzie-Mohr & Smith, 1999).
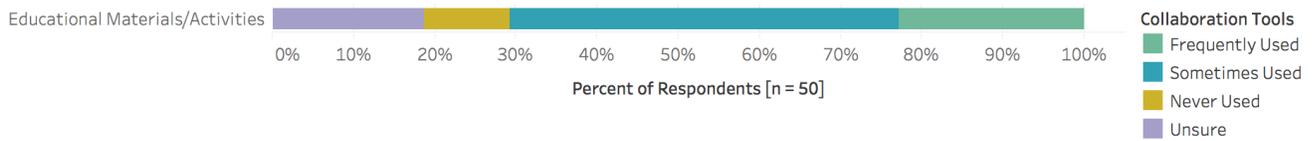
Figure 22. Survey response: What tools were used to support collaboration? Educational Materials/Activities.

Barrier #1: Lack of Incentive

When communities lack resources such as worker capacity or funding, the environment receives limited attention (National Research Council, 1996). To encourage more engagement by the community, we suggest three strategies to provide external listening and learning opportunities (Table 8). Encouragement can be in the form of incorporating intergenerational learning opportunities and inviting the community into planning meetings to contribute their knowledge and expertise. With support, a dedicated Tribal partnership coordinator(s) can lead and create engagement opportunities to combat the lack of incentive. As collaboratives combat this barrier, it is important to remember that individuals need to be invested and engaged to recognize that inaction in the management of natural resources can hurt their communities.

Strategy	Tool(s) or Practices
Value Generational Knowledge	• Intergenerational Knowledge Exchange • Incorporate Youth • Peer Learning & Information Sharing
Adapt Strategies to Refine Conservation Priorities	• Collaborative Training Sessions • Needs/Community Assessments
Support Tribal Partner Coordinator(s)	• Bolster respected Tribal Liaisons & evaluate work plans • Utilize agencies as conduit/facilitator

Table 8. Strategies, Tools, and Practices to overcome a lack of incentives.

Value Generational Knowledge

Knowledge is commonly passed down from generation to generation. As a result, there is great respect for elders within Tribal communities (Huntington, 2011). Of our survey respondents who reported using different strategies to incorporate traditional ecological knowledge, approximately 53% noted that they use intergenerational knowledge as a way to incorporate communities' traditional ecological knowledge into their collaborative projects. Interviewees cited that intergenerational knowledge exchange is also an effective way to 'pass the torch' from Tribal elders to the youth as a way to sustain conservation projects long term (Gail, pers. comms.). To reinforce the value of knowledge, collaboratives should propose peer learning and information sharing opportunities, when

appropriate. Peer learning and information sharing provide opportunities to build partnership networks, which are essential to engaging in collaborative work (Archi & Braus, 2017).

> *"And the youth, I think, is a huge part of it, too, because a lot of our Tribal youth, they won't ever get the opportunity to go to college or get that masters or PhD. But in three to five years of working on our youth crews, or working in job training, and placement within [our organization] ...they have the soft skills and the transferable skills to work within their own Native American departments within their Tribes."* - Gail

Adapt Strategies to Refine Conservation Priorities

Community and needs assessments are important tools in the planning process to assess and integrate adaptive strategies that can motivate communities to engage in "place-protective attitudes and behaviors" (Doyle-Capitman & Decker, 2018, p. 41). Each project needs to evaluate at what time it is best to include communities and how to include communities in the planning process (Doyle-Capitman & Decker, 2018). The benefits and challenges of including communities in the planning process should be considered during pre-project planning (Archie & Braus, 2017). Including Tribal partners in pre-project planning can enhance the utility of the project and the potential reach within the community (survey respondent, Casey pers. comm.; Archie & Braus, 2017). Interviewees often mentioned combatting this barrier by allowing individuals into planning meetings to share their personal concerns and lived experiences, or allow individuals to ask questions to help familiarize themselves with the project (Earl; Mike, pers. comm.).

> *"So, the folks that come to our meetings and sign in, I tell them, you are now a part of the climate change advisory committee and you are a lifetime member. And there's no way you can get off unless, unless you just pass away."* - Earl

Support Tribal Partner Coordinator(s)

Tribal partnership coordinators are the lead conduit to increase engagement between non-Tribal partners and Tribal communities. Ten interviewees identified themselves as being in a coordination role within their organization, and 51% of survey respondents defined themselves as a partnership coordinator. At conferences, we found that Tribal liaisons balance a lot of responsibilities,

including the pressure of establishing and maintaining trust with multiple communities. Interviewees noted that it is important to support Tribal members to take on professional positions such as Tribal liaisons. Often, Tribal members who hold a Tribal liaison position are widely respected by non-Tribal entities, as they are viewed as an authority on certain topics. This perceived authority can lead to more fruitful dialogue between Tribal and non-Tribal partners, leading to greater inclusion of Tribal input on collaborative projects (Bradley, pers. comm.) In addition, it is important to evaluate work plans to ensure engagement is integrated and prioritized. At times, government agencies can effectively act as a conduit for bringing together entities on a collaborative conservation project. Agencies can facilitate communication between partners, and drive projects forward. For instance, agencies can promote Tribal stories and voices by actively partnering with Tribes to appropriately share their artwork and cultural practices with the general public, utilizing communications channels that Tribes may not otherwise have access to (Laura, pers. comm.).

"You know, because I do have this position at a university and that's something that government agencies recognize as, you know, an authority on certain topics. I can engage in conversations with environmental regulators or energy regulators. And I might be saying the exact same thing that an elder said, or a community member said, but for whatever reason, it means more to some people when it comes from a university person." - Bradley

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Accountability

Accountability breeds commitment to a cause. To achieve accountability across a collaborative conservation framework, external collaborative outreach needs to exist. This includes finding ways to involve multi-directional information sharing and deliberation by development teams with various partners (Doyle-Capitman & Decker, 2018). Often, there are a lot of moving parts within multi-partner projects. Thus, to improve coordination as the project progresses, partners need to find ways to improve their external communication strategies across partners. To achieve accountability and commitment by partners, it is important to coordinate activities. Approximately 48% of survey respondents noted that they frequently use coordinated activities as a collaboration tool (Figure 23). Coordinating activities provides an opportunity to lean on partners to diversify responsibility across a collaborative partnership.

What tools were used to support collaboration?
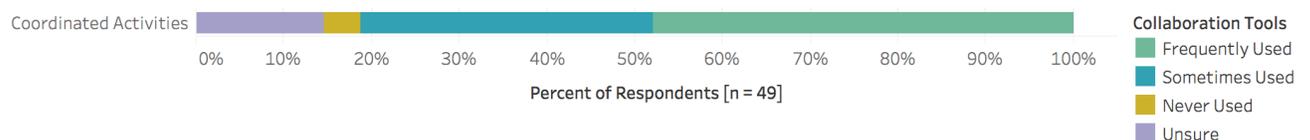
Figure 23. Survey response: What tools were used to support collaboration? Coordinated Activities.

Approximately 36% of our respondents noted that they frequently use strategic planning as a collaboration tool (Figure 24). Strategic planning sets a framework for partners. Each partner can take ownership of a component of the project. These structures help to facilitate external communication across partners to instill more confidence and trust across a partnership.

What tools were used to support collaboration?

Strategy planning (planning of long-term, continuous engagement)

Percent of Respondents [n = 48]

Collaboration Tools
- Frequently Used
- Sometimes Used
- Never Used
- Unsure
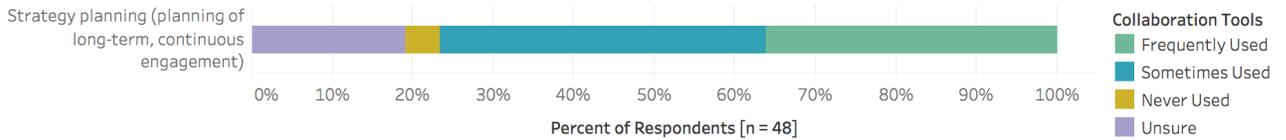
Figure 24. Survey response: What tools were used to support collaboration? Strategy planning.

> "*We had a two day strategic planning session with over 60 different stakeholders from traditional plant gatherers to farmers, to ranchers, to BIA staff and we met monthly for two and a half years...that developed all of our measurable goals and objectives for the next 10 years, that was directly from the community.*" - Mike

Barrier #2: Credibility Concerns

The lack of accountability in a partnership leads to limited investment in outcomes and a lack of ownership, often leading to goals of the project not being met (Hickman, 2018). We recommend three strategies to overcome this barrier (Table 9). To ensure consistent and appropriate expectations, responsibility must be diversified. Tribal voices must be given a continuous and accessible platform to participate and raise concerns (Doyle-Capitman & Decker, 2018). Identifying allies and/or "linkers" can provide examples and resources to guide collaboratives to implement successful, on-the-ground outcomes, and meet external expectations of the partnership.

Strategy	Tool(s) or Practices
Diversify Responsibility	• Evaluate Strengths, Weaknesses, Opportunities, & Threats (S.W.O.T.) • Identify working groups
Promote Tribal Ownership	• Highlight successful collaboration information rooted in Tribal ownership • Hire Tribal Members
Identify Allies or "Linkers" at Different Scales	• Attend Conference & Workshops • Use "Umbrella" Organizations

Table 9. Strategies, tools, and practices to overcome credibility concerns.

Diversify Responsibility

To encourage accountability, collaboratives must evaluate the strengths and weakness of their partners and delegate responsibilities accordingly. Alongside community or needs assessments, collaboratives should identify missing technical skills in order to determine external partners the collaborative should engage with. Evaluations such as S.W.O.T. help to assess each individuals'

strengths, weaknesses, opportunities, and threats to acknowledge that everyone brings something unique to the table (Lomakatsi Restoration Project, 2018). These evaluations can help to build steering committees or working groups to address the identified skills missing within the partnership (Labich, 2015). These steering committees or working groups can delegate responsibilities across identified external partners to address the partnership's needs. The identification of external partners can foster participation by local communities and better diversify perspectives to contribute to decision making responsibilities (Doyle-Capitman & Decker, 2018).

> "*So, [because communities] were involved in that development process and each of them signed up for [component of the project stating that they] would take care of this piece by this time. [Our hope is that] we should be able to just coordinate and make sure everybody is aligned going toward that same goal. And taking care of each of the components that falls within their wheel house.*" - Mike

Promote Tribal Ownership

To increase engagement, it is important to create narratives that appeal to diverse audiences (Doyle-Capitman & Decker, 2018). Often, non-Tribal partners have access to communications channels that Tribal communities may not have access to (Laura, pers. comm.). Non-Tribal partners should prioritize identifying Tribal partners who are willing to share their relevant culture, traditional practices, and success stories to encourage Tribal participation within a collaborative project. Non-Tribal partners should use this access to visit with communities and, with permission, elevate Tribal voices to share their experiences and knowledge with interested individuals. By uplifting Tribal narratives of success, prospective Tribal partners may feel encouraged that their own conservation and cultural priorities will be realized, spurring them to join conservation collaboratives.

In addition, it is important to foster external partnership with interested communities within a collaborative project. Many of the collaboratives we spoke with advocated for non-Tribal partners to hire Tribal members or encourage Tribal leadership to achieve components of the collaborative project (Survey Respondent, Mike & Gail, pers. comm.). Some common recommendations were to hire youth crews, work with Tribal colleges or partner closely with Tribal agencies (Gail, Mike & Madalyn, pers. comm.). These are a few examples of how non-Tribal partners can offer more engagement opportunities to Tribal communities, and be effective allies to Tribes in co-creating the conservation narrative, while elevating Tribal voices to increase and support Tribal ownership.

> "*We [visited] all the pow wows, all the agricultural events as well as hired [Tribal member] survey collectors from each of those five [target communities] ...and we had them go door to door targeting agricultural producers and sitting down with them to explain [our project]. I think that was why we were so successful in our [engagement by the community].*" - Mike

Identify Allies or "Linkers" at Different Scales

Attending conferences, workshops, and other in-person gatherings is valued as a way for non-Tribal entities to make connections and build relationships with prospective Tribal partners (Casey, Earl, Gail, Laura & Raymond, pers. comm.). Attending major conferences such as the National Congress of American Indians provides an opportunity for invested partners to meet with Tribal leaders who can be "linkers" to the community (Casey, pers. comm.; Pretty & Smith, 2004). In addition, other interviewees reiterated that meeting with Tribal cultural and natural resource departments is key to building allies to support projects goals (Gail, pers. comm.). There is growing evidence to suggest that when individuals are well-connected in networks, and their knowledge is sought, incorporated, and built into planning and implementation of a conservation project, projects are more likely to sustain stewardship and protection over the long term (Pretty & Smith, 2004). Outside of conferences, umbrella organizations, such as the First Nations Development Institute or Native Voice Rising, can be bonding (links between similar groups) or bridging (links between different groups) to increase social capital and develop opportunities to diversify engagement (Gail, Casey & Early, pers. comm.; Pretty & Smith, 2004).

> *"We work with cultural heritage departments in Tribes...natural resource departments in Tribes...there's no wrong door to how we work with Tribes."* - Gail

Decision-making Structure

The structure in which decisions are made often affects external participation and transparency in a collaborative effort. There has been a recognizable shift in public participation in the United States away from authoritative or top-down decision-making structures that are often inflexible and fail to encapsulate the values of the larger community (Doyle-Capitman & Decker, 2018). Although this shift is gradually occurring, we found that Tribal members impacted by a collaborative's decisions still feel left out (Casey, Gail, & Earl, pers. comm.). If inadequate communication and decision-making structures exist, such as participants being asked to provide input *after* major decisions have been made, respondents will be less likely to participate in the future (Doyle-Capitman & Decker, 2018; Johnson, 2019, Survey Respondent). This frustration is particularly hard felt by participants who feel that access to decision-makers has already been reduced because of the historic constraints of top-down regulations that they have little power in changing (Doyle- Capitman & Decker, 2018; Johnson, 2019).

> *"...I know it's really important to [make sure] Tribes [are included] at the very beginning. My grandfather used to tell me, [if] you want my signature at the end of [this project], he goes, you should have included me when you first thought of [this grant], because you're not getting my signature now, just as a token Indian."* - Gail

To incorporate community input into collaborative conservation efforts, 34% of our survey respondents noted sometimes using public hearings as a collaboration tool while only 11% frequently engaged in public hearings (Figure 25). This demonstrates a need for additional engagement with communities.

What tools were used to support collaboration?
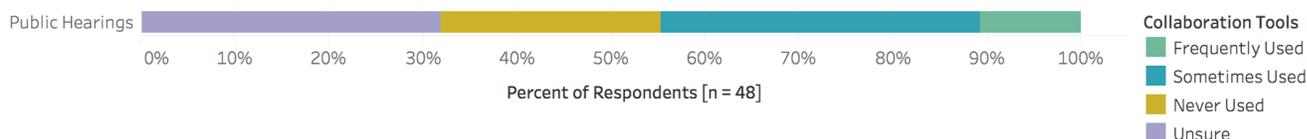
Figure 25. Survey response: What tools were used to support collaboration? Public Hearings.

Interviewees highlighted conducting and attending multiple events during the planning process to continually keep Tribal communities apprised of their collaborative efforts (Mike, Earl, Laura & Madalyn, pers. comm.). These continued external communication methods helped the collaboratives to collectively adapt conservation strategies and minimize top-down decision-making approaches (Doyle-Capitman & Decker, 2018).

"*...the past year at [a local Tribal celebration] we made sure that we did a spiel to help us kind of come out with the major findings of the report to report back to the community so they know that their [shared knowledge] is being used and their time wasn't wasted.*" - Mike

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Barrier #3: Transparency

Top-down approaches to communication often cut off the voices of those who will be impacted the most by a project (Doyle-Capitman & Decker, 2018; Johnson, 2018). Continually incorporating input and providing information to communities can be an effective solution to remedying transparency issues associated with top-down communication strategies (Doyle-Capitman & Decker, 2018; Table 10).

Strategy	Tool(s) or Practices
Report Back to the Community	• Town and/or community hall meetings • Direct communication with individuals • Regular updates to Tribal Council

Table 10. Strategies, tools, and practices to overcome transparency issues.

Report Back to the Community

Non-inclusive decision-making processes can damage relationship between the collaborative and the community. When decisions are restricted to the leadership of a collaborative, community

members can view the collaborative as taking an authoritarian approach (Doyle-Capitman & Decker, 2018). Interviewees often mentioned how frustrating it was to be told what to do by non-Tribal members instead of being included in the process (Earl & Casey, pers. Comm.). Providing opportunities through regular town hall-style meetings or events can combat these challenges (Mike, Earl & Madelyn, pers. comm.). However, sometimes the best form of reporting back is simply communicating with individual community members directly, as it has the added benefit of further building trust and relationships (Anita, pers. comm.). All Tribes are different, and different practices are preferred by different communities.

> "...I think what I've seen and what I've witnessed is that if you have...a group of non-Tribal people going into a Tribal group and telling them, you need to change your ways...they have a hard time listening to that." - Earl

After consultation and engagement events, it is important to follow up with the community. Interviewees noted the importance of communicating directly with Tribal leaders such as Tribal Councils to align collaborative priorities with Tribal priorities (Mike, Casey & Earl, pers. comm.). Reporting back to leadership and the community demonstrates respect for the Tribal communities' time invested and provides the community with an understanding of how their contributions will be incorporated into the collaborative outcomes (Doyle-Capitman & Decker, 2018). By incorporating this suite of practices into their engagement strategies, non-Tribal partners are more likely to cultivate mutual respect, and encourage Tribal partners to commit to working toward conservation goals.

