



BRAIDING INDIGENOUS TRADITIONAL ECOLOGICAL KNOWLEDGE AND THE IMPLEMENTATION OF THE ENDANGERED SPECIES ACT

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Cover image: Ron Nordin, Jr., Red Cliff tribal member, is the Wildlife Technician for the Treaty Natural Resources Department of the Red Cliff Band of Lake Superior Ojibwe in Wisconsin. Ron is holding two wolf pups. Photo by Andrew Edwards

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CALIFORNIA CONDOR; DAVID SKERNICK

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BRAIDING INDIGENOUS TRADITIONAL ECOLOGICAL KNOWLEDGE AND THE IMPLEMENTATION OF THE ENDANGERED SPECIES ACT

Fifty years ago, the U.S. Endangered Species Act (ESA) was passed to protect imperiled species and the ecosystems upon which they depend. While the ESA is one of the strongest environmental laws to date, its implementation has nevertheless fallen short in consistently incorporating the voices and knowledge of an essential group of ecological experts. For centuries, Indigenous communities have practiced land stewardship across U.S. lands, accumulating a deep and culturally congruent understanding of ecosystem health and well-being. This Indigenous understanding of the land and natural cycles is often referred to as Indigenous Traditional Ecological Knowledge (ITEK). The ESA includes a mandate to employ the “best available science” (BAS) to inform policies and decisions. Statutory requirements to rely on BAS have historically prioritized western science and reflected uncertainty around how to include other forms of knowledge, often leading to the exclusion of ITEK from the literature cited in environmental management decisions. Here we discuss the unrealized value of ITEK to BAS and its great potential in advancing ESA implementation and the statute’s intended goals. “Braiding” ITEK and western science involves the respectful use of these two forms of knowledge in tandem and can provide a more robust approach to BAS and conservation more broadly. Indigenous rights and sovereignty, the implementation of culturally meaningful recovery targets, and a proactive approach to building partnerships and trust are essential components to improving the incorporation of ITEK in ESA implementation over the next 50 years and beyond.



TECHNICIAN OF THE BAD RIVER BAND OF LAKE SUPERIOR OJIBWE CONDUCTING POPULATION ASSESSMENTS ON JUVENILE STURGEON IN LAKE SUPERIOR. PHOTO BY CHARLIE RASMUSSEN

INTRODUCTION

In 2008, the U.S. Fish and Wildlife Service (USFWS) officially listed the polar bear (*Ursus maritimus*) as a “threatened” species in accordance with the Endangered Species Act (ESA). During the process leading up to the official listing, the USFWS utilized the Indigenous knowledge of Inuit and Inupiat hunters in the Arctic to characterize polar bear habitat and populations to support the final listing (US Fish and Wildlife Service 2008). In 2007, the Cowlitz Tribe of Washington State petitioned the National Marine Fisheries Service (NMFS) to list the Eulachon (*Thaleichthys pacificus*), a small anadromous fish and traditional food source for the Tribe, as a “threatened” species in need of federal protection. In their final report, NOAA’s Northwest Fisheries Science Center stated that, “*There is a largely untapped store of knowledge on the Eulachon residing in the culture and traditions of Native American Indian Tribes and First Nations of Canada*” (Reynolds and Romano 2013). In these instances, as well as numerous others, Indigenous knowledge has provided invaluable insights into formulating protections for imperiled species. Collaboration and knowledge sharing between Indigenous communities and practitioners trained in western science can serve to produce and inform important

conservation outcomes in a time when we need them most.

Today the world is experiencing rates of extinction hundreds to thousands of times higher than the background extinction rate (Cowie et al. 2022); the ESA is considered one of the strongest laws for addressing this downward trend of biodiversity with almost every species listed to date having avoided extinction (Dwyer et al., 1995; Schwartz, 2008). The purpose of the ESA is to protect and recover imperiled species and the ecosystems upon which they depend, calling on “best available science” (BAS) to inform policies and decisions. The law largely leaves the interpretation of what constitutes BAS to the two main federal agencies that implement the ESA: USFWS and NMFS. A history of prioritizing western science in ESA decision-making and uncertainty around how to include other forms of knowledge has often led to their exclusion (Agrawal, 1995; Ross et al., 2011; Whyte, 2013). While the need to incorporate Indigenous Traditional Ecological Knowledge into conservation planning is widely discussed (Kimmerer, 2002; Aswani and Hamilton, 2004; Shackeroff and Campbell, 2007; Carter and Nielsen, 2010), there is a dearth of guidance specific to how it should be integrated into ESA planning and implementation.