> "For 30 days [the report] will be open for public comment and we'll poll at multiple locations across the reservation. From there it will go to Tribal Council they will approve it or deny it. So far, the components [of the project] have been very supported by Tribal Council. We've made sure that they are updated and involved through our whole process. So that when we get to the end, we know that we're supported and they know what is going on and it's not going to catch them by surprise or anything. So hopefully [our engagement] will reduce any resistance that may come about. In addition, we have kept the community involved and made sure we did the proper outreach to make sure that people [have felt] supported [during] the whole process." - Mike

Reflection on Engagement

> "*...we have to learn how to talk to [Tribes]...how to bring them to the table, how to see where they're comfortable, what they can tell us, what they're willing to tell us, and always make sure they know before [we] are even thinking about [sharing information].*" – Laura

To examine the theme of engagement in the context of Tribal collaborative conservation projects, we focused on how partners are creating opportunities to support Tribal communities through self-determination. *Pathways Forward* highlights the need to "replace talking with listening" (NLC, 2018). Our evidence strongly suggests that this is an important approach to increase engagement opportunities. *Pathways Forward* focuses on the power of storytelling to better "incorporate diverse perspectives, develop shared conservation priorities, and expand the very definition of conservation" (NLC, 2018, p. 15). We agree with the importance of storytelling, however our research tried to focus beyond this method and identify mechanisms collaboratives are using to encourage listening and storytelling to achieve more engagement with external partners and the community at large. In our discussion of collaboration, we found strong evidence to suggest that defining the problem by listening and finding shared understanding will lay the groundwork for collective solutions (Table 4, 6 & 7). An important benchmark mentioned in *Pathways Forward* is to connect people to information, to the landscape, and to one another by engaging individuals who have had long-term connections to the landscape (NLC, 2018). Our findings suggest that when permission is given it is important to promote Tribal knowledge and hire Tribal members to increase Tribal ownership of the collaborative's conservation story and increase community engagement (Table 9). *Pathways Forward* is explicit about the need to increase communication strategies to better highlight interdisciplinary intersections of landscape conservation projects (NLC, 2018). A majority of the collaboratives we spoke with worked to weave communities' holistic planning methods and traditional knowledge into planning (Table 7). Permission to use this knowledge was given by the community and Tribal members during planning meetings (Table 8). We found that this approach has not only helped to highlight the interdisciplinary nature of the collaborative projects with Tribes, but also to weave together diverse stories to integrate a shared sense of place across collaborative projects (NLC, 2018). An important component of achieving engagement is to make the projects relevant and inclusive (NLC, 2018). We identify ways to achieve this at the beginning of a project by listening to the Tribal community (Table 7, 8), during the middle of the project by including Tribal members in the planning process (Table 9), and the end of the project by reporting final findings back to the community and Tribal council (Table 10). Engagement is about creating opportunities to listen. This brief reflection on the similarities and difference of our findings and *Pathways Forward* is to help non-Tribal practitioners identify practical ways to increase engagement with Tribal communities.

Science Based Planning
- Informed data for informed decisions -

Our definition of science-based planning is expanding as we build more refined and accurate datasets. Innovative planning tools such as The Nature Conservancy's *Resilient and Connected Landscape for Terrestrial Conservation* are contributing to strategic prioritization of large landscape conservation projects (Anderson et al., 2016).

In the following discussion, we investigate how science-based planning is being used to support projects that involve Tribes. From our survey, we found that almost 62% of respondents reported that project methods changed due to collaborating with Tribes. Almost 53% of respondents reported that the project was supported primarily by contemporary science but used some traditional ecological knowledge (Figure 23). Of those using traditional ecological knowledge, 75% reported that traditional ecological knowledge influences conservation methods, 55% reported gathering oral histories, 55% used traditional ecological knowledge to prioritize conservation areas, 53% supported intergenerational knowledge sharing, and 39% reported doing community survey data collection (Figure 24). Considering the different ways in which traditional ecological knowledge can influence a project's methods, we focus on opportunities for the dual use of traditional ecological knowledge and contemporary sciences to support more holistic conservation goals.
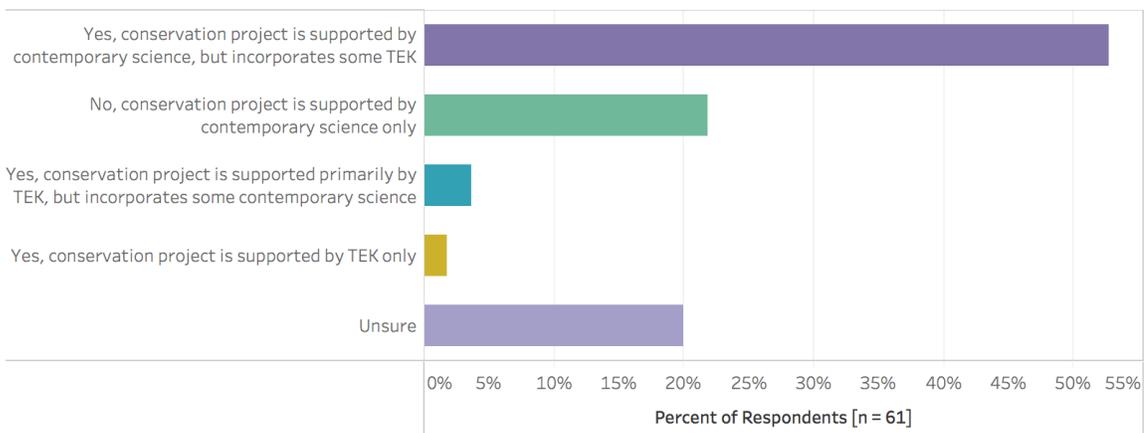
Figure 26. Survey response: Is traditional ecological knowledge being used to support project goals?

Figure 27. How was Tribal knowledge incorporated in the project?

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Barrier #1: Sensitivity of Information

Non-Tribal organizations should understand what knowledge is important to the communities they work with to value, support and promote the incorporation of traditional knowledge into a project. However, Tribal knowledge has historically been appropriated, disrespected, or misused at the Tribe's detriment (Rosa-Aquino, 2018). Therefore, it is of utmost importance for non-Tribal collaborators to first understand that Tribal knowledge cannot be treated like any other data set – it needs to be respectfully incorporated with the explicit consent of knowledge holders and Tribal leadership. Traditional ecological knowledge is inseparable from Tribal culture and therefore, to use it outside of the context of collaborating with a Tribe, is appropriation (Norgaard, 2014).

Strategy	Tool(s) or Practices
Respect Sensitive Information	• Establish data sharing protocols
Engage Knowledge Holders	• Cultural committees

Table 11. *Strategies, tools, and practices to overcome sensitivity of information.*

Respect Sensitive Information

Non-Tribal entities should not share or use a Tribe's knowledge without the explicit consent of the Tribe and/or knowledge holder. It can be difficult to know what information is appropriate to share and there may be uncertainty around how data or knowledge could be used in the future. One way to ensure that sensitive information is being respected is to establish clear data sharing protocols. This ensures that Tribal knowledge is not accidentally shared or used in an inappropriate way.

"We protect through policy procedures [and] protocol the areas that are really, really sensitive."
– Gail

Engage Knowledge Holders

"We used to have the culture committees come to the department annually and talk about things that they thought were important for us to be focusing on, or things about the environment that we needed to be mindful of [...] and there would be a planned field tour, and people would go out and we had a much closer relationship that way. [...] We have our employees thinking a little more culturally, a little more holistically about science and culture." – Madelyn

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Engaging knowledge holders individually within a Tribe or through existing structures, such as cultural committees or elder councils, is a crucial way to root science-based planning within community priorities. It also ensures that sensitive information is being respectfully gathered and used as knowledge holders will be directly involved or personally consulted when knowledge is integrated into project strategies and goals.

We highly recommend reading *Dibaginjigaadeg Anishinaabe Ezhitwaad: A Tribal Climate Adaptation Menu,* which provides an excellent guide (page 13-15) on how to approach and work with knowledge holders.

Barrier #2: Lack of Baseline Information & Monitoring

Conservation projects often need to get creative about what information they have, how to access more data, or how to create more data (Table 12). For example, one of our interviewees, Mike, described how their collaborative chose to create a survey with the Tribal community to combat the data challenges they faced. Similarly, monitoring the impacts of a project is crucial yet often deprioritized. Monitoring supports the ability to adapt to the changing needs of a landscape (Karen, pers. comm.).

Lack of data and monitoring are often associated with limited funding; this will be discussed in the next section, Investing.

> "*People who are actually out on the ground observing changes have to continue to be supported.*"
> – Karen

Strategy	Tool(s) or Practices
Identify Examples to Engage and Create "Cross-boundary" Projects	• Use your network or identified linkers for knowledge sharing • Evaluate adjacent partners strategic plans • Multiparty monitoring

Table 12. *Strategies, tools, and practices to overcome the lack of baseline information and monitoring.*

Identify Examples to Engage and Create "Cross-boundary" Project

Knowledge sharing between Tribes and non-Tribal partners can capitalize on the diversity of partners. By incorporating social capital structures such as bonding (links between similar groups) and bridging (links between different groups) (Pretty & Smith, 2004).

Accessing baseline data and collection of data can be done by overlapping data collection with other projects. Bringing data together from various parties will provide a more complete picture of the landscape and thus, better inform science-based planning. This can be challenging, but is an essential step to improve data access, especially when financial resources are limited.

> "*Probably the biggest problem [...] has been to figure out how we can all collect common types of information even if we don't need that information, recognizing that we all have limited resources. But if you can collect data consistently across a very large landscape, sometimes you will see results that you can't see at the project level. And but it's very, it's very, very challenging to get everybody on the same page. Everybody's very proprietary about their monitoring and evaluation protocols and procedures.*" – Stephen

Barrier #3: Misalignment of Expectations

Management plans should be built around cultural values, not just conservation values. Fundamental cultural differences can limit the capacity to collaborate on science-based planning, especially if non-Tribal partners do not recognize the differences. For example, timelines of a non-Tribal partner and a Tribe may not align. We recommend two strategies for overcoming the barrier of expectation misalignment (Table 13). Broadening the conservation lens to include cultural values will support a project integrating traditional ecological knowledge.

Strategy	Tool(s) or Practices
Bridge TEK and Contemporary Sciences	• Cultural conservation • Indigenous consultants • Understand the differences between TEK and contemporary sciences • Buffer timeline • Leave room for questions

Table 13. Strategy, Tools, and Practices to overcome misalignment of expectations.

Bridge TEK and Contemporary Sciences

Traditional Ecological Knowledge (TEK) is defined as "a cumulative body of knowledge,

practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmissions, about the relationship of living beings (including humans) with one another and their environments (Berkes 1999 p.8)". This knowledge contributes to Indigenous place-based conservation practices, which include the following characteristics: sustainable, culturally significant, time tested, efficient, environmentally beneficial, and stewardship induced (Johnson, 2019).

Fundamental differences between TEK and contemporary science include TEK being attached to a unique landscape, time, or person, versus contemporary science being considered "facts" that are universal and can be used in a variety of ways and in different combinations (Norgaard, 2014). In essence, "traditional knowledge is inseparable from culture" while contemporary science does not have strong cultural ties (Norgaard 2014 p.8).

Time-tested TEK methods employed by Tribes produce similar conservation outcomes as standard practices based in contemporary science that are institutionalized by government agencies. Thus, conservation methods based in TEK should be accepted by non-Tribal partners as viable (Johnson, 2019). This could aid in aligning expectations amongst collaborative partners.

As in every other aspect of working with Tribes, actively listening to Tribal leadership and continually thinking outside of the limited confines of colonial conservation practices as well as knowledge systems is essential. Intentionally broadening the conservation framework to include cultural values will also support the use TEK. This is especially important when using both traditional ecological knowledge and contemporary sciences to support project strategies and environmental outcomes. A broader framework will allow the two knowledge systems to coexist.

> "*I'm trying to reinforce culture as it relates to conservation, but it's more than that. It's about bringing back that energy to people who are slowly losing it and slowly eroding...so it's kind of like cultural conservation.*" - Casey

Reflection on Science-Based Planning

In *Pathways Forward*, the importance of having shared knowledge and data is discussed as well as the understanding that cultural, social, and economic variables are essential to consider in conservation planning. Using contemporary science and traditional ecological knowledge to support conservation outcomes on projects involving Tribes will create holistic outcomes that value not just the environment, but cultural and historic resources as well. This field is now recognizing the need to incorporate cultural values into science-based landscape management. Some projects, such as the National Park Service's (NPS) mapping of "Indigenous cultural landscapes" in the Chesapeake region, incorporate methods to quantify or map cultural landscape values. However, limited methodology exists to date (NPS, 2019, p. 29). We echo the importance of expanding and creating new planning tools to better incorporate social and ecological resources when mapping conservation priorities as discussed in *Pathways Forward*. Our geospatial case study is an example of how social and ecological resources can be used for conservation prioritization.

With science-based planning, there are particular considerations that must be made when collaborating with Tribes. First, non-Tribal partners need to avoid appropriation, misuse, or breaches of privacy by carefully consulting and collaborating with knowledge holders (Table 11). For many projects, creatively accessing and generating data, for example through multi-party monitoring schemes, will further support a collaborative's capacity to achieve project goals (Table 12). Finally, non-Tribal partners wishing to collaborate with Tribes and incorporate Tribal knowledge must consider the fundamental cultural differences that exist between knowledge systems (Table 13).

Investing
- Sustained funding through innovative and traditional frameworks -

Investing involves providing landscape-scale collaborative conservation projects with long term, sustainable funding that provides the financial capital to see projects and initiatives to completion. Need for conservation funding has long outpaced the amount of dollars available. However, there is not just a lack of funding for conservation work, but a funding gap for the collaborative process itself (NLC, 2018). The projects and collaboratives that we examined largely depend on federal government funding, but some have pursued alternative funding sources.

Overall, questions posed to our interviewees and survey respondents did not center on investment strategies, so we lack extensive data on how to improve investing mechanisms for collaborative conservation initiatives. However, numerous respondents cited a significant deficit in capital for conservation efforts as a primary barrier to effective collaborative landscape conservation. This reality is pervasive for Tribal natural resource management agencies, largely due to limited federal funding and associated underfunded agencies. For instance, only .007% of state funds received from the U.S. Fish and Wildlife Service were made available to federally recognized Tribes in 2010 (Gautem et al, 2013). Furthermore, only one percent of Environmental Protection Agency funding is directed towards Indigenous lands (Clark, 2002). Funding was cited as a barrier to collaboration by approximately 15% of our survey respondents not currently collaborating with Tribes (Figure 9). On the contrary, securing funding was cited as a motivation to collaborate with Tribes by 26% of survey respondents (Figure 20). Contributors also acknowledged that Tribes have unique challenges that impede them from obtaining adequate conservation funding. For instance, only a small percentage of conservation funding from NGOs ever reaches indigenous communities, despite significant overlap between protected areas and Indigenous lands (Dominquez & Luoma, 2020). Thus, we explore two barriers and associated creative strategies for acquiring funding for Tribes and non-Tribal partnerships. In addition, we discuss a barrier and associated tools intended for entities dispersing funds, so they can expand funding opportunities for Tribal partners.

> **"***Capacity and funding are the two things that I see Tribes struggle with throughout the US.***"**
> - Survey respondent

Barrier #1: Lack of access to sustained capital

> "*…lack of capital. That's always a big problem on Indian reservations, because our lands are held in trust. And we have a different land tenure status with the United States and the fact that we can't access capital readily.*"- Casey

A primary impediment to long-term investment is limited access to sustained capital. There is a lack of grant funding available for conservation projects, and existing grants usually fund projects in one to two-year intervals. This narrow duration only allows organizations to fund seasonal or short-term positions, preventing partners from hiring a dedicated coordinator for collaborative projects. Grant announcements are not easily accessible, and are not marketed to just anyone (Laura, pers. comm.). This is a particular impediment for Tribes, as they often lack the resources,

such as reliable internet access, to be regularly searching for grant announcements through listservs or other channels. Furthermore, federal dollars can be impeded by government shutdowns, which stalls projects and has a grave impact on Tribal economies, as many members of Tribes work in public sector jobs, exacerbating the already existing socio-economic issues on reservation lands (Mike, pers. comm.; Toby et al, 2020). Lastly, although some Tribes have access to capital through gaming enterprises on their lands, this revenue is dedicated towards addressing social issues on native lands. Approximately only 63% of federally recognized Tribes operate gaming facilities (Conner & Franklin, 2019). For other indigenous communities, few other enterprises to generate self-sustaining capital exist. Therefore, Tribal nations remain largely dependent on external, inconsistent funding for conservation on their lands. We recommend two strategies for overcoming this barrier (Table 15).

> "*This is how I get that announcement - it comes to me in an email buried in other grants, and it's very much a form letter. And it just says...here is a suite of grant applications. It is very much a form letter that is cold and it's just like, boom, here's the money. Good luck. So that's not marketed to anyone. There's no fanfare about it. It just gets rotated to circles. If you happen to be in touch with the right people at the right time, then you get that information. If you're somebody who watches grants.gov, and you make sure that you're aware of those things, then you know about them. But I wouldn't say that anyone beyond people like myself...or people who are actively looking for grants, even know that those are available.*" -Madelyn

Strategy	Tool(s) or Practices
Diversify Funding Sources	• Get creative: Seek out private capital/corporate partners/investors/ internal revenue streams • Create free-standing funding sources • Acquire in-kind donations
Prioritize Strategic Grant-making	• Hire dedicator grant coordinator • Grant database • Support technical writing • Prioritize grants for monitoring & model projects

Table 14. Strategies, tools, and practices to overcome lack of access to sustained capital.

Diversify Funding Sources

> "*It's holding onto the funding too because funding is always a big problem. I've seen so many things fail because they started off good and then the funding got cut off and the whole thing went under the table*"- Casey

One way of overcoming a lack of capital is seeking funding from alternative sources. Diversifying funding allows initiatives to be more self-sufficient and opens the doors to new partnerships (Archie et al, 2017). One interviewee suggested Tribes with gaming revenue dedicate a percentage of their earnings towards conservation on reservation and ancestral lands. However, that may require changes to federal policies regulating gaming on reservations (Casey, pers. comm.). Another practitioner spoke about how their organization is working towards launching a private label to certify beef raised by members of the Tribe they work with as a means of generating private capital for the community, which can in turn be applied towards conservation (Mike, pers. comm.). Several others acknowledged that they are actively seeking out private investment and capital as a means of diversifying their funding streams (Ronald, pers. comm.). Emerging markets show financial promise as a potential alternate revenue stream for Tribal nations. Eight indigenous entities in the United States are selling carbon credits as a means of generating discretionary income, which is largely being invested in conservation efforts and purchasing previously lost ancestral lands. So far, California's cap and trade program has distributed over $500 million to Tribal projects for carbon credits (Kormann, 2018). One interviewee's organization has created a source of free-standing, non-federal funding through establishing a non-profit support service agency that was co-created by partnering Tribes and a state government agency. The agency provides match funding for state and federal grants (Stephen, pers. comm.). Non-Tribal partners can further support Indigenous partners through providing in-kind work, staff, and equipment for conservation projects on Tribal lands. (Stephen, pers. comms.). Overall, our findings indicate that reducing reliance on federal funding and grants through seeking alternate revenue streams is an important step towards overcoming the lack of access to capital for conservation in Indian country. Non-Tribal partners can support these efforts by dedicating their resources towards helping Tribes achieve greater economic self-sufficiency. Diversifying funding sources can help close the gap in funding for both collaborative, and on-the-ground conservation work.