PRESTON KERES; USFS

A recently published procedural handbook from the Department of the Interior makes strides to remedy this gap (DOI 2025), but there is still a long way to go.

This article focuses on the braiding of knowledges to inform ESA decision-making and implementation. The term “braiding” refers to utilizing both Indigenous knowledge and western science concurrently, at the same time, maintaining the autonomy of both knowledge systems, like strands of braided sweetgrass (Kimmerer 2015). Here we look back at over 50 years of historical implementation of the law to offer new insights and solutions for the future protection of imperiled species by highlighting the current and potential contributions of ITEK and Indigenous peoples. This article will: 1) define Indigenous Traditional Ecological Knowledge (ITEK), 2) discuss the fundamentals of ESA implementation as it relates to tribal lands and sovereignty,

3) identify Indigenous perspectives of biodiversity and conservation, as well as Indigenous ways of knowing and how they differ from western science, 4) describe Indigenous data sovereignty and how this relates to ESA implementation, and 5) propose ways in which we can move forward using both ITEK and western science through “best available science” in ESA implementation. While there is still a long way to go to equitably and respectfully braid ITEK and western science as the standard for positive conservation outcomes, there is increasing opportunity to shift the conservation paradigm into one that celebrates the value of ITEK and the importance of its practitioners. Heeding Indigenous sovereignty, implementing culturally meaningful recovery targets, and taking a proactive approach to building partnerships and trust are all key to improving the incorporation of ITEK in ESA implementation over the next 50 years and onwards.

Disclaimer: This article interchangeably uses the terms Indigenous people, Native Americans, and American Indians in referring to the Indigenous people of the United States: “American Indian” refers to a more historic perspective; “Native American” refers to Indigenous people in the United States; “Indigenous” refers to a global perspective. “First Nations” or “Aboriginal people” are terms used to refer to Indigenous people of Canada. In more specific cases, tribal nations will be acknowledged by their traditional names in accordance with their ancestral languages, such as Ojibwe, White Mountain Apache, Southern Ute, etc. The convolutedness of terminology reflects the complexity of tribal histories. It is important to keep in mind the displacement of Indigenous peoples and erasure of traditional names, therefore referring to a tribe or tribal members’ self-identifying name is strongly recommended. So too, this article is specifically meant to explore the braiding of ITEK and western knowledge, it does not evaluate the use of other local inputs or conflate the discussed benefits of ITEK with any other information sources.



WHOOPING CRANES; USFWS

2. RECOGNIZING INDIGENOUS TRADITIONAL ECOLOGICAL KNOWLEDGE (ITEK)

“Much of the world’s terrestrial wild and domesticated biodiversity lies in areas traditionally managed, owned, used or occupied by Indigenous people,” according to the Global Assessment Report on Biodiversity and Ecosystem Services by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES 2019). Sobrevila (2008) pointed out that 80% of global biodiversity is located on Indigenous homelands. In the United States, tribal nations manage over 95 million acres of land (Kraniak et al. 2015). The richness of biodiversity exists because many Indigenous peoples possess cultural, place-based perspectives of their traditional homelands that have contributed to their sustainability and well-being for generations (Berkes et al. 1994; Berkes 1999; Gadgill et al. 1993; Pierotti and Wildcat 2000; Cajete 2000; Kawagley 2006; Reo 2011; McGregor 2013; Kimmerer 2015). So too, the perspectives of Indigenous women are embraced by Indigenous cultures and contribute to healthy and biodiverse ecosystems (McGregor 2005). These philosophical paradigms contribute to a more personal connection of and personalized responsibility for ecosystem conservation, known by some Indigenous people as

“protecting our relatives” (Waasegiizhig-Price 2021). As a result, the abundance, behaviors, and distributions of threatened or endangered species may- in many cases- be better known by resident Indigenous people than western-trained scientists (Nabhan 2000). It is estimated that over 1 million species are now facing extinction globally unless action is taken to reduce the intensity of drivers of biodiversity loss (IPBES 2019). Indigenous Traditional Ecological Knowledge will be imperative to restoring global biodiversity by introducing concepts such as coexistence, reciprocity, and responsible stewardship (Larsen and Johnson 2017; Ogar et al. 2020) as opposed to extractive and exploitative processes of the natural world.

ITEK is defined as *“a body of observations, oral and written knowledge, practices, and beliefs that promote environmental sustainability and the responsible stewardship of natural resources through relationships between humans and environmental systems”* (Lander and Mallory 2021). This and other synonymous terms for this knowledge originated from academia and not from Indigenous communities (McGregor 2000).



TOP: MEMBERS OF THE SKOKOMISH TRIBE CONDUCTING ELK MONITORING; USFWS, BOTTOM: MEMBERS OF THE DUCKEATER SHOSHONE TRIBE CONDUCTING RESTORATION OF SPRINGFISH HABITAT; USFWS

The recognition of Indigenous Traditional Ecological Knowledge by the scientific community accelerated during the study of climate change in the Arctic (Wenzel 1999). Scientists working in the Arctic realized that Inuit and Inupiat hunters possessed precise observations of changes in sea ice – observations that contained more nuanced and detailed observations than empirical data and modeling (Wenzel 1999; Van Drei 2014). Soon, the observations and perspectives of Indigenous peoples became a buzzword, known as Traditional Ecological Knowledge, and many western researchers now wanted to integrate Indigenous perspectives and understanding into scientific inquiry. Since the late 1990s, Traditional Ecological Knowledge, also known as Indigenous knowledge, Indigenous science, and Native Science, has been the intellectual focal point for a new paradigm in environmental stewardship and sustainability based on the lived experiences of Indigenous peoples (Berkas 1999; Pierotti and Wildcat 2000; Cajete 2000; Kawagley 2006; McGregor 2013; Kimmerer 2015). Due, in part, to the vast underrepresentation of Indigenous peoples in academia, scientific journal articles are rarely authored by Indigenous individuals (Nelson and Madsen, 2018; Gewin et al., 2021). Institutional racism and funding disparities, colonialism, and genocide have contributed to barring Indigenous individuals from entering many scientific

academic realms and continue to prevent representation of Indigenous communities and instill distrust towards western scientific spaces (Green, 1978; U.S. Commission on Civil Rights, 2003; Pacheco et al., 2013). Historically and to this day, oftentimes when Indigenous knowledge is published, it has been coopted by western scientists and the Indigenous communities who had originally held that knowledge is not credited- this is referred to as parachute science (Odeny and Bosurgi, 2022). A resurgence to strengthen relationships between the federal government and Tribal Nations by US leaders has led to promising equity outcomes that have been missing.

On November 15, 2021, the Biden Administration issued an Executive Memorandum on the inclusion of Indigenous Traditional Ecological Knowledge (ITEK) and Federal Decision Making (Lander and Mallory 2021). This memorandum, distributed throughout all federal agencies and departments, was meant to strengthen relations between federally recognized tribal nations and the federal government as well as to recognize the knowledges, traditions, and lifeways of Indigenous peoples in the United States. This document recognizes that Indigenous peoples hold applicable knowledge, values, relationships, and perspectives, embedded in their ancestral languages and traditions, and past personal experiences, that promote



LEFT TO RIGHT: CANDY DARTER, RYAN HAGERTY/USFWS; MOUNTAIN SWEET PITCHER PLANT, PEEPLES/USFWS; TIPTON KANGAROO RAT, USFWS

environmental sustainability and responsible human stewardship of Earth's biological systems. Indigenous ways of knowing were not consistently considered in previous federal policies and mandates prior to this acknowledgment. At the end of 2023, the Department of Interior released their Departmental Manual 301 "Departmental Responsibilities for Consideration and Inclusion of Indigenous Knowledge in Departmental Actions and Scientific Research" which will become the Department's policy to create collaborative, reciprocal relationships with Indigenous Peoples and to respect and promote the inclusion of Indigenous Knowledge in decision making, resource management, scientific research, and other actions. It will invite Indigenous Peoples to decide when it is appropriate to make available IK to

inform decisions under the ESA. In January 2025, the Department of the Interior put out a comprehensive handbook detailing procedures for the inclusion and application of ITEK in departmental work (DOI 2025). This document lays helpful groundwork for engaging with tribal partners. At the publication of this report, many of these legislative commitments appear uncertain as the Trump administration moves to dismantle the progress made by the previous one. For instance, Executive Order 14112 of Dec. 6, 2023 — "Reforming Federal Funding and Support for Tribal Nations to Better Embrace Our Trust Responsibilities and Promote the Next Era of Tribal Self-Determination" was revoked three months after the administration change. Regardless, administrations are temporary, and the

USFWS

conservation community's interest in building partnerships that enable tribal sovereignty persists.