> "*We're starting to get a little bit more into private lending. I know my supervisors probably on the phone call right now, looking at other options to give us more flexibility. The federal government is very, very specific.*" – Ronald

Prioritizing Strategic Grant Making

> "*So, like the Agricultural program, in particular, you know, all the hemp that they're starting to grow around here is because everybody else [is] seeing people making a lot of money. So, it's like changes like that. You got to see...people be successful, before you're willing to change. So, if they can demonstrate success by doing something that makes you smarter, adaptable, or prevent climate change impacts as much to the area, the more people start to do it. But it takes that bold person or the innovator, and usually that involves money, funding, definitely.*" - Ronald

Outside of private investment and enterprises on Tribal lands, grant funding can also help overcome a lack of capital for Tribes. However, there are special considerations to take into account when applying for grants to benefit Tribal entities. Hiring a dedicated grant coordinator for

collaborative projects is important, as a lack of one may lead to individual staff pulling their energy away from primary responsibilities to apply for grants that continue to fund their positions. Alternatively, projects can pool their resources by having all partners apply for grants to maximize the types of funding they can apply for, while sharing the responsibility for acquiring funds (Karen, pers. comm.). Budget equity between collaborators must be established, so if non-Tribal partners are awarded the funds, a fair amount of money still gets dispersed to Tribal partners (Mike, pers. comms.). Some non-Tribal partners have had their staff apply for grants specifically to continue their own work to develop monitoring programs on Tribal lands and act as a liaison between federal and Tribal entities (Raymond, pers. comm.). This strategy can help support technical writing internally, improving partner capacity to successfully acquire future funding. One respondent cited a need for strategically prioritizing grant funding for innovators, those that are leading the way on adopting new enterprises that can help support Tribal economies, while achieving conservation objectives. Within their collaborative, they see a need for funders to support emerging hemp ventures that are demonstrating success to the rest of the community (Ronald, pers. comm.). We witnessed Tribal members and representatives at a conference share similar sentiments with federal agents, calling for grant prioritization for hemp enterprises on Tribal lands so Tribes could become more self-sufficient and have additional discretionary funding to support conservation on and around their lands. There's also a need to prioritize grant funding for on the ground monitoring of the landscape, as so much of the funding for monitoring efforts has been cut (Karen, per. comm.). By prioritizing strategic grant funding, collaboratives can better support the needed conservation activities on Tribal lands.

"*We're very aware that Tribal people and NGOs have different funding pools. And with that in mind, we have all been applying for grants around this partnership.*" - Karen

Barrier #2: Financial Status of the Tribe

"*Once they 638 these contracts out, oftentimes, by taking it over, they also take over the funding mechanism of it too. And so, if the Tribe has a bad year, that program just goes out of out of the water...that's what you call 638'ing in Indian country.*" - Casey

The financial status of Tribal nations often impedes further investment with Tribal partners. Importantly, most Tribes lack 501c3 non-profit status, so the mechanisms of providing them with funding differ and are typically more challenging compared with other partnering entities. This is a significant impediment, as many Tribes are entirely prevented from applying to numerous grants due to their lack of tax-exempt status. This lack of status also impedes collaboration- approximately 15% of survey respondents not collaborating with Tribes reported the Tribe's financial status as a barrier to collaboration. In addition, Public Law 93-638 affects the federal funding provided to Tribal nations, as it allows Tribal governments to take on the responsibility of overseeing conservation programs on their lands. However, this autonomy often results a Tribe taking over the funding mechanism of the programs as well. This often results in poor conservation outcomes, as Tribes often do not have the financial capacity to sustain the program. We address Public Law 638 and its effect on investing in more detail in Policy. We recommend overcoming this financial status and legal barrier with creative strategies (Table 16).

Strategy	Tool(s) or Practices
Overcome Legal Barriers through Creative Means	• Evaluate treaty right tax exemption from IRS – Office of Indian Tribal Governments • Support individual Tribal members to create nonprofits

Table 15. Strategy, tools, and practices to overcome the financial status of the Tribe.

Overcome Legal Barriers through Creative Means

> *"It's also true that just because tribes themselves are not nonprofit, does not mean that people within the Tribes can't begin to have nonprofits. One of the people... we hope to bring more fully into this partnership is [name of individual's] [name of organization], which is a nonprofit based on the [name of Tribe] reservation that's engaged largely in educating youth and trying to push the Tribal governance toward a more environmentally responsible... they're getting pushed internally by this nonprofit...that has been extremely successful in getting funding because there just aren't that many nonprofits, especially in our area that are Tribally run and lead. So that's a strategy too. It's not just tribes themselves, of course, it's also individuals with interest being able to put together a platform to earn their funding."* -Karen

As for overcoming the lack of 501c3 status, one Tribal organization received recognition of tax-exempt status from the Internal Revenue Service by contacting their Office for Tribal Governments. They suggest other Tribes go through this process, as some Tribal governments may qualify for tax-exempt status through their treaties with the federal government (Madelyn, pers. comm.). Another means of overcoming Tribe's legal status is having individual Tribal members create their own 501c3 organizations, and then applying for grant funding that could be dispersed to the Tribal government or an organization affiliated with the Tribe. (Gail, Karen & Ronald, pers. comm.). Tribal partners and non-Tribal entities have avenues they can pursue to overcome the precarious legal status of Tribal nations.

Barrier #3: Funding Timeline and Requirements

> *"One of the things that we always talked about at our meetings is the regional Tribal operations committee was that, you know, even all of our funding is based on a European, European type of timeline. There is a timeline on everything. You, you get this funding from September or October 1 and has to be spent out by September 30. Well that's, that's not how we work. It's really difficult."*
> - Earl

Federal funding opportunities often have strict parameters, and require funding matches by the organizations soliciting the funds. This prevents partners from demonstrating their full financial commitment to their partners. Tribes often do not have the financial capacity to match funds, preventing them from applying in the first place. Furthermore, federal dollars also operate on a timeline that misaligns with Tribal governments. Federal funding operates on the fiscal year, or a 'European' timeline. Tribes do not operate in the same way. For instance, when a Tribal elder passes

away, the nation's government will temporarily come to a halt, preventing work on submitting grant applications and moving forward with federal funds (Earl, pers. comm.) This is an important difference and consideration when collaborating with Tribal communities. We recommend two strategies for overcoming this barrier (Table 16).

> "*One of the big challenges with that...is a lot of funding, federal funding grants and contracts require match funds, federal match funds...they want to see a 50% match before they throw their money into the pot. So, it's a cart before the horse problem sometimes. And that's a challenge for all of us in this business is making sure that you can demonstrate your partnerships before some of them are committed to because they you know, everybody wants, they don't want to jump in till they know that there's a commitment from the other side. So exactly match funding is a real booger to get around.*" - Stephen

Strategy	Tool(s) or Practices
Create Flexible Funding Structure	• Do your research: evaluate successful Tribal organization funding models
Provide Matching Fund Alternatives	• Waive or decrease matching fund requirements

Table 16. Strategies, tools, and practices to overcome funding timeline and requirements.

Create Flexible Funding Structure

Conservation projects and priorities shift and change as different perspectives are incorporated into collaborative projects. Establishing timelines, particularly when evaluating funding processes, are important components of project management, however it is important to recognize when and where it is appropriate to incorporate flexibility provisions (Archie & Braus, 2017; Joffrion & Fernández, 2015). To prevent reinventing the wheel for funding it is important to evaluate existing funding structures established by Tribal-led institutions. For example, the Lomakatsi model provides flexible funding to Tribal partners. This non-profit organization acquires funding from a combination of federal and state natural resource agencies, private foundations, and individual donors. The funds are then distributed to Tribes (Gail, pers. Comm.; Lomakatsi Restoration Project, 2018) In addition, interviewees mentioned the importance of prioritizing compensation for Tribal leaders for their contributions to a project as one funding mechanism (Gail, pers. comm.).

> "*What we planted around the riparian area was due to 88-year-old elder helping us and [they] were paid as a cultural monitor during that period of time...[we] really compensate our elders when they come out in the field and help to train and talk to the youth, just like we would have PhD.*"
>
> - Gail

To increase collaboratives knowledge about the challenges of funding Tribal communities we highly recommend reviewing several reports produced by the First Nations Development Institute (FNDI) and their partners, including:

- *Community Foundation Giving to Native American Communities and Causes (FNDI, 2018a*
- *Growing Inequity: Large Foundation Giving to Native American Organization and Causes – 2006-2014 (FNDI, 2018b)*

Provide Matching Fund Alternatives

We suggest that external funders, particularly federal agencies, either waive or decrease matching fund requirements to create a fair playing field for Tribal entities when they apply for grant funding. This practice is already being carried out by some organizations. The Network for Landscape Conservation's 2019 Catalyst Fund had no matching fund requirement, and issued 14 grant awards for conservation collaboratives working on landscape-scale conservation projects. A portion of the fund is specifically dedicated to Indigenous-led partnerships. This fund is supported by private foundations, which collaborative partners should consider when seeking out funding sources that have fewer restrictions than government-oriented funding structures (NLC, 2019). Private foundations may prove a viable alternative, especially for Tribal partners that are unable to match funds.

Reflection on Investing

Pathways Forward identifies two major funding impediments to advancing landscape-scale conservation: a lack of access to acquisition and easement dollars due to funding needs surpassing funding availability, and a deficit of funding sources that support collaboration efforts (NLC, 2018, p. 32). The report explores several emerging trends as potential additional sources of revenue for collaborative landscape-scale conservation, including quantifying ecosystem services and emerging markets such as carbon markets, green bonds, water funds and coastal buyout programs. One compelling example is California's cap and trade program to mitigate carbon emissions, as it allows land conservation as a means of mitigating emissions (NLC, 2018). Through our research, we discovered that Tribes are already beginning to improve their financial autonomy through this cap and trade program. Furthermore, the report highlights the need for conservation practitioners to look at markets that improve the viability of private lands, such as investing in local food distribution markets. There is emphasis on local governments, as they provide the largest source of conservation funding in the U.S., and more local governments are passing measures to provide additional conservation dollars to their jurisdictions. In contrast, none of respondents or interviewees emphasized local governments, possibly because they don't focus on funding Tribal entities. A top challenge to achieving collaborative conservation is funding backbone organizational support to see collaborative efforts through. Thus, the NLC highlights the need for additional investment and financial support for these backbone organizations (NLC, 2018, p. 39). To achieve more investment to collaborate with Tribes we highlight the need to fix existing financial mechanisms and implementation frameworks (Table 15 & 16). We echo the importance of increasing funding and agree that diversifying funding by targeting or encouraging the creation of sustainable funding mechanisms should be a priority (Table 14).

Policy
- Bolster collaborator capacity by improving existing legislative frameworks -

Policies that promote collaborative conservation with Tribes are still largely non-existent or fall short of what's needed to adequately support conservation in Indian country. While there is a breadth of conservation policies in the United States, they often address conservation issues with a siloed approach, and are insufficient to address landscape-scale conservation (NLC, 2018). There is misalignment between the political structures of Tribal Nations and federal, state, and local government agencies, impeding successful collaboration between Tribal and non-Tribal partners. Although our respondents stated that their organizations and projects have partnered with government agencies to acquire funds and resources for Tribal partners, resources remain under-allocated to Tribes. For example, only two percent of cost-share contracts awarded through the Natural Resources Conservation Service went to Tribal nations in 2017. There is a need to expand federal cost-share programs to help Tribal partners improve conservation outcomes on their lands (Johnson, 2019).

> *"Our Tribal leadership, policy folks, are absolutely essential to moving the ball on collaboration, intergovernmental collaboration, so you got to have that government-to-government relationship. And it's got to be tended and it's got to be understood by both parties."* - Stephen

Overall, our interviewees did not emphasize how policy can improve collaborative conservation with Tribes. Therefore, there are limited tools and practices addressed herein. However, some interviewees work for organizations that have partnered with federal agencies to develop initiatives to protect rangeland habitats and expand federal capacity to implement strategic conservation through interagency agreements (Monica, pers. comms.). Others work for organizations that are assisting Tribes with implementing Agricultural Resource Management Plans (ARMP), which allow Tribes to define management objectives for natural resources on their lands (Mike and Raymond, pers. comm.). The American Indian Agricultural Resource Management Act of 1993 authorizes Tribal governments to develop such plans in collaboration with the Bureau of Indian Affairs, which are binding on the federal government (USDC ND/OK, 2016). Others recognize that a strong government-to-government relationship must exist for effective collaboration with Tribal nations to occur (Stephen, pers. comm.) Some organizations serve as a conduit between federal agencies and the Tribes they serve to ensure agency work reflects Tribal policy, and upholds agency responsibility to protect a Tribe's trust resources (Stephen, pers. comm.). This work is sometimes supported by Tribal resolutions and Memorandums of Understanding (Figures 15 & 25). All in all, there is a gap between the need for additional on the ground conservation, and the policies to support it.
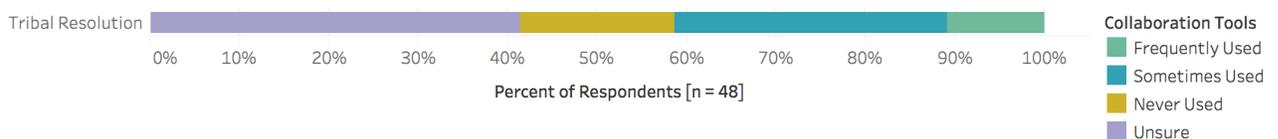
Figure 28. Survey response: What tools were used to support collaboration? Tribal resolution.

Survey respondents were also generally vague in their reflections and responses on how policies can advance collaborative conservation with Tribes. Approximately 8% of survey respondents said that they partner with Tribes due to regulation, whereas about 15% of respondents cited the federal government administration as a reason why they haven't partnered with Tribes. Federal regulation appears to be both a catalyst and impediment to collaborating with Tribes. There were generalized responses acknowledging a need for federal, state, and other government agencies to change policies and laws that affect Tribes. Furthermore, state and federal statutes differ in their requirements to incorporate TEK into programs, with some states having no requirement, while some federal agencies make an effort to incorporate it (survey respondents). This inconsistency could result in divisions amongst partners when it comes to collectively deciding on how to best proceed with conservation planning, and the degree in which it incorporates contemporary and Indigenous ways of knowing. Ultimately, lack of policy consistency across different levels of governance appears to hinder collaboration with Tribes.

We recognize that there is a multitude of policies at all levels of government that could play into collaborative conservation efforts involving Tribal nations. However, we will focus specifically on what we discovered through our conversations with practitioners and responses from our survey. We recommend additional research into how specific policies would influence collaborating with Tribes on conservation projects on a case-by-case basis. To learn more about this subject, we encourage our readers to turn to Beth Middleton's *Trust in the Land: New Directions in Tribal Conservation* (2011).

> "*It's always a challenge…to make sure that you're not just getting lip service…the more carefully that we articulate the policies and the priorities of the Tribes, and the more consistently that we ask the Forest Service to apply those, for instance… the better they get at talking the talk and walking the walk.*" - Stephen

Barrier #1: Institutional Knowledge

When turnover of administrative personnel occurs, there is a potential for limited guidance or support to be given to communities (Doyle-Capitman & Decker, 2018). In addition, the legal and policy realities for Tribes often differ significantly from those that apply to non-Tribal partners. We recommend two strategies to overcome these challenges (Table 20). A network of individuals can help better guide communities to achieve conservation outcomes. In addition, preparation for inevitable turnover is a priority as administration changes can shift policy priorities across a community. Recognizing differences in Tribal law and policy, and acknowledging a Tribal government's chain of command can also improve collaborators' working relationship with Tribal partners on landscape-scale conservation projects.

Strategy	Tool(s) or Practices
Prepare for Changes in Leadership	• Establish relationships to track changes in Tribal leadership and government
Understand Policy Realities	• Recognize in trust lands implications • Respect different policy priorities

Table 17. Strategies, tools, and practices to overcome lack of institutional knowledge.

Prepare for Changes in Tribal Leadership

Both Tribal and non-Tribal partners acknowledge that there is often significant turnover within Tribal Councils. Thus, external partners find it difficult to get on Tribal council agendas to move projects forward (INCA, 2019). To overcome this, non-Tribal partners must establish and sustain relationships with the Tribal leaders or those connected to them with whom they aim to collaborate. Not only will relationship building help build trust, it provides partners an ability to learn from Tribes when there are changes in a Nation's leadership. Being apprised of such changes allows non-Tribal partners the time to adapt to new realities and possible changes to Tribal policies, as well as potential changes to their working relationship moving forward. Being aware of this internal institutional knowledge can help ensure a collaborative conservation project continues to proceed smoothly in the midst of leadership turnover. Furthermore, leadership changes occur within government agencies that are collaborating on conservation projects. Keeping up with administration changes, and the associated shifts in policy priorities that occur can benefit other non-Tribal partners such as non-governmental organizations.

Understand Policy Realities

Numerous federal government policies impact Tribal nations in the United States. Namely, Tribes in the U.S. possess nationhood status, and thus retain powers of self-governance. The federal Indian trust responsibility legally obligates the U.S. government to protect Tribal lands. Much of the land currently occupied and used by Tribal nations is held in trust by the U.S. government. These in trust lands are managed by Tribal governments and held communally by a Tribe, but the federal government holds the legal title (NRCS, n.d.). Non-Tribal partners involved in collaborative conservation projects must remain acutely aware of this legal reality, as it can affect how Tribal partners can participate in a project. Particularly, this reality means that federal agencies are required to manage in trust lands with Tribal interests in mind. This requirement may lead to collaborative work with Tribes taking additional time and effort, as Tribal governments must be consulted and agree to management plans (Stephen, pers. comm.). This policy reality cannot be changed overnight, but non-Tribal partners must understand how it works. Furthermore, non-Tribal collaborators must recognize that internal Tribal policies often reflect the cultural and traditional values of a Tribe, and management of their natural resources ties back to their relationship with the Creator and greater view of the world (Stephen, pers. comm.). These policies guide Tribal partners' decision making in regard to conserving natural resources on and around their lands, which in turn can influence how they approach collaborating with outside entities. We suggest non-Tribal partners be mindful of this reality when looking to align policy priorities with Tribes.

> "*we have a memorandum of agreement with the [name omitted] national forests. And every year they bring their projects, their annual work to us, we look at it technically, we talk to them at the technical level. We identify policy issues, we take it back to our policy commissions and committees here at the Tribe, we get their input on it, we go back to the Forest Service and the supervisory level comes and meets with our governing body. And that's an annual basis just to make sure that they're not just talking to talk they're walking the walk relative to protection of the trust resources that they hold for the Tribes...the treaty rights are limited to open and unclaimed lands, which are*

public lands. And so the Forest service is a trustee of those resources and needs to manage it with the Tribes interests in mind." - Stephen

Barrier #2: Institutional Mismatches

Policy-wise, there remain significant gaps between what federal, state, and local government agencies acknowledge as sound science, and traditional Indigenous practices. These institutional mismatches pose an impediment to Tribal governments accessing federal conservation funding in the form of cost share programs (Johnson, 2019). Non-Tribal entities still often fail to recognize the legal sovereignty of Tribes, and thus consulting with Tribes is often done in a way that's "too little, too late" (Bradley, pers. comm.). Furthermore, Public Law 93-638 plays a crucial role in Tribal governments, as it gives Tribes the opportunity to establish their own government functions under contract with the Bureau of Indian Affairs (Casey, pers. comm.) However, transferring program administration responsibilities to a Tribe often also results in the federal government's abdication of funding the associated program, leading to funding shortfalls. To overcome these institutional mismatches, we recommend advocating for the recognition of Tribal sovereignty and legal representation (Table 18).

Strategy	Tool(s) or Practices
Advocate for the Recognition of Tribal Sovereignty and Legal Representation	- Support Tribal resolutions - Evaluate Public Law 93-638 - Supplemental Environmental Impact Statements - Indigenous Field Office Technical Guides (IFOTG)

Table 18. *Strategy, tools, and practices to overcome institutional mismatches.*

Advocate for the Recognition of Tribal Sovereignty and Legal Representation

There a significant need to recognize and respect Tribal sovereignty, values, and legal concerns when working on collaborative conservation projects. For one, Tribal resolutions, the strongest form of Tribal policy, must be supported by non-Tribal partners (Gail, pers. comm.). Some government agencies have already taken it upon themselves to incorporate Indigenous Stewardship Methods into their guiding documents, agency structure, and long-term vision for employees and Tribal partners (NRCS, 2010). For instance, the NRCS's American Indian/Alaska Native Employees Association envisions that the agency will work alongside Tribes to apply stewardship methods together to benefit natural resources and communities (NRCS, 2010). While the NRCS tries to reconcile contemporary and Indigenous ways of knowing in how the agency approaches working with Tribes, there is potential to go even further (Casey, pers. comm.). While the NRCS has Field Office Technical Guides, they remain imbedded in contemporary science. Thus, proposals to develop Indigenous Field Office Technical Guides (IFOTG) are gaining traction. The main difference between the IFOTG and NRCS's current management strategy is that conservation practice criteria would be determined through an Indigenous community-based decision-making process in consultation with USDA (Johnson, 2019). Moreover, due to the aforementioned in trust relationship that exists between the federal and Tribal governments, it's imperative that partnering agencies, and even private

partners, perform thorough and consistent consultations with Tribes. When the consultation process is not performed in good faith, one suggested remedy is to prepare a supplemental Environmental Impact Statement (EIS) (Bradley, pers. comm.). Supporting Tribal resolutions, IFOTGs, and good faith consultation with Tribes can all help overcome the institutional mismatches that exist that exist between Tribal and non-Tribal governments and other partnering entities.

Lastly, Public Law 93-638 must be evaluated, and possibly amended to allow for Tribal takeover of conservation programs while continuing a flow of capital from the federal government, as it gives Tribes additional autonomy without having to worry about a lack of capital for conservation programs on their lands. As discussed in Investment, Tribal takeover of conservation program funding often results in poor conservation outcomes, as Tribes often do not have the financial capacity to sustain the program. This could be overcome by federal agencies adopting policies under 638 that allow Tribes to facilitate a program, while still providing federal funding to finance it (Casey, pers. comm.) We believe it's important for non-Tribal partners to review the challenges Public Law 93-638 poses to Tribal communities. It is important to ensure agencies can continue to fund conservation programs that Tribes take responsibility of administering on their lands to secure sustained capital flows into the program. Alternatively, in the context of the NRCS, the agency could revise their policies to prioritize funding for conservation projects that incorporate cultural elements, giving Tribes more of an opportunity to acquire necessary funds (Casey, pers. comm.). Public Law 93-638 has an integral influence on Tribal lands. Non-Tribal partners should remain aware of its realities, and advocate for its reform when feasible, as it could lead to improved alignment between Tribal and non-Tribal institutions, thus generating improved outcomes for conservation collaboratives.

Reflection on Policy

Pathways Forward addresses how improvements in policy at all levels of government can support collaborative conservation initiatives. It explores how landscape-scale conservation is difficult due to the patchwork of public and private land ownerships in the U.S., calling for creative approaches from federal agencies to formulate policies that promote collaborative conservation across multiple spatial scales and jurisdictions. Recommendations include updates to and greater appropriations for existing federal legislation to promote collaborative landscape conservation, flexible and sustained funding from existing federal conservation legislation, and strengthening existing federal programs that already aim to bring collaborators together (NLC, 2018). In addition, it highlights the importance of including private lands in landscape-scale projects through adopting policies to promote working lands and incentives for improved private management and restoration efforts. Developing policy that allows federal agencies to share research and planning tools at scale with conservation practitioners is also key to implementing science-based planning across ecosystems. There is also significant potential to incorporate land conservation objectives into emerging climate policy to sequester carbon. Overall, *Pathways Forward* provides a sound foundation of insights and recommendations for advancing collaborative conservation at the landscape scale.

While *Pathways Forward* provides a comprehensive overview of the current state of landscape conservation efforts, there is limited discussion of the nexus of policymaking and collaborative conservation with Tribes. The report highlights the need for improved integration of Tribal and federal conservation programs, calling for greater incorporation of Traditional Ecological Knowledge in land planning (NLC, 2018, p. 47). Our findings indicate that the report's insights and recommendations are sound for collaborative conservation practitioners at large, but they lack in specificity for how policies can benefit Tribal partners. There are numerous barriers that influence advancing policy with Tribes, including differing political and legal realities for Tribal and non-Tribal partners (Table 17). We

highlight that these barriers are often rooted in the lack of legislation that requires or recognizes Tribal knowledge and sovereignty (Table 18). The limited legislative language and incorporation of Tribal priorities is also amplified by the turnover in Tribal and non-Tribal governments (Table 17). Our research aims to expand upon the NLC's recommendations, offering strategies for overcoming the unique policy barriers facing collaboratives that are working with Tribal partners.

Qualitative Findings Conclusion

Pathways Forward offers landscape conservation practitioners a definition of collaborative conservation, while providing insights and benchmarks to support this growing field of conservation. The five themes within this report touch on integral elements of landscape conservation: the central role of collaboration, what it takes to communicate and engage communities across a landscape, how to advance science to contribute to conservation efforts at a larger scale, the innovative investment strategies needed to sustain these efforts, and lastly, how to align policy to achieve landscape conservation (NLC, 2018). Our research reflects on the similarities and differences on how this framework applies to active collaborative conservation projects working with Tribes in the United States. Our hope is to provide a menu of options for collaborative conservation practitioners to consider to improve their collaborative conservation projects involving Tribes. We hope to support the ongoing efforts to recognize the important considerations that must be made to improve and increase collaborative conservation work with Tribes (Black, 2011).

II. GIS Case Study

The survey and interview findings elucidate many fine points about effective collaborations between Tribal and non-Tribal organizations. These findings relate to the importance of collaboration with Tribes and consulting with Tribes across entire landscapes to address the ecological and cultural connectivity that Tribes depend upon and value. The GIS analysis provides a prioritization scheme across ancestral Bitterroot Salish land as an example of how Tribal priorities can be applied to off-reservation land.

GIS Case Study: Priority Variables and Methods

The Confederated Salish and Kootenai Climate Change Adaptation Plan (2016) identifies nine priority variables for management focus in planning for climate change resilience across the reservation. We selected five of these variables to undertake a geospatial conservation prioritization across the Bitterroot Salish ancestral lands delineated by Native-Land.ca. We identified proxies for each of the variables to make evidence-based assumptions about the conservation value of cells in the study area.

Priority Variable	Focus	Proxy	Methods
Forestry	Concern about timber mortality, invasive species and decreased water holding capacity	Fire Regimes and Whitebark Pine (native species)	Dickson et al., 2014
Water	Quality and quantity of groundwater and surface water	Proximity to all water and impaired streams	Dickson et al., 2014
Wildlife	Terrestrial wildlife habitat	Land Cover	Dickson et al., 2014
Land	Preserve native plant communities	Cheatgrass (invasive species)	MTNHP, 2019; Phillips, 2006, 2017
Fish	Healthy fish habitat across Western Montana	Bull Trout (native species)	Endries 2011; Phillips, 2006, 2017

Table 19. Priority variables and appropriate proxies and methods used to model their spatial distributions.

We developed variable indices at 270m cell resolution ranging from 0-1 with 0 being lowest priority and 1 being the highest conservation priority cells. We combined these indices using the weighted linear combination method (Drobne, 2009) and reclassified the variables and cumulative result into equal intervals of low, medium, and high priority cells. Lastly, we analyzed landscape composition of the patches of high priority cells and the landscape as a whole using the R package landscapemetrics (R Core Team, 2019; Hesselbarth et al., 2019).
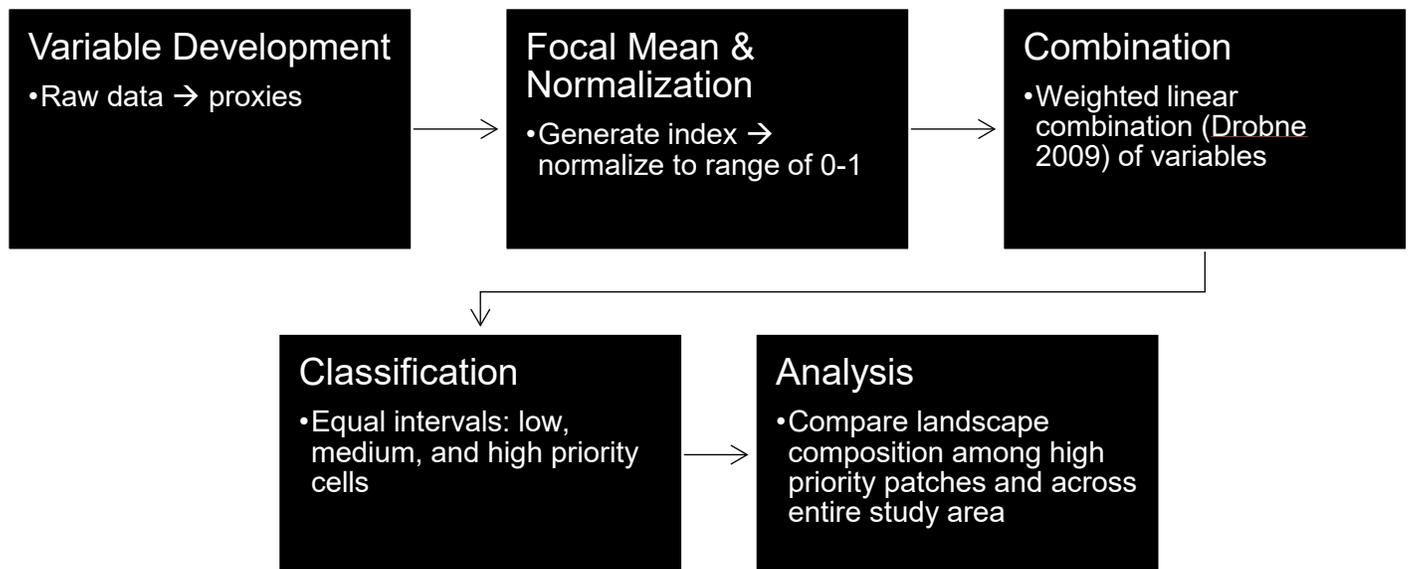
Figure 29. Generalized methods for GIS case study analysis.

GIS Case Study: Priority Variables and Methods

Priority Variables

Forestry

Wildlife

Water

Fish

Land

Montana

Priority
- High
- Medium
- Low
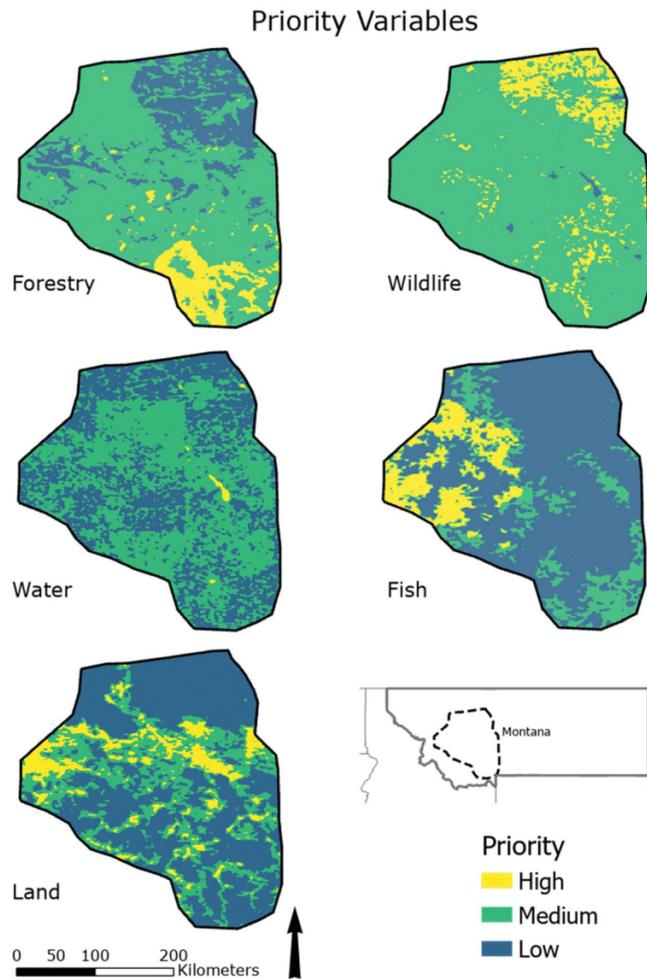
Figure 30. Spatial distributions of priority variables.

High Priority Cells within Variables:

Fish: minimally fragmented patches; greater distance between patches than other variables

Forestry: relatively small percent of landscape

Land: moderate percent of landscape; high total edge distance of patches throughout landscape

Water: smallest amount of land area and percent of landscape; shortest average distance between patches; greatest total edge distance

Wildlife: highest fragmentation; greatest area of landscape; small total edge length

Cumulative Prioritization High Priority Cells: highly uniform; 7.54% core area coverage of patches; 9868km^2 area (8%) across landscape; 3.6km between patches of the same priority level; 21,033km of edge distance throughout study area

Cumulative Prioritization

- High
- Medium
- Low
- Protected Area
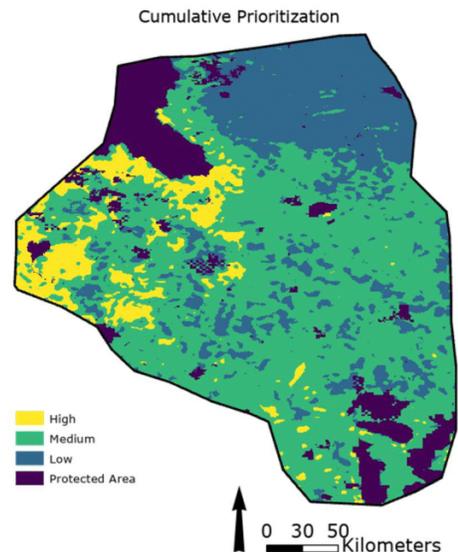
Figure 31. Spatial distribution of cumulative prioritization.

GIS Case Study: Priority Variables and Methods

Environmental managers can use continuous raster indices of priority variables to make environmental planning decisions. These decisions include selecting appropriate planning scales, units, and tools based on management objectives, collaborative capacity, and available resources.

Planning Scales	Examples
Watershed	Hydrologic Units
Ecoregion	Bailey's, IUCN
Political	County, Census boundaries

Table 20. Possible planning scales for conservation planning.

Planning Units	Uses
Hexagon Grids	Marine conservation; large landscapes
Tax Parcels	Incorporate property values
Raster Cells	Landscape-scale patch delineation

Table 21. Possible planning units for conservation planning.

Planning Tools	Uses
Simulated Annealing ex. **Marxan**	Reserve design and optimization
Integer Linear Programming ex. **Prioritizr**	Optimization

Table 22. Possible optimization planning tools for conservation planning.

The future of collaborative and large-landscape conservation necessitates cross—jurisdiction planning and creative tools to meet the needs of communities in the face of climate change and novel environmental challenges. Tribal priorities can and must be thoughtfully included in conservation prioritization schemes for environmental management to be truly inclusive.

CONCLUSION

Limitations

All collaborative conservation projects achieve collaboration in different ways. Additionally, all Tribes are different. These interviews were conducted to investigate how conservation projects that include Tribes accomplish or combat barriers to collaboration. For this project, we were provided with an exception to IRB review. As a result, we are unable to provide specific details about individual conservation projects or Tribal members who participated in the informal interviews. To supplement Duke University's IRB approval process, we attempted to comply with best practices established by the Native American Research Guidelines Advisory Committee (NARGAC) (Mihesuah, 1993). Due to time constraints we were unable to accomplish all of the relevant recommended guidelines. For example, Tribal members had the opportunity to provide input on our questions, however each Tribal Council was not able to provide direct input in a timely manner. To address this time constraint, we informed all participants that their participation was voluntary. Participants and interested parties were also informed on where to find our published final report. We highly recommend reviewing NARGAC guideline to incorporate in future academic research with Tribal communities.

Survey results are limited by the demographics of respondents. The survey did not collect detailed information on each respondent's work on specific collaborative projects. Each project is unique. Survey results can only provide a bird's eye glimpse of characteristics of collaborations across the country. Results do not provide a complete description of projects and do not account for differences in geography, scope of work, funding, and various other factors that may influence an organization's capacity to collaborate with Tribes.

Our findings are not comprehensive and should not be considered as definitive solutions to collaborating with Tribes. There is no one way to work in Tribal country. Hundreds of Tribes, and millions of Tribal members reside across their ancestral lands. While some degree of commonality exists in Indian Country, there is an incredible amount of diversity in culture, tradition, and natural resources, and respective approaches to conserving them.

Our work is simply aimed at encouraging conversation around indigenous justice and how conservation in the United States can be more equitable. Future research could aid this conversation, particularly investigating opportunities for policy and investing measures to positively impact landscape-scale conservation. Additionally, further investigation of existing collaborative efforts would be beneficial to continue to learn how practitioners are working together.

Conclusion

Collaborative conservation is a conservation management strategy that necessitates crossing boundaries. Our analysis seeks to further the *Pathways Forward* collaborative conservation framework to support opportunities to increase collaboration with Tribes.

This report provides valuable insights into the nuances of collaborative landscape conservation involving Tribes in the United States. The purpose of the report is to start a conversation and provide a glimpse of the challenges collaboratives around the country are facing. More importantly, it suggests key strategies that could be instrumental in strengthening collaborative efforts. Increasing ecosystem-scale collaboration and effectively including Tribal leadership is essential as communities face mounting environmental challenges. These challenges can be overcome through integrating Indigenous ways of knowing with contemporary science.

Effective landscape-scale conservation prioritization necessitates inclusivity in all steps of management, from identifying and acknowledging displaced inhabitants, to expanding scientists' methodologies and planning resources. Using tools like GIS to support community and ecosystem conservation can provide opportunities to align with the vision of practitioners and collaborators and create an advantage for all vested parties. Further, *Pathways Forward* highlights the need to develop methodologies to map and analyze cultural and ecological landscapes at a landscape scale. In our analysis, we highlight the importance and necessity of including and elevating Tribal priorities from the onset. Centering Tribal priorities improves contemporary conservation strategies because of the comprehensive cultural and ecological value Tribes can add to landscape-scale resiliency planning.