ITEK and Indigenous cultures bring new perspectives for observing and interpreting the natural world. Having a multi-cultural lens for ESA implementation can only strengthen and enhance the mission of protecting imperiled species. Many Indigenous communities share similar beliefs regarding animals as equals and/or relatives; this Indigenous perspective is common around the world (Larsen and Johnson 2017; Fernandez-Llamazare 2021). The term "more-than-human" is a concept that views the animal world as having a longer tenure on the planet than humans, thus animals are regarded as having more knowledge, wisdom, and survivance than

human beings. In the Anishinaabe Creation Story, human beings are seen as the least of creation as hierarchically compared to earth, plants, and animals (Benton-Benai 1988; Johnston 2014). Accordingly, animals are bestowed with respect and dignity by culturally fluent tribal people who, in turn, would be in a good position to make effective decisions regarding the protection of imperiled species (Larsen and Johnson 2017). Preserving biodiversity and respecting all living beings as relatives are concepts that are woven into the cultural and spiritual fabric of Indigenous peoples. This is why it is imperative to include culturally knowledgeable Indigenous people in the implementation of the ESA within their traditional homelands and ceded territories and to do so in a way that respects their decisions and collective goals.

3. UNDERSTANDING TRIBAL SOVEREIGNTY IN ESA IMPLEMENTATION

Tribal governments have more plenary power than state governments originating from government-to-government treaty negotiations between the federal government and tribes (GLIFWC 2022; Blackhawk 2023; Treuer 2023). Generally, tribal sovereignty defines the inherent right of a tribe to exist and govern as a nation within the borders of the United States, whereas the trust responsibility defines the federal government's obligation to protect the rights and sovereignty of tribal nations. The United States has a long history of government-to-government relationship with Tribes but this has often fallen short of tribal knowledge and needs. In 1997, Secretarial Order 3206 was released to Departments to *"carry out their responsibilities under the Act in a manner that harmonizes the Federal trust responsibility to tribes, tribal sovereignty, and statutory missions of the departments, and that strives to ensure that Indian tribes do not bear a disproportionate burden for the conservation of listed species (USFWS, 1997)."* Proper consultation with Tribes is important because new policies and regulations can force management on tribes that are inconsistent with their own goals, values, and legal rights.

TRIBAL SOVEREIGNTY - In the 1800s, as European settlers began moving westward in search of new homelands, the federal government made treaties with Indigenous tribes as a way to secure legal title to lands. The federal government treated each tribe as a nation and drafted nation-to-nation treaty agreements for the cession of lands to the United States. Each tribe or a confederacy of tribes negotiated with government officials for the provisions in each treaty agreement. Some provisions included cash annuities, food rations, tools, and other trade goods. For example, the Ojibwe Tribes, in the region of what is now called Wisconsin and Minnesota, specifically negotiated "reserved rights" to hunt, fish and gather on the lands to be ceded to the United States; these reserved rights are known as "usufructuary rights" (Satz 1991). The Ojibwe signers of those treaties wanted to ensure that their future descendants would retain the rights to hunt, fish, and gather on those ceded lands well into the future (GLIFWC 2022). These treaties between tribes and the federal government, which are guaranteed by Article VI of the U.S. Constitution, are the legal basis for tribal sovereignty.



FISHERIES TECHNICIANS AND INTERNS OF THE BAD RIVER BAND OF LAKE SUPERIOR OJIBWE CONDUCT POPULATION ASSESSMENTS ON JUVENILE STURGEON IN LAKE SUPERIOR. PHOTO BY CHARLIE RASMUSSEN

TRUST RESPONSIBILITY - A series of early Supreme Court cases define the trust responsibility that the federal government has toward tribal nations and serves as the groundwork for federal Indian law (Meyer 2016). In 1831, Chief Justice John Marshall declared in the Supreme Court decision, *Cherokee Nation v. Georgia*, that federally recognized tribes are “domestic dependent nations” and that tribal lands, as defined by negotiated treaties, would be “held in trust” by the federal government (Meyer 2016). Another Marshall court decision in the following year, *Worcester v. Georgia* (1832), declared that tribes have sovereign immunity from the states and that they have the inherent authority to govern their

own affairs, including the management of tribal lands (Zellmer 1998).

The Endangered Species Act (ESA), signed into law by President Richard Nixon in 1973, consists of 17 sections each highlighting the procedural implementation of listing and conserving imperiled species. The ESA makes only one reference to Indigenous people in Section 10(c)(1-4) regarding subsistence hunting and fishing activities for Alaska Natives or permanent residents of Alaska Native villages (Zellmer 1998). Relative to federally recognized tribes in the lower 48 states, the final draft of the ESA in 1973 made no reference to tribally controlled lands or

constitutionally guaranteed treaty rights as defined by law. While the ESA mandates the use of “best available scientific and commercial data,” hereafter referred to as “best available science (BAS),” when making key decisions in ESA implementation, there was no explicit mention of incorporating ITEK. Though the mandate is vague about what constitutes BAS (Doremus 2004; Lowell and Kelly 2016), it presents agencies with the responsibility of determining what qualifies as “science” - and which of that science is “best” - on the Services. Decisions based on BAS include whether to list or delist a species under the ESA; to ensure, in consultation with the Services, that agency actions are not likely to jeopardize the existence of listed species; and the designation of any critical habitat for listed species, among others.