While it remains an emerging field, collaborative conservation has largely left out Tribal input. However, given current and future conservation challenges, it is imperative that collaborative conservation projects include Tribal perspectives in addition to contemporary paradigms. There are instances where non-Tribal partners are beginning to embrace this idea. For example, government entities are actively approaching Tribes to incorporate Indigenous perspectives into climate resiliency plans (Bradley, pers. Comms.; Vinson, 2019). In addition, TEK is already employed by some federal agencies in their conservation planning strategies (Johnson, 2019). These trends are encouraging, but further incorporation of Tribal perspectives is needed to achieve inclusive collaborative conservation.

When collaborating with Tribes, additional considerations must be made. While a number of strategies are similar to collaborating with any other partner, others are unique to working with Tribal communities. Various barriers to achieving effective collaboration, engagement, and science-based planning with Tribal partners exist. Furthermore, there remains a lack of investment and policy geared specifically towards supporting Tribal partners. We offer a number of insights that inform strategies and concrete practices to support overcoming these barriers; ultimately, we hope to collaboratively achieve landscape-scale conservation with Tribes, promoting our shared values of environmental protection and preserving cultural integrity in an era of unprecedented environmental change.

APPENDIX

FULL GIS CASE STUDY REPORT

Confederated Salish Kootenai Tribes Climate Change Strategic Plan

The Confederated Salish and Kootenai Tribes (CSKT) Climate Change Strategic Plan was written in 2013 by a team of Tribal leaders and external partners. The plan was updated in 2016. This plan lays out vulnerabilities and risks (Figure 1), goals, and actions for on-reservation management in the face of climate change. Two regional plans that set precedent for this climate change plan are the Montana Climate Change Action Plan and the Missoula County Climate Action: Creating a Resilient and Sustainable Community Report (CSKT, 2016). The nine priorities for management are forestry, land, fish, wildlife, water, air quality, infrastructure, people, and culture. The plan centers these priorities in their background, vulnerability and risk analyses, goals and objectives, and management actions. A study of traditional ecological knowledge as well as vulnerability and risk assessments were used to generate priorities and appropriate planning actions.

Vulnerability: "the susceptibility of a system to harm from climate change impacts."	***Risk: "the consequence of an impact times the probability or likelihood that the impact will happen."***

Figure 1. Definitions of vulnerability and risk according to CSKT Climate Change Strategic Plan (2016).

Vulnerability and Risk Assessment

CSKT departments and partner organizations utilized a Vulnerability Matrix, Risk Matrix, and Identifying Priority Planning Areas Tool (Figure 2) to determine and outline planning priorities. The vulnerabilities and risks are based upon the 2009 U.S. global Change Research Program assessment (Karl et al., 2009) and the regional trends and scenarios outlined in the Missoula County Climate Action: Creating a Resilient and Sustainable Community report (Koopman, 2011).
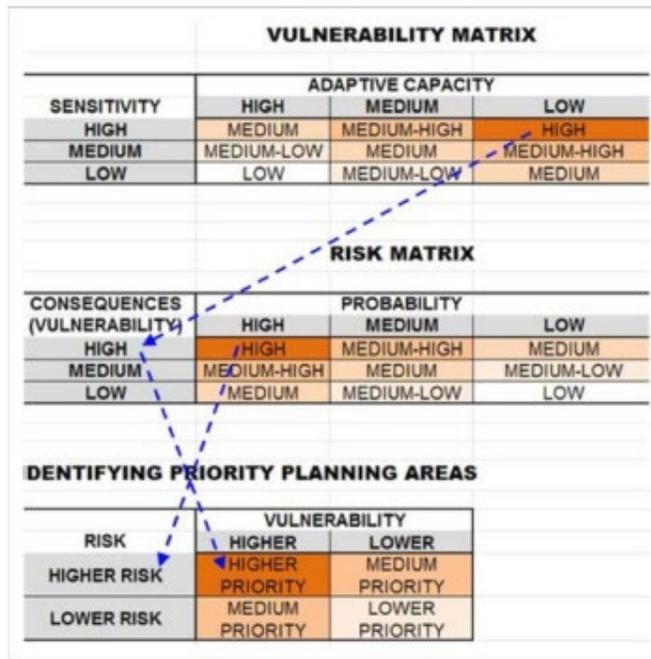
Figure 2. Matrices used in vulnerability and risk assessments for CSKT Climate Change Strategic Plan (2016).

Background on CSKT

The CSKT occupy a reservation of 1.317 million acres in Western Montana. The CSKT are made up three main Tribes that once occupied about 20 million acres of Northwestern North America between the Rockies and the Cascades. These Tribes are the Bitterroot Salish, Kootenai, and Pend d' Oreille. CSKT has about 5300 enrolled members on the reservation and 2900 enrolled members off of the reservation. The reservation itself was directly impacted by federal allotment from 1881 to 1934. The Flathead Allotment Act of 1910 resulted in the loss of about 527,000 acres from Tribal ownership and management, although the Flathead Reservation still includes these acres. As a result, in 2010, the number of non-Indian to Indian ratio of residents was 2:1 (CSKT, 2016).

Conservation Priorities

For the purpose of this geospatial analysis, we have decided to focus on five of the nine CSKT climate change priorities, excluding air quality, infrastructure, people, and culture due to constraints on feasibility. The five priorities (forestry, land, fish, wildlife, and water quality/quantity) and the objectives laid out in the plan inform the conservation prioritization of the Bitterroot Salish ancestral lands.

Ancestral Lands & Scale

Native-Land.ca is a beta research initiative aimed at mapping, as accurately as possible and with Tribal consultation, ancestral lands of Tribes across the world. The site is relatively data-rich for North America and Australia. The research group behind the project recognizes that delineating boundaries on a map perpetuates contemporary ideas of cartography and place, stating as a disclaimer to all users accessing the site, "This map does not represent or intend to represent official or legal boundaries of any Indigenous nations. To learn about definitive boundaries, contact the nations in question" (Native Land Digital, 2020).

We decided to focus on one of the three Tribes of the CSKT for feasibility with our allotted time and resources to undertake this project. The three Tribes have overlapping lands that extend far North into Canada and further West across the United States. Many Tribes have ancestral lands that

overlap in space and time, and state and local governments should use appropriate resources to identify the Tribes that once occupied the lands now being managed by non-Tribal governments. We would like to make very clear that this prioritization scheme is not at the behest of the tribe, nor do the boundaries reflect any conversations with Tribal leadership. The boundaries are solely sourced from current Native-Land.ca Bitterroot Salish coordinates. Because drawing ancestral land boundaries on a map is a form of Western cartography, we recognize that the boundaries used in this research are not accurate nor are they valid for any future studies. However, the goal of this research is to develop methodologies that can be used in generating a conservation prioritization scheme using Tribal priorities, explore possible uses of Native-Land.ca, and encourage land management practitioners to reframe the ways in which they view analysis extents away from U.S. federal, state, or local government-delineated jurisdictions to a perspective that includes Native land acknowledgement and collaboration.

Maxent

For two of the variables, Land and Fish, the species distribution modelling software Maxent was used according to two appropriate methods papers, Montana Natural Heritage Program (2019) and Endries (2011), respectively. Maxent is a Java application that models species distribution based on known species occurrence points and environmental variables. It is one of the most widely used and well performing species distribution models (Elith et al., 2006; Phillips et al., 2017). Maxent is based upon the second law of thermodynamics (Figure 3) and the theory that systems constantly move towards entropy, or disorder. In the ecological sense, this means that species distributions will tend towards distributions with minimal constraint. Maxent requires presence-only points, creates random, uniform points as pseudo absences, and uses a generative, sequential algorithm to model predicted species distribution.

> ### *The second law of thermodynamics: without external influences, entropy (disorder) in a system increases.*

Figure 3. The second law of thermodynamics, according to Philips et al., 2006 and Nave, 2017.

Maxent is rooted in many fields: information theory, statistical mechanics, machine learning, and mathematical theory (Phillips et al., 2006). The algorithm depends upon identifying constraints and minimizing assumptions, which is why most resulting predicted area will be larger than the functional niche of the species being studied. Users enter presence points and continuous or categorical raster datasets of environmental variables for the study area. The environmental variables are statistically analyzed and the user can decide how they should be treated. The variables are analyzed as linear features, quadratic features, product features, or other types. This requires a thorough understanding of variable interactions and distributions. The features determine which statistic is used to define the environmental conditions of the species' realized niche. Linear features are defined by their mean. Quadratic features are defined by their square root and variance. Product features are based on the combination of two continuous variables and their covariance (Phillips et al., 2006).

The Maxent output is a grid of raw prediction values for each cell. Typically, these are transformed into a cumulative grid, which adds the prediction value of the cell to all of the equal or less than prediction values. Otherwise, the grid consists of extremely small cell values (they all add

72

up to 1 across many thousands of cells). The cumulative predictions can be reclassified by a threshold to generate a binary habitat suitability grid. The threshold at which to reclassify the cells is up to the user. Different thresholds prioritize different outcomes, such as higher specificity (higher omission rate of test and training points, smaller area is considered habitat) or sensitivity (inclusion of all presence points, larger area is considered habitat) (Phillips et al., 2006).

Without additional post-processing, users can see how well the model fits based on the AUC provided by Maxent. A higher AUC indicates a better model fit. Users can maximize AUC by trying out different regularization multipliers in the settings. To test for model fit and accuracy beyond the Maxent-generated results, users can use a binomial t-test such as Minitab to test whether the model prediction is better than a random habitat prediction. Users can also use AccuROC, a software, to analyze the ROC curve (AUC, area under the curve) which shows whether or not a random point will be correctly classified (Phillips et al., 2006).

General Analysis Methods
The source for the general methods for this prioritization is the Dickson et al. paper, "Systematic identification of potential conservation priority areas on roadless Bureau of Land Management lands in the Western United States" (2014), which uses principal components analysis to generate weighting vectors for conservation scores. While the methods in this analysis do not incorporate principal components analysis, the moving window evaluation provides a valid way to assess neighborhood-level conservation characteristics of the study area and incorporate regional connectivity. The general method for developing each of the five variables is as follows, with details in preceding sections:

1. Reclassify source data based on identified priorities.
2. Assign cells the focal mean of the surrounding moving window at a scale of ~20km^2 with a focal radius of 2430m, or nine cells at 270m resolution.
3. Normalize the focal means across study area to generate a 0-1 index of low to high priority.
4. Clip to extent of Tribal polygon.
5. Reclassify into three equal intervals: low, medium, and high.

Analysis Extent
To generate an appropriate analysis extent (Figure 2) for the ancestral Bitterroot Salish lands, a python tool was created in Spyder (Anaconda, 2016) to extract boundary coordinates from the Native-Land.ca database using its API. The user, knowing the slug, or keyword, of the Tribe they are interested in (see https://native-land.ca/api-docs), can designate the ancestral lands of interest from within ArcGIS Pro and request the current boundaries. The tool steps include the following:
1. Response is stored as a variable and converted to JSON
2. Data is refined down to its coordinates and converted into a data frame using Pandas (McKinney et al 2010).
3. Columns of longitude and latitude are defined.
4. Data frame is converted into a CSV
5. Arcpy is used for the rest of the process (Esri, 2019). The coordinates are converted into points, lines, and then a polygon.
6. In ArcGIS Pro, an envelope is created around the polygon.
7. Envelope is buffered by 270m to minimize edge effect of analyses for the interior polygon.
A full description of the python tool, its uses, and its code are found at the end of this report.
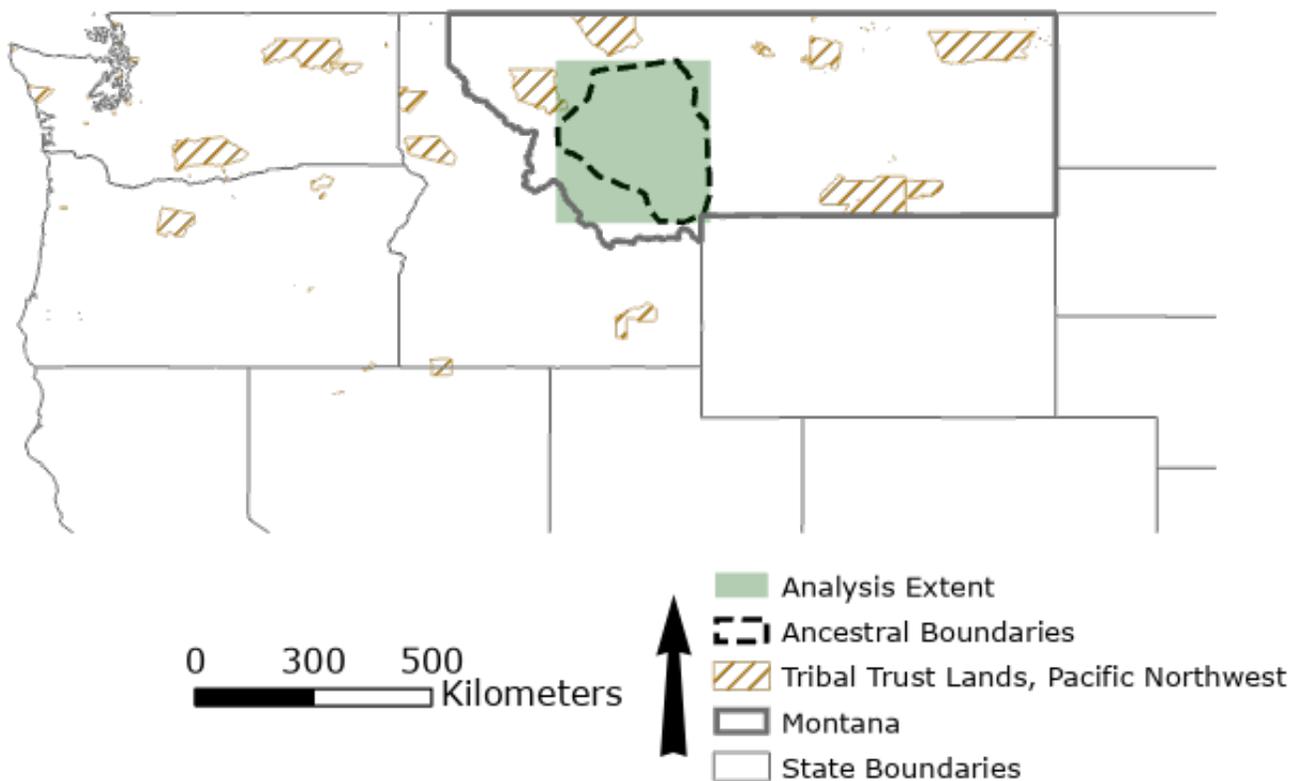
Figure 4. Analysis extent, ancestral lands, and context within the state of Montana.

Priorities

The final conservation score based on the five variables uses the Weighted Linear Combination (WLC) method (Eq. 1) (Drobne, 2009) to quantify the priority levels assigned in the CSKT plan. Each of the five priority variables had either a medium or high priority and were given a priority value of 2 or 3 where 2 is a medium priority and 3 is a high priority. The theoretical maximum is 12, so each of the priority values were divided by 12 to find the multiplier.

Eq. 1 *Conservation Priority = Forestry*1/6 + Land*1/6 + Fish*1/4 + Wildlife*1/6 + Water*1/4*

Priority Variable	Priority Level	Unit of Measure	Data Source
Forestry	Medium (rank = 2, weight = .167)	Index of priority fire regimes (mean)	USGS LANDFIRE (2010), Whitebark Pine Ecosystem Foundation (2019)
Land	Medium (rank = 2, weight = .167)	Index of cheatgrass habitat suitability (mean)	NLCD 2016 (Yang et al., 2018)

Fish	High (rank = 3, weight = .25)	Index of priority catchments (mean) based on priority streams	USFS eDNA presence points (Young et al., 2019), USGS NHDPlus v2 (USEPA and USGS, 2012), NLCD2016
Wildlife	Medium (rank = 2, weight = .167)	Index of priority land cover types for wildlife (mean)	USGS GAP Land Cover (2011), NHDPlus v2
Water Quality/Quantity	High (rank = 3, weight = .25)	Index of distance to water and impaired waters across catchments (mean)	USGS NHDPlus v2, EPA 303(d) Impaired Waters (2015)

Table 1. Priority variables according to CSKT Climate Change Adaptation Plan.

Forestry

USGS LANDFIRE data identifies land by fire regime group as opposed to cover type. The USGS defines the fire regime classes based on return interval and severity of fire. The LANDFIRE data was reclassified to reflect CSKT priorities (Table 2).

One of the CSKT priorities is the Whitebark Pine species, which is not represented in the USGS LANDFIRE dataset. The CSKT fire regime class for this species is "Timberline," which has a medium priority for protection. The Whitebark Pine Ecosystem Foundation provides a publicly available 1km resolution raster of current Whitebark Pine distribution. This dataset was developed with data from USFS, NPS, BLM, states, and Tribes. The dataset was re-projected and resampled to a 270m resolution with accuracy remaining at the 1km scale. This dataset was reclassified using the Is Null tool to give NoData values a value of 1 and Whitebark Pine areas a value of 0. These pixel values were merged with the reclassified USFS dataset with the Conditional tool. 0 values were reclassified to 2 to represent the priority of the Timberline Fire Regime, and all other values were given their original Fire Regime priority values.

The final steps of variable development were doing a focal mean moving window with a 9-cell radius and then normalizing to a scale of 0-1, where 1 is highest priority and 0 is the lowest. We used a geomorphometry toolbox to normalize the data while maintaining distributional shape (Evans et al 2014) (Eq. 2). The result was an index of priority fire regimes.

Eq. 2 *Normalize (row standardize) = IF min(y) positive, (y / max(y)) ELSE (y – min(y)) / (max(y) – min(y))*

Original Value	Label	Description	CSKT Fire Regime	Reclass Value
1	Fire Regime Group I	<= 35 Year Fire Return Interval, Low and Mixed Severity	Nonlethal	1
2	Fire Regime Group II	<= 35 Year Fire Return Interval, Replacement Severity	Nonlethal	1
3	Fire Regime Group III	35 - 200 Year Fire Return Interval, Low and Mixed Severity	Mixed	2
4	Fire Regime Group IV	35 - 200 Year Fire Return Interval, Replacement Severity	Lethal	3
5	Fire Regime Group V	> 200 Year Fire Return Interval, Any Severity	Mixed	2
111	Water	Water	None	0
112	Snow/Ice	Snow / Ice	None	0
131	Barren	Barren	None	0
132	Sparsely Vegetated	Sparsely Vegetated	none	0

Table 2. Forestry priority fire regime reclassification scheme.