As with other laws, the United States consults with tribes on a government-to-government basis to address issues surrounding tribal trust resources, tribal treaties, and other rights. Since the tribes have the right to self-govern, the ESA is not usually enforced the same way on tribal land as on non-tribal land, though specific sections, such as the section 9 “take” prohibition (to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or to attempt any of these on an ESA listed species), still generally apply (16 U.S.C. 1542(b)). The predominant form of inclusion of the tribes in ESA decision-

making has been and continues to be accomplished through the Services consulting with Tribes on matters affecting imperiled species on tribal lands (Vinyeta and Lynn, 2013).

On November 8, 1993, Interior Secretary Bruce Babbitt issued Secretarial Order 3175 which instructs Interior Department agencies to conduct meaningful government-to-government consultation with tribes on issues affecting tribal lands and citizenry (Albert 2002). Soon afterwards, on April 29, 1994, the Clinton Administration issued Executive Order 13175 on “Government-to-Government Relations with Native American tribal Governments.” Both S.O. 3175 and Clinton’s Executive Order recognize that federally recognized tribes are government entities, and that the federal government is directed to consult with tribes on a government-to-government basis to “the greatest extent possible” (Albert 2002). Tribal consultation should be “regular, meaningful and robust,” but, federal agencies have not always followed the executive mandates, and tribes were either treated as mere stakeholders or they were completely ignored in ESA implementation (Zellmer 1998; Albert 2002). The 2021 Executive Memorandum on the inclusion of Indigenous Traditional Ecological Knowledge and Federal Decision-Making states, “*These commitments include ensuring that Federal agencies conduct*

regular, meaningful and robust consultation with Tribal officials in the development of federal research, policies, and decisions, especially decisions that may affect Tribal Nations and the people they represent” (Lander and Mallory 2021). Tribal Consultation remains the most effective channel for tribal-federal partnerships and effective decision-making (Blumm and Pennock 2023).

However, consultation between tribes and the Services has not always been properly carried out, and many times tribes are overlooked or completely ignored in land management decisions (Albert, 2002). While some ESA guidance documents mention consulting tribes, this is rarely given much attention in practice. For example, the Section 7 Consultation Handbook states that when evaluating the cumulative effects of a proposed action, the effects of future tribal actions that are reasonably certain to occur in the action area should be considered (USFWS, 1998). However, the consultation process seldom provides any analysis of tribal actions or an account of tribal coordination, despite the handbook explicitly stating that coordination with tribal governments should occur (Section 2.6). Other provisions of the ESA fail to connect to how the incorporation of ITEK could improve the foundational science for policy decisions, with many listed species recovery plans failing to mention ITEK entirely. To begin to fully understand how to appropriately and respectfully incorporate ITEK, we must understand the ways in which this knowledge is kept and shared.



4. BACKGROUND ON INDIGENOUS WAYS OF KNOWING AND KNOWLEDGE KEEPING

Epistemology is the study of how we come to know what we know. There are epistemologies that are rooted in western science and there are Indigenous epistemologies that are being defined by Indigenous scholars and thinkers who are developing new paradigms and intellectual frameworks for interpreting the natural world in accordance with their respective languages and cultures (Kovach 2009; Whyte 2009; Absolon 2011; Grincheva 2013). Below are a few of the many Indigenous-centered frameworks for interpreting the natural world. These woven together with western science can help constitute a foundation of best available science.

BRAIDING KNOWLEDGES - The concept of Braiding Knowledges was introduced by Dr. Robin Kimmerer, a citizen of the Potawatomi Nation and professor of Plant Ecology at SUNY Syracuse. In her book, “Braiding Sweetgrass,” she introduces how she sees two knowledges, Indigenous knowledge and western science, braided together like strands of sweetgrass to create a new integrated paradigm for solving contemporary socio-environmental challenges, these two strands woven together create additional strength and resilience (Kimmerer 2015). Lamb et al. (2023) uses the term “braiding” to discuss integrating

Indigenous rights with endangered species law and to describe how the ESA falls short in addressing treaty-protected harvest rights and culturally meaningful abundances. Specifically, Lamb et al. argue that aiming recovery targets at minimum viable populations rather than culturally meaningful abundance falls short as these lower targets do not allow Native communities to resume sustainable harvest (discussed further in Section 5). This