Wildlife

The CSKT Climate Change Strategic Plan prioritizes wildlife by identifying priority land cover types. The USGS Gap land cover dataset was used alongside the NLCD because it has alpine and grassland classifications. The data from these sources are at 30m resolutions. To appropriately classify riparian areas, we did the following:
- Added an index value to the rivers and streams raster dataset we developed for the fish priority
- Turned the indexed rivers and streams raster into a binary raster to cover the study area
- Applied the conditional tool to give any pixel found to have a river or stream a priority of 1, replacing the original landcover classification pixel values

As described in general analysis methods, focal mean was calculated and the data was normalized to a 0-1 scale to generate a wildlife priority index.

Water Quality/Quantity

The USGS NHDPlus V2 datasets for the Pacific Northwest and Upper Missouri regions provide point, line, and polygon hydrography data. We used this data to identify locations of important water (rivers, streams, springs, and seeps) and generate an index of distance to water with impaired streams prioritized the most.
1. Merged all relevant points, lines, and polygons.
2. Converted these to 30m raster datasets across the study area.
3. Generated binary datasets for each type of water where 0 was non-water and 1 was water.
4. Added these together into one binary raster dataset across the study area.
5. Reclassified all non-water cells to NODATA.
6. Calculated Euclidean distance between all cells and those that have water features.

7. Resulting distance raster was reclassified into three equal intervals to designate low, medium, and high distances to water.

Then, we incorporated the priority of conserving impaired waters.
1. Converted the EPA 303(d) Impaired Waters shapefiles to 30m raster datasets.
2. Generated binary raster files and added them together into one raster dataset.
3. All impaired waters were reclassified as 1 and non-impaired water cells were reclassified to 0.
4. Ran a conditional statement: if a cell was found to have impaired water, it was given a value of 4. If the cell was not found to have impaired water, it was assigned its value from the water distance classification.

The result was a raster with cell values 1-4, where values of 1 indicate a cell that is far from water and does not feature impaired water. A value of 4 indicates that the cell is impaired water. A value of 3 captures all other water cells and those that are close to water. The water raster was bilinearly resampled to a resolution of 270m, we ran focal mean and normalized to a scale of 0-1.

Land

The main focus of the Land category in the CSKT plan is protection of native species and mitigation of nonnatives species. As a proxy for invasive species, we chose to model the species distribution of a common nonnative grass, cheatgrass. Cheatgrass is classified as Priority 3 invasive species, meaning "these regulated plants have the potential to have significant negative impacts" (MTNHP Field Guide, 2020). The Montana Natural Heritage Program (MTNHP) produces species distribution models for many resident species, including cheatgrass. We followed the methods from the MTNHP (2019), modified the predictor variables and reduced to 14 (Table 3), and acquired cheatgrass presence points by request (MTNHP, 2020).

A. Presence Points

Following the methods of the MTNHP, we subset presence points using the following rules:
1. Retain points that have a locational uncertainty of under 800m.
2. Retain the maximum number of points possible that do not fall within 1600m of another point to avoid spatial autocorrelation.

Applying rule 1 relied upon a pre-filled field that listed locational uncertainty distances. To follow rule 2, we used the Create Random Points tool in ArcGIS and limited the points by the pre-existing point features. We set a high number of points, 400, to capture the maximum possible within the 1600m minimum distances, resulting in 179 usable presence points across the study area, exported and organized as a CSV for input into Maxent as training samples. 17, or 10%, were withheld as test samples.

B. Predictor Variables

The environmental variables used in the Maxent species distribution model follow closely those used in the MTNHP model, with a few removed (Table 3). All continuous variables were bilinearly resampled to 90m and the categorical variables were resampled to 90m resolution using the nearest neighbor function.

Soil information was obtained from the ArcGIS SSURGO Downloader and required downloading 26 soil packages, merging the packages, selecting out the appropriate fields for ease,

and then clipping the dataset to the study area. Ruggedness was found using a third-party tool called the Vector Ruggedness Measure (VRM) tool, adapted from methods developed by Hobson (1972). This tool captures variability of slope and aspect of each cell and averages them across the specified neighborhood. The methods paper for the VRM tool, Sappington et al. (2007), relies on a small 3x3 moving window at 8100m^2 for study areas of 550km^2 to 930km^2. Because this study area is far larger, at over 81,000km^2, we enlarged the moving window to save time and space. Further, the moving window requires a cell area divisible by 9 cells, so we selected a neighborhood size of 81 cells (9x9 at 270m cell resolution) for a neighborhood area of ~5.9km^2. For the distance to forest variable, we switched to the NLCD 2016 dataset because it has fewer forest classifications and the differences between classes are more easily interpretable than the more detailed MSDI Montana Land Use/Land Cover dataset.

Variable	Identifier	Description	Type/Source
Land Cover	catesys	28 level two classes	Categorical; MSDI Montana Land Use/Land Cover (Mitchell, 2016).
Geology	Mt_geol5_90	Five major rock categories (Table 5)	Categorical; USGS Montana
Soil Order	soilorder	Major soil orders: inceptisols, alfisols, entisols, histosols, andisols, vertisols, mollisols, and aridisols	Categorical; USDA NRCS SSURGO (Soil Survey Staff, 2019)
Soil Temperature Regime	soiltemp	Two temperature regimes: cryic and frigid	Categorical; USDA NRCS SSURGO
Elevation	contelev	1-arc second tiles mosaicked together	Continuous; USGS NED DEM (2017)
Aspect	Cg_aspect	Aspect tool	Continuous; USGS NED DEM
Slope	CGslope	Slope tool	Continuous; USGS NED DEM
Ruggedness	Cg_vrm	VRM tool (Sappington et al., 2007)	Continuous; USGS NED DEM
Annual NDVI	ndvi	Yearly greenness	Continuous; MODIS Terra Satellite (Montana Climate Office, 2014)
Precipitation	precip	Average annual precipitation in mm for 1981-2010	Continuous; Oregon State PRISM (2019)
Max Summer Temperature	tmaxjuly	Average maximum temperature for July, 1981-2010	Continuous; Oregon State PRISM
Min Winter Temperature	tminjan	Average minimum temperature for January, 1981-2010	Continuous; Oregon State PRISM
Distance to Stream	diststreams	Distance to all streams in meters	Continuous; NHD Plus V2
Distance to Forest	distforest	Distance to forested land cover classes in meters	Continuous; NLCD 2016

Table 3. Maxent cheatgrass distribution model: environmental variables, identifiers, and sources.

C. Results and Thresholds

To run Maxent, we withheld 10% of training samples as test samples and then set two different habitat thresholds to classify the habitat distribution into low, medium, and high suitability continuous datasets. The lowest threshold was set at the 10th percentile training presence threshold, .155. The next threshold was set at .338, the maximum training sensitivity plus specificity. As described in general analysis methods, focal mean was calculated and the dataset was normalized to a 0-1 index to identify land priority from low to high.

Fish

While there are a number of native fish important to the CSKT, we decided to use Bull Trout as a representative fish to model suitable habitat and identify priority conservation areas. The methods were derived from U.S. Fish and Wildlife Service paper, "Aquatic Species Mapping in North Carolina Using Maxent" (Endries, 2011), which looked at 249 aquatic species across North Carolina to prioritize streams in the state. The variables used in this analysis are mostly the same (Table 3), with the removal of sinuosity and HUC6 delineations and the reclassification of the geology types to five major categories (Table 4). The HUC6 delineations were removed from the model because the home range of Bull Trout does not extend beyond one basin: 170102; this was roughly verified by absence of Bull Trout from lake sampling sites beyond the basin in a dataset provided by the state of Montana. The purpose of this analysis was to identify priority stream segments and did not incorporate lake presence points or variables.

Variable	Identifier	Level	Type/Source
% Barren	Barren_rast1	Catchment	Continuous; NLCD 2016
% Cultivated Cropland	Crop_rast1	Catchment	Continuous; NLCD 2016
% Developed	Dev_rast1	Catchment	Continuous; NLCD 2016
% Forest	Forest_rast1	Catchment	Continuous; NLCD 2016
% Pasture	Past_rast1	Catchment	Continuous; NLCD 2016
% Shrubland	Shrub_rast1	Catchment	Continuous; NLCD 2016
% Wetland	Wet_rast1	Catchment	Continuous; NLCD 2016
Stream Velocity	Velocity	Stream	Continuous; NHDPlus V2
Stream Flow	Flow	Stream	Continuous; NHDPlus V2
Average Precipitation	Precip	Stream	Continuous; NHDPlus V2
Drainage Area	Drain_rast	Stream	Continuous;NHDPlus V2
Slope (%)	Slope_rast	Stream	Continous; NHDPlus V2
Strahler's Stream Order	Streamorder	Stream	Categorical; NHDPlus V2
Average Yearly Temperature	Temp	Stream	Continous; NHDPlus V2
Type of Geology	Mtgeol_rast	Study Area	Categorical; USGS Montana
% Riparian Disturbance	Disturb_rast	Stream	Continuous; NLCD 2016
% Imperviousness	Imperv_cat	Catchment	Continuous; NLCD 2016

Table 4. Variables used to model Bull Trout habitat suitability in Maxent.

A. Presence Points

The sample points come from the USFS eDNA dataset. The data was subset to include only those samples that found Bull Trout present within the study area. Then, we selected the streams that featured presence points, and we identified the midpoints of the selected stream segments as the presence points for input into Maxent so as not to duplicate stream segments. The resulting number of presence points (stream segments) was 317. We added longitude and latitude points and converted them to a CSV file.

B. Predictor Variables

All variables were developed according to the methods in the Endries (2011) paper, snapping and clipping the extent to a 30m raster of the study area and bilinearly resampling all continuous raster datasets to resolutions of 30m and using the nearest neighbor function to resample categorical raster datasets to 30m resolutions. The raster datasets were converted to ASCII raster files. Some predictor variables were developed at the study area level, others at catchment level, and the remainder at the stream level (Table 3). To generate layers at the stream level, the NHD vector streams were buffered 100m on each side and converted to 30m raster datasets. Catchments were converted to 30m raster datasets.

Original Value	Label	Rock Category	Reclass Value
1	water	water	1
2	clastic	sedimentary	1
3	fine-grained mixed clastic	sedimentary	1
4	medium-grained mixed clastic	sedimentary	1
5	meta-argillite	sedimentary	1
6	alluvium	unconsolidated	2
7	sandstone	sedimentary	1
8	carbonate	sedimentary	1
9	quartzite	metamorphic	3
10	glacial drift	sedimentary	1
11	mudstone	sedimentary	1
12	alluvial terrace	sedimentary	1
13	diorite	plutonic	4
14	glaciolacustrine	sedimentary	1
15	alkalic intrusive rock	plutonic	4
16	volcanic rock (aphanitic)	volcanic	5
17	quartz monzonite	plutonic	4
18	metamorphic rock	metamorphic	3
19	granitoid	plutonic	4
20	meta-conglomerate	metamorphic	3
21	dolostone (dolomite)	sedimentary	1

Table 5. Rock types grouped according to USGS 5 categories and water as a 6th category: Sedimentary, Unconsolidated, Metamorphic, Plutonic, and Volcanic.

C. Results and Thresholds

We ran Maxent with 20% of training samples held back as test samples to validate accuracy of the model. The Maxent species distribution model for Bull Trout revealed highly suitable and less suitable streams for bull trout habitat. Based on the methods, we set our habitat and non-habitat

threshold at the 10th percentile training presence, .190. All values below .190 were reclassified as 0 and all values above the threshold were reclassified as 1. Because no bull trout were found outside of their home range and home basin (HUC6 170102), we converted the HUC6 basins to a binary 1 and 2 raster dataset, where 2 represents the home basin and 1 represents all other basins. We multiplied this raster by the habitat streams as a way to give home basin streams more weight in the fish priority index.

We assigned priority to catchments that feed into priority streams by intersecting the resulting habitat raster with the original stream vectors, selecting the priority streams, adding an index to the priority streams, and then joining the index to the catchments that feed into those priority streams. The catchments were converted to a binary priority/nonpriority catchment raster. Lastly, we applied focal mean to capture neighborhood statistics and normalized to an index of 0-1, where a higher value indicates a higher priority pixel for Bull Trout conservation.

Landscape Metrics

To calculate metrics of resulting priority conservation areas, we used R Studio (R Core Team 2019) and the R package "landscapemetrics," (Hesselbarth et al., 2019) which is an R tool developed from the standalone software FragStats (McGarigal et al., 2012). FragStats and R landscapemetrics process patch, class, and landscape level metrics and utilize user inputs like edge depth, edge contrast, and different sampling methods such as uniform or moving windows to analyze patch, class, and landscape characteristics. R landscapemetrics has fewer metrics but is preferred because it is a free CRAN package that doesn't require the user to install and pull data into a standalone software. Further, using additional R packages, "raster," "rgdal," "dplyr," and "tidyr," (Hijmans, 2020; Bivand et al., 2019; Wickham et al. 2020; Wickham and Henry, 2020) we were able to visualize our raster datasets, process and organize them in a more streamlined manner and output one table instead of various tables for each file, which would be the case in FragStats. We chose to look at eight class and landscape-scale metrics (Table 6). These metrics have detailed descriptions and equations in the R landscapemetrics guide (Hesselbarth et al., 2019).

Some common terms in these metrics are Patch, Core, Class, Landscape, and Edge. Patch refers to a contiguous group of cells that share the same value. Core refers to the cells within a patch whose adjacent cells, or cells within a specified distance, are all the same value. Class is the cell value. Landscape is the entire raster dataset area and the patches and classes it contains. Edge refers to the non-core cells of a patch.

To build a usable table of metrics in R, we ran the metrics and then re-organized the resulting tables into one table output. The detailed R code for this process is found at the end of this report. A summary of this process follows:
1. Exported the variable and composite prioritization classifications as geoTIFFs, a commonly used format for geo-referenced raster datasets that works wells in R and in FragStats.
2. Installed and loaded the required packages.
3. Checked the landscape to ensure that the data we wanted to read into R were valid.
4. Generated metrics data frames for each of the six raster datasets.
5. Added an ID index column to each data frame and joined all of the resulting metrics into one table
6. Subset the data to metrics for the high priority class and landscape and retained three columns: values, metrics, and index.
7. Reorganized the table so that the metrics (previously identified in one column) each had their own column.

Metric	Level	R code	Description	Units and Range
Aggregation Index	Class	Lsm_c_ai	Adjacency of class cells to cells of the same class	Percent from 0-100 where 100 is maximally aggregated
Mean Core Area Index	Class	Lsm_c_cai_mn	Mean % of class core area in relation to patch area	Percent from 0-100
Core Area Percent of Landscape	Class	Lsm_c_cpland	% of class core area in relation to entire landscape	Percent from 0-100
Class Area	Class	Lsm_c_ca	Total class area	Hectares converted to km^2 in this analysis, > 0
Percent of Landscape	Class	Lsm_c_pland	% of landscape occupied by the class	Percent from 0-100
Mean Nearest Neighbor	Landscape	Lsm_l_enn_mn	Average distance between patches of the same class	Meters, > 0
Total Edge	Landscape	Lsm_l_te	Total edge distance of all patches	Meters, > 0

Table 6. Metrics used to compare classifications of priority variables and final prioritization scheme, according to R landscapemetrics package (Hesselbarth et al., 2019 and McGarigal et al., 2012).

RESULTS

The objectives of this study were to identify priority conservation areas across the ancestral lands of the Bitterroot Salish Tribe. Our result was five raster dataset indices of priority variables (Figure 2) with ranges of 0 to 1, where higher values indicate higher conservation value. We calculated basic statistics, mean and standard deviation, of the indices (Table 7) as well as landscape composition metrics (Table 9).

Priority	Mean	Standard Deviation
Forestry	.512	.157
Wildlife	.541	.112
Water	.345	.116
Land	.266	.274
Fish	.171	.280

Table 7. Mean and standard deviation of priority variable indices.

Forestry

The forestry index has a mean of .512 and standard deviation of .157, with high priority areas in the southern region of the study area.

Wildlife

The wildlife index has a mean of .541 and a standard deviation of .112, with high priority areas distributed north to south in large patches.

Water

The water index has a mean of .345 and a standard deviation of .116, with high priority areas fragmented across the landscape.

Land

The ROC curve, or receiver operating characteristic of the model, indicates how well the model compares to a random prediction of habitat occurrence. The AUC, area under the ROC curve, is the value of the model based on the training data. The goal is typically to achieve an AUC as close to 1 as possible. A random prediction of habitat occurrence has an AUC of .5. The maxent species distribution model for cheatgrass has an AUC of .866 (Figure 5). The land index has a mean of .266 and a standard deviation of .274, with high priority areas distributed east-to west in the middle of the study area.

Figure 5. Inverse specificity versus sensitivity of resultant Maxent model for cheatgrass. Area under the curve for training data is .866.

Based on the maxent model, the predictor variables are ranked according to percent contribution to the selected model and permutation importance (Table 8), or how much effect the variable has on different model iterations. Both numbers are valuable in assessing how much of a role the predictor variables play in effective maxent species distribution modelling. The jackknife figure is a graphic model of variable importance in the model that includes all of the variables, and importance in a model based solely off of the variables independently from one another (Figure 6).

For cheatgrass, the most important variables in habitat modelling are land cover, terrain ruggedness, aspect, elevation, and proximity to forest.

Variable	Percent contribution	Permutation importance
Land Cover	33.3	16
Ruggedness	19.6	25.8
Aspect	12.6	15.8
Elevation	7.1	12.2
Distance to Forest	7.1	14.8
Precipitation	5.1	4.3
Annual NDVI	4.2	3
Max Summer Temperature	3.9	0.8
Geology Type	3.4	2.7
Soil Order	2	1.9
Soil Temperature Regime	1.2	2.2
Min Winter Temperature	0.5	0.4
Slope (%)	0.1	0
Distance to Streams	0	0

Table 8. Importance of environmental variables in Maxent species distribution mode for bull cheatgrass. Percent contribution is how much the variable was used in model creation. Permutation importance shows how the variable contribution changed when fit to different models.

Figure 6. Jackknife of training gain for cheatgrass species distribution model. Dark blue bars show model importance when modelled independently.

Fish

The maxent species distribution model for bull trout has an AUC of .933 (Figure 7). The fish index has a mean of .171 and a standard deviation of .280, with high priority areas distributed across the Western portion of the landscape.
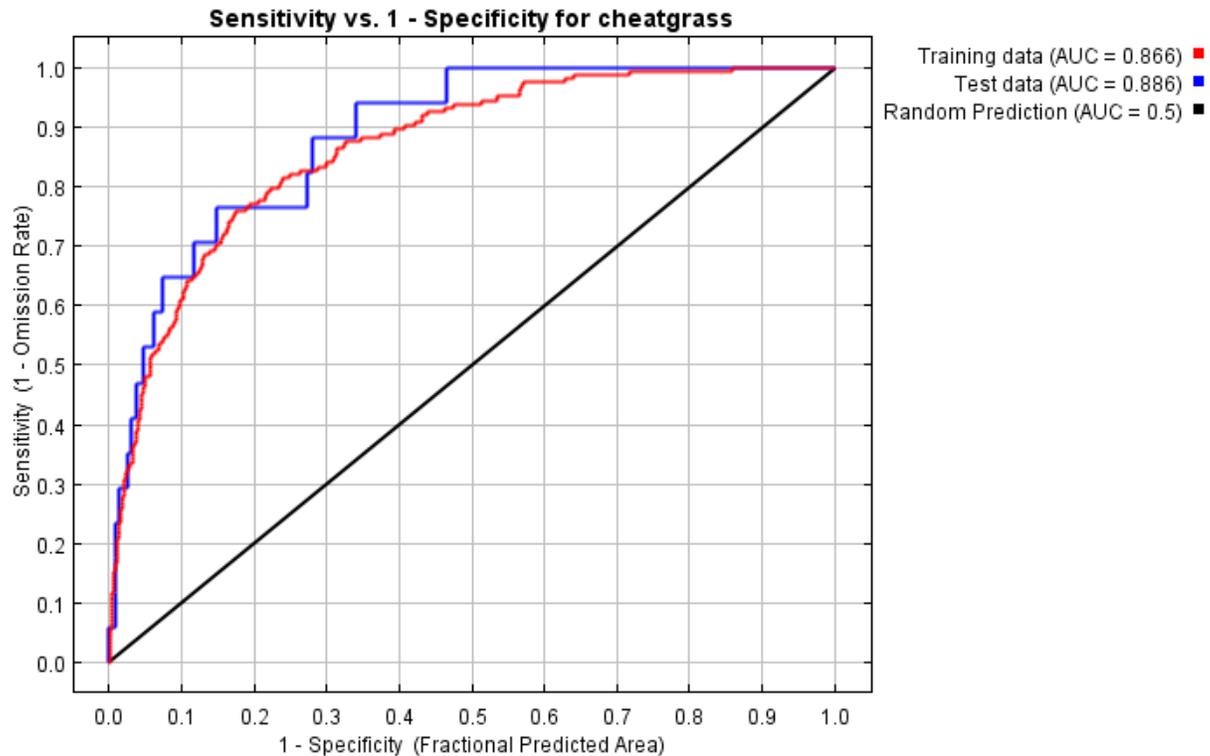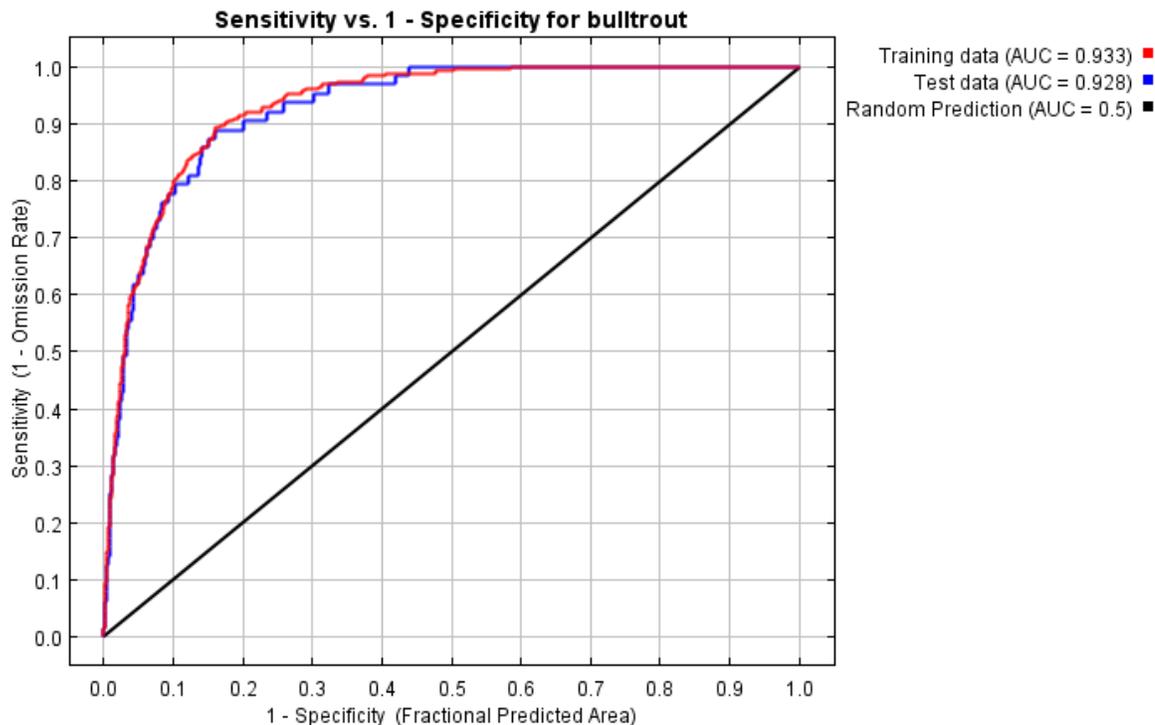
Figure 7. Inverse specificity versus sensitivity of resultant Maxent model for bull trout. Area under the curve for training data is .933.

The predictor variables for bull trout with the greatest percent contribution to the selected model are percent forest coverage, stream order, average yearly precipitation, and average yearly temperature. The predictor variables with the greatest permutation importance are average yearly precipitation, percent forest, and percent slope (Table 8). The jackknife figure clearly shows the importance of percent forest and average yearly precipitation (Figure 8).

Variable	Percent contribution	Permutation importance
% Forest	37.1	10.6
Strahler's Stream Order	27.4	1.1
Average Precipitation	15.7	51.9
Average Yearly Temperature	5	5
Type of Geology	4.9	2.1
Drainage Area	2	3.2
Stream Flow	1.9	5.3
Slope (%)	1.4	7.4
% Pasture	1.1	0
% Cultivated Cropland	0.9	4.5
% Barren	0.7	2.5
% Wetland	0.5	1.8
Stream Velocity	0.5	3.2
% Shrubland	0.4	0
% Riparian Disturbance	0.3	1
% Developed	0.2	0
% Imperviousness	0	0.4

Table 8. Importance of environmental variables in Maxent species distribution mode for bull trout. Percent contribution is how much the variable was used in model creation. Permutation importance shows how the variable contribution changed when fit to different models.
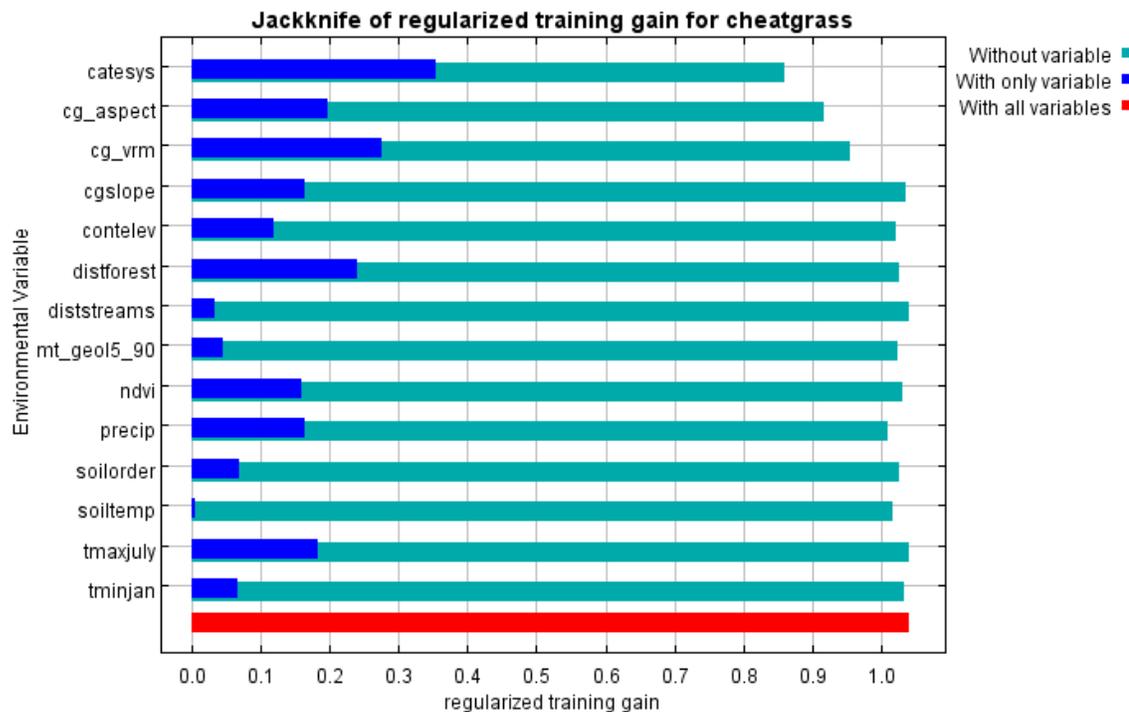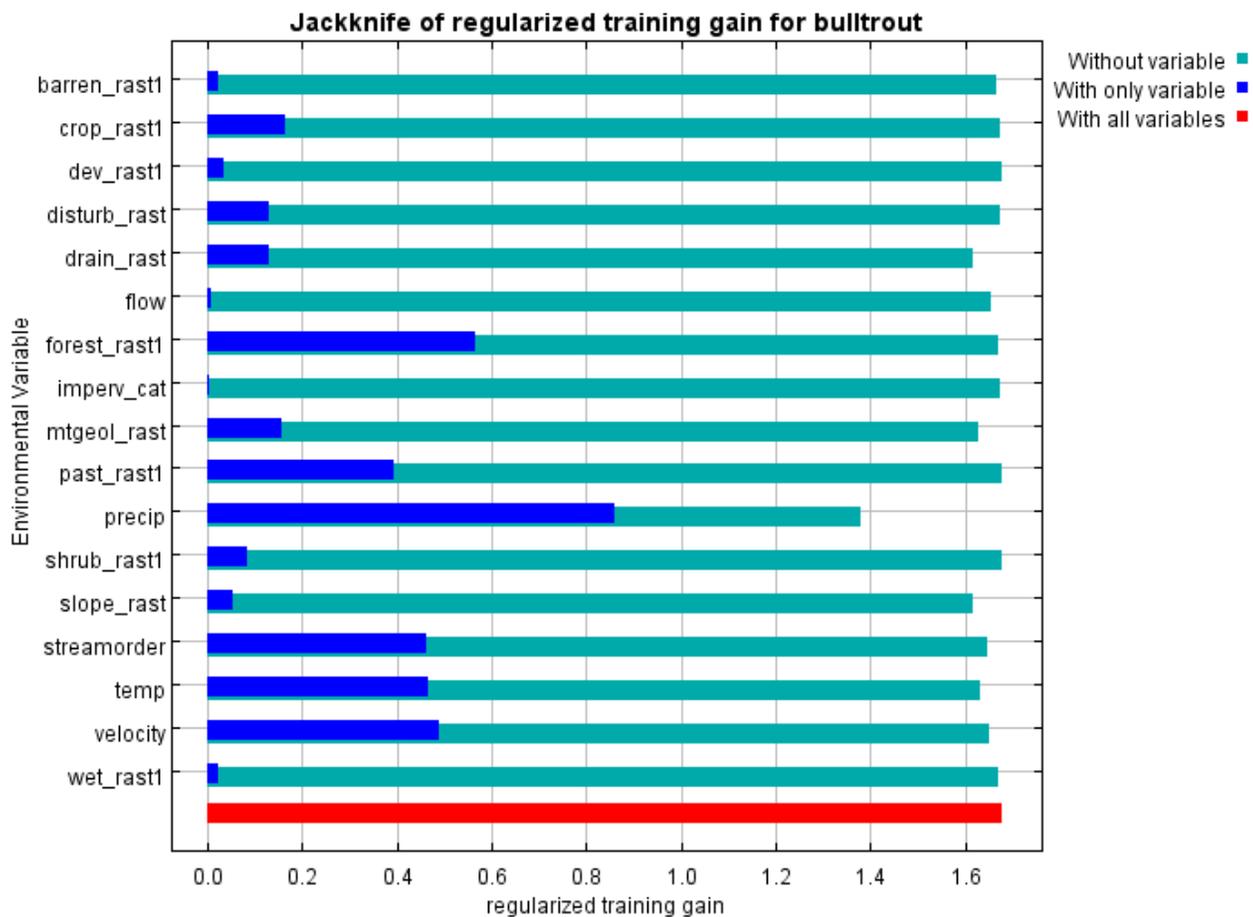

Figure 8. Jackknife of training gain for bull trout species distribution model. Blue bars show model importance when modelled independently.

Final Prioritization

      The final prioritization weights each index according to the respective priority designated in the plan and combines the raster datasets into one final conservation index with a range of 0.107 to .706. We reclassified these indices using equal intervals into Low, Medium, and High priority areas for interpretability (Figure 9). We reclassified current protected areas according to the International Union for the Conservation of Nature (IUCN) six major categories of conservation (I-VI) to a conservation value of 4 (non-priority) in order to assess the conservation value of unprotected public and private land (Figure 9). The IUCN classifications are included in the USGS Protected Areas Database Version 1.4 (PAD-US), compiled by the USGS Gap Analysis Program (US Geological Survey, 2016).
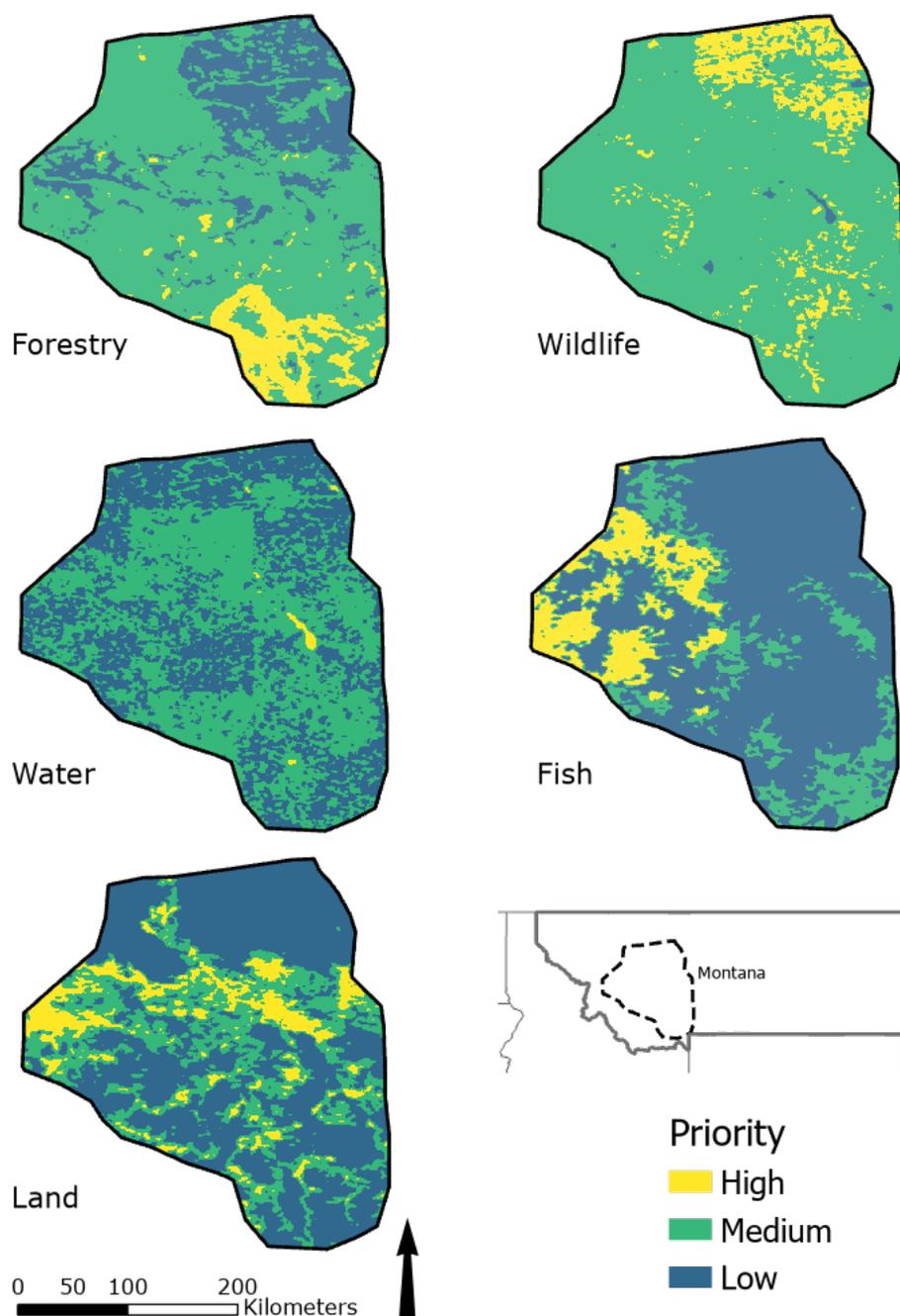
Figure 9. Indices for priority variables: Forestry, Wildlife, Water, Fish, and Land. Indices are normalized to a 0-1 scale where 0 is the lowest priority area and 1 is the highest priority area. The indices are reclassified into equal intervals of Low, Medium, and High Priority.

We reclassified current protected areas according to the International Union for the Conservation of Nature (IUCN) six major categories of conservation (I-VI) to a conservation value of 4 (non-priority) in order to assess the conservation value of unprotected public and private land. The IUCN classifications are included in the USGS Protected Areas Database Version 1.4 (PAD-US), compiled by the USGS Gap Analysis Program (US Geological Survey, 2016). The final prioritization was reclassified by four intervals into the categories of Protected Area, Low (0-.31), Medium (.31-.51), and High (.51-.71) conservation priority (Figure 10).

Figure 10. Final prioritization values across ancestral Bitterroot Salish Lands: low, medium and high.

Landscape Metrics

Landscape metrics were calculated to assess the characteristics of the resulting prioritization classifications at a class and landscape scale.

Aggregation Index

The layer with the greatest aggregation or adjacency of high priority cells is Fish; however, the range of aggregation indices is minimal, from 94.04 to 98.07, indicating that all layers have relatively high aggregation among high priority cells. This is verified by the very low coefficient of variation, calculated by dividing standard deviation of the values by the mean. The cumulative prioritization falls at 96.27% aggregated.

Mean Core Area Index

Mean core area index is highest for Fish and Water and lowest for Wildlife. The mean core area index for the cumulative prioritization is 47.39%. The coefficient of variation for this index is 46.56%.

Core Area Percent of Landscape

Comparing the class level across the entire landscape rather than comparing average values between class patches, the results shift. Cumulatively, the priorities yield a core area percent of the landscape of 7.54%. The layer with the greatest value is Fish and the coefficient of variation is 49.31.

Class Area

The class area of high priority cells is greatest in the Wildlife layer at 14302.4km^2 and lowest in the Water layer at 469.4km^2. The cumulative prioritization high priority areas cover an area of 9867.82km2. The coefficient of variation for this index is 49.61%.

Percent of Landscape

High priority cells make up 12.28% of the entire landscape at a maximum (Wildlife) and .4% at a minimum (Water). High priority cells make up 8.47% of the landscape in the cumulative prioritization. Because the percent of landscape metric is directly related to the class area metric, the coefficient of variation is the same at 49.61%.

Mean Nearest Neighbor

Fish has the largest mean nearest neighbor distance between high priority cells and Water has the smallest. The mean nearest neighbor distance for the cumulative prioritization is 3.55km. The coefficient of variation for this metric is 31.20%.

Total Edge

Lastly, total edge length is highest for Water and lowest for Wildlife. Total edge length for patches in the cumulative prioritization layer is 21,033.27km, and the coefficient of variation for this metric is 31.86%.

Priority	Aggregation Index	Mean Core Area Index	Core Area % of Landscape	Class Area (km^2)	% of Landscape	Mean Nearest Neighbor (km)	Total Edge (km)
Cumulative	96.27	47.39	7.54	9867.82	8.47	3.55	21033.27
Fish	98.07	73.17	10.78	13376.57	11.48	4.29	14050.80
Forestry	97.31	30.66	8.29	10472.67	8.99	2.34	16314.48
Land	96.13	42.95	9.67	12654.64	10.86	2.60	20290.77
Water	96.95	76.01	0.36	469.40	0.40	2.08	29833.92
Wildlife	94.04	19.91	10.32	14302.40	12.28	2.18	13393.08
Coefficient of Variation (%)	1.43	46.56	49.31	49.61	49.61	31.20	31.86

Table 9. Landscape metrics of high priority cells for each variable. Shaded cells represent class-level metrics. Non-shaded cells represent landscape-level metrics (Hesselbarth et al., 2019).

DISCUSSION

Methodological Value

The Network for Landscape Conservation's *Pathways Forward* report (2018) highlights the need to develop methodologies to map and analyze cultural and ecological landscapes at a landscape scale. Specifically, the report addresses science-based planning trends from a geospatial perspective, referencing climate resiliency, landscape connectivity, citizen science datasets, and optimization tools as important elements to consider in effective collaborative and landscape-scale conservation. The methods and datasets used in this report add to the body of scientific work focused on landscape-scale conservation. In this report, we use eDNA citizen science presence points for bull trout; analyze the data with four software packages: ArcGIS Pro, R Studio, Spyder, and Maxent; generate a prioritization scheme across legal boundaries, public, and private land; and focus on priority variables that support climate change resilience and mitigation. Further, because the analysis centers Tribal priorities (another priority according to *Pathways Forward*), it supports the development of cultural landscape modeling methodologies.

Method Limitations

Because the geospatial analysis is exploratory rather than client-based, the final prioritization and visualizations likely do not accurately represent the priorities of the CSKT. Further, the spatial analysis only uses five of the nine priorities listed in the CSKT Climate Change Strategic Plan, which limits the applicability of the final prioritization. Another limitation is all of the unknowns needed to move forward in a usable prioritization: funding, staffing, time, private data, and other resources. Funding limitations or availability can determine the final low, medium, and high priority ranks. In this analysis, we reclassified indices using the equal interval method. Equal Interval divides the range of values into three equal ranges, with thresholds at .333 and .667 for an index of 0-1. The type of classification can highly influence the interpretation of the results. We chose to classify the indices into three equal intervals for maximum interpretability and comparison. The statistical classification methods such as dividing the results into quantiles provides less comparable classifications among priority variables.

Another major limitation to these methods specifically for habitat distribution modelling is the question of whether habitat that has no presence points should be included as suitable habitat for the Bull Trout (or any species). As this prioritization is a tool, environmental managers should be wary of this limitation and evaluate management plans and priorities to decide if species will be stocked, connectivity opportunities developed, or other actions that could support fish species in the face of climate change.

The limitations of using Maxent are many (Table 9), but it remains consistently well-performing and frequently used for species distributions by environmental managers. In this study, the main limitation is its inability to model future species distributions with the effects of climate change, which is the point of the CSKT Climate Change Strategic Plan. That being said, because Maxent generally models more habitat than species occupy as their realized niche, it may capture some future distribution possibilities.

Limitation #1: Models species distribution based on realized not fundamental niche of study species.
Limitation #2: Predicted area is often larger than realized distribution.
Limitation #3: Species presence points are often correlated with access points (rivers and roads) for observers.
Limitation #4: Models current prediction, not future distribution with climate change or other disturbances or processes.
Limitation #5: Not being a more developed statistical model, it's difficult to fully estimate error like generalized linear or additive models.

Figure 11. Maxent limitations that pertain to the two species distribution models used in this prioritization scheme (Phillips et al., 2006).

Summary Statistics and Landscape Metrics

The summary statistics and landscape metrics reveal differences between priority conservation areas across the study area depending upon the variable. Using Aggregation Index and Mean Core Area Index as indicators for fragmentation, Wildlife has the most fragmented high priority cells. Nevertheless, high priority conservation area for Wildlife covers a greater proportion of the landscape than any other variable. However, across all cells, Water has the most edge distance, indicating that the high priority cells are not the most fragmented but the classification of the medium and low are highly fragmented. The variable that exhibits the most connectivity in its high priority cells is Fish, with a high Mean Core Area Index and Aggregation Index. It ranks second in coverage of the total landscape, behind Wildlife.

Regarding the cumulative prioritization, recall that Fish and Water were ranked as high priority conservation goals and Wildlife, Land, and Forestry were ranked as medium priority conservation goals. The cumulative prioritization metrics show that the weighted linear combination of variables yields a fragmented and limited coverage prioritization of conservation areas. This is likely because each variable showed very different spatial conservation values across the study area.

The high fragmentation and high coverage of high priority Wildlife cells as well as the fragmented cumulative prioritization index pose a unique challenge and opportunity for land managers. The metrics will change depending upon the classification and summarization that managers choose to utilize in their planning process, discussed in the proceeding section.

Shifting Classifications

As mentioned in limitations, the low, medium, and high classifications can shift depending upon management decisions and resources. In this report, the three classifications were made by dividing the pixels into three equal interval classifications. We used the equal interval classification method because it is the most easily interpretable classification visualization and does not vary based on the unique statistics of each variable. Each variable index has different statistical distributions (Table 7); therefore, using quantiles, quartiles, or natural breaks would render the comparison of the different variables confusing and misleading. While the equal interval classification we used is helpful for visualization and understanding of the results, managers should decide for themselves how many and which observations they want to consider high priority and using options presented in the following sections for developing planning units, appropriate scales of analysis, and optimization schemes.

Possible Uses or Variation in Prioritization Indices

Environmental managers can utilize the index methodology developed in this analysis to begin environmental planning initiatives. The decision-making process before and beyond index development should include selecting an appropriate planning scale (Table 10), planning units (Table 11), and planning optimization tools (Table 12).

Three common planning scales that environmental managers can use to optimize conservation planning decision-making are watersheds, ecoregions, and political boundaries. 4

Planning Scales	Examples
Watershed	Hydrologic Units
Ecoregion	Bailey's, IUCN
Political	County, Census boundaries

Table 10. Common conservation planning scales.

Different planning units used to prioritize land include tax parcels, cell groupings such as region groups, and hexagon grids. The planning units are imperative because they will allow managers to precisely define their management scope and assign appropriate landscape metrics to groups of cells rather than individual cells. Planning units are the building blocks for conservation prioritization and optimization based on attributes such as connectivity, cost, and additional social-ecological values.

Planning Units	Uses
Hexagon Grids	Marine conservation; large landscapes
Tax Parcels	Incorporate property values
Raster Cells	Landscape-scale patch delineation

Table 11. Common conservation planning units.

Environmental managers have many options once they have developed initial prioritization indices at appropriate scales with comprehensive input from vested parties. Tools like Marxan and Prioritizr are commonly used in systematic conservation planning, which "facilitates a transparent, inclusive and defensible decision-making process" (Game and Grantham, 2008). These tools aim to optimize conservation planning based on attributes such as costs (or core area substituted for costs), spatial efficiency, connectivity, and acquisition or protection feasibility. Marxan is a standalone software that is commonly used in marine reserve design but has been successfully utilized in terrestrial case studies. Further, Marxan necessitates robust planning processes, evidence-based ecological observations and goals, and various forms of knowledge and social-ecological perspectives (Game and Grantham, 2008). Prioritizr is an R package in the CRAN repository that can be used to optimize like Marxan and has additional conservation planning functionality. Prioritizr can operate more quickly than Marxan and incorporate values of various vested parties to solve conservation planning problems (Hanson et al., 2020).

Planning Tools	Uses
Simulated Annealing ex. **Marxan**	Reserve design and optimization
Integer Linear Programming ex. **Prioritizr**	Optimization

Table 12. Planning tools for landscape-scale optimized conservation planning.

Further Research

The field of landscape-scale conservation planning is rapidly expanding, offering a wealth of opportunities for further research to advance the science and technology for effective and inclusive decision-making. As *Pathways Forward* states, conservation planning needs to be done at a resolution that is appropriate for landscape-scale analysis and understanding while still allowing for localized conservation decision-making, or "site intervention" (NLC, 2018). We foresee a shift to finer resolutions as more detailed datasets are released, and technology continues to improve its capacity and speed for bigger analyses and datasets.

Additional analyses that would enrich these conservation value indices include connectivity analyses using cost surfaces and distances within ArcGIS or standalone software such as Circuitscape. Circuitscape utilizes circuit theory to determine the most appropriate and least obstructed pathways between habitat patches. A wall-to-wall connectivity analysis allows for the generation of landscape-scale connectivity surface datasets that are not specific to individual species (Koen, 2014). Landscape-scale datasets that showcase metrics and data such as permeability (Theobald et al., 2012), human influence (Theobald, 2010), and change over time will be important to incorporate into future analyses as influences such as climate change, disasters, human development, human and non-human migration, and unforeseen circumstances shape societal decision-making and conservation planning processes moving forward.

Another important step towards effective landscape-scale conservation planning is working with a Tribe to identify unique conservation planning needs and tools and their methodologies and appropriate data sources. This may include implementing an optimization tool or something else entirely.

CONCLUSION

While this analysis is step one of a process that requires far more time, data, and research, it highlights the fact that Tribal priorities can and should be incorporated in conservation planning processes; in fact, they improve traditional models of conservation because of the comprehensive cultural and ecological value they add to landscape-scale resiliency planning. Further, centering Tribal priorities in conservation planning inches natural resource management closer to inclusivity and justice while retaining focus on landscape-scale connectivity and conservation.

QUALITATIVE ANALYSIS

Figure 1. Interview Questions Organized by Theme

Questions by Theme	Rational

Collaboration
• Could you tell us about the organizations (other nonprofits, tribal orgs or agencies) involved in the project and what their roles are?
• Is there a dedicated coordinator for partnerships? Who is it?
• When so many partners are involved, how are decisions made?
   o Is there a steering committee? Who is on it?
• Has the project resulted in improved relationships among partners?
   o What factors have been important for improving relationships and building trust?
   o How does the project build trust with tribes?
	Understand the partnerships structure and the internal decision-making mechanisms.

Engagement
• What are some key strategies you use to facilitate coordination and communication?
   o Are there MOUs and formal policies/rules to structure collaboration, or is it voluntary?
• Do you have outreach engagement plans? What are they? **OR** We saw that there are plans for [type of engagement ex: youth engagement, education, cultural programming] could you tell us more about the purpose of those plans?
   o Who does the project aim to engage? Has the project been successful in engaging those communities?
	Understand the Engagement/Outreach objectives and external communication mechanisms.

Science-based Planning
• What are the conservation goals for this project? What is being done to achieve those goals on the ground?
• We want to ask about the role science is playing in this project...
   o Is traditional knowledge being used?
   o How do you prioritize traditional knowledge when working on multi-partner projects?
   o Does the project collaborate with scientists?
   o What type of scientific data is being used? (inventory/monitoring data, scientific reports, internal agencies data)
• How is the project monitoring progress towards the conservation goals?
   o Is data being collected to monitor progress?
   o Are progress reports being published?
	Identify conservation objectives and how modern and traditional ecological knowledge are incorporated.

Investing • Is the project supporting the tribe's economy? o Are tribal members being hired?	Identify common funding mechanisms or strategies that

• Where does your funding come from?
    o What strategies do you use to secure sustainable funding?
    o Who is responsible for managing finances?
	support or hinder the collaborative.

Policy • Does the project/organization face legal barriers when partnering with tribes? o We understand that your organization is a 501c3, what is like partnering with tribes that have different legal statuses? • Are tribal agencies involved? Are they implementing policy for the project?	Examine how policy is used to support or hinder the collaborative.

All Themes
• What have been your biggest successes to date?
• What factors have contributed most to the project's success? *[potential responses: strong relationship with partners, funding, community support, supportive policy, visionary leadership]*
• What factors have hindered project success? *[potential responses: poor relationships with partners or community, lack of funding, capacity issues, lack of infrastructure, lack of scientific expertise]*
    o Could you tell us about a specific challenge the project has confronted? How was this challenge overcome?
• **What are some important considerations for successful collaboration with tribes that you think are important to share with others?**
• In 10 years, what would a successful project look like to you?
• Do you have any ideas on how the project could improve in the future?
• Is there anything else you would like to add or would like to talk about?
• Do you have any additional partners or conservation projects that could provide us with more information on achieving collaborative conservation with tribes?
• Do you recommend or have any documents you think would be useful for our project?
    Planning/Strategy Documents
    Partnership Agreements (MSA, MOU's etc.)
    GIS Data
	Provides additional context for the long-term collaborative conservation strategy of each project. Provides an opportunity for respondent to share anything we may have missed.

Figure 2. NVivo Coding Structure
1. **Collaboration**
   o Motivation
   o Strategy
   o Vision
   o Values
   o Leadership
   o Barriers
2. **Engagement**
   o Trust
   o Education/cultural heritage
   o Community
   o Empowerment
   o Communication
   o Barriers
3. **Science-based planning**
   o Evaluation
   o Management
   o Community health
   o Land
   o Discipline
   o TEK
   o Barriers
4. **Investing**
   o Funding
   o Sustainability
   o Financial status
   o Tribal Economy
   o Barriers
5. **Policy**
   o Legal
   o Community based approaches
   o Tribal government
   o Non-tribal government
   o Advocacy
   o Barriers
   Lessons Learned
   a. What are some important considerations for successful collaboration with tribes that you think are important to share with others?
   Quotes

Figure 3. Survey Questions

Question	Rationale
Demographics • *Ethnicity* • *Gender* • *Age*	Understand demographic characteristics of survey respondents

Tribal affiliation • *Are you a member of a Tribe? (including unrecognized by U.S. state or federal government)* • *If yes, which Tribe are you a member of?* • *Are you involved in Tribal governance, or in a community leadership role* • *Please describe your role:*	Understand characteristics of respondent's relationship with Tribe
Descriptors of Respondent's Work • *Which best describes your primary place of work?* • *What is the name of your organization?* • *What is the size of your organization?* • *Which State(s) does your organization primarily work in?* • *Please indicate to what extent your organization prioritizes the following: (Landscape conservation, wildlife conservation, cultural heritage conservation, climate change, invasive species, biodiversity, tourism, working lands (agriculture, ranching, timber), education, economic development, wildfire, food sovereignty/security, water quality, other)* • *Which best describes your position at your organization? Select all that apply. (partnership coordination, project management, scientific research/consultation, legal consultation, field work, fundraising, spatial analysis, community engagement/education, administration, other)*	Understand characteristics of respondent's work and their organization; these questions are important to consider when analyzing subsequent questions on collaboration and are important in limiting the context of results
Collaboration • *Please select all partners your organization has collaborated with: (Government agency (Federal, State, Local), Tribe(s), Non-profit/NGO, For profit entity, Private citizens, Lessees of trust land, Foundation/Grantmaker, University/College, Other)* • *Please select the top three partners that collaborate with your organization: (Government agency (Federal, State, Local), Tribe(s), Non-profit/NGO, For*	Understanding extent of Tribal collaboration; highlights key factors of collaboration and explores motivations and outcomes

profit entity, Private citizens, Lessees of trust land, Foundation/Grantmaker, University/College, Other) *How many Tribes has your organization partnered with?* *What tools has your organization used to increase collaboration with Tribes?(memorandum of understanding (MOU), facilitated conflict resolution, financial support, technical and/or legal support, peer learning network/information sharing, Tribal resolution, Coordinated activities, Educational materials/activities, in-person meetings, Strategy planning (planning of long-term, continuous engagement), public hearings, acknowledging tribal history, Other)* *Why does your organization engage with Tribal partners?(similar issues and goals, similar geographic region or overlapping resource interests, mentor or share lessons learned, incorporate other forms of knowledge, compare and contrast strategies, compare and contrast legal frameworks, social justice, secure project funding, broaden conservation network, regulation, other)* *Overall, would you say that projects you have been involved with have resulted in increased trust between partners, including Tribes?* *Overall, would you say that partnerships with Tribe(s) have influenced the outcomes of projects you have been involved with?* *What are important considerations for successful collaboration with Tribes that you would like to share?*	
For organizations not collaborating with Tribes *Has your organization considered working with Tribes?* *What barriers have prevented your organization from collaborating with Tribes? (Tribes financial status, funding, technical capacity, job capacity, federal government*	Understanding of why organization has not collaborated

administration, disparate conservation goals, other)	
For non-Tribal entities collaborating with Tribes • *Overall, would you say that projects you have been involved with had different approaches due to collaborating with a Tribal partner?*	Identifying how Tribal collaboration influences a project's approach to conservation
For Tribal members • *What elements would you like to see non-Tribal partners incorporate into their approach when working with members of Tribal communities?*	Identifying key collaboration strategies from a Tribal perspective
For all organizations collaborating with Tribes • *Overall, would you say that the collaborative projects that you have been involved in incorporated Tribal input?* • *Would you say that the project adequately incorporated Tribal input?* • *If no, why do you believe the Tribal perspective was not adequately incorporated?*	Understanding extent of collaboration
Use of Science • *Is Traditional Ecological Knowledge (TEK) being used to support the goals of the collaborative projects your organization is involved with?* • *Please select all methods your organization has used to incorporate TEK (gather oral histories, community survey data collection, inter0-generational knowledge sharing, site prioritization based on TEK, conservation methods influenced by TEK, Other)*	Understanding if and how TEK is used
Conclusion • *Please share any other suggestions or information:*	Providing opportunity for additional feedback from respondents

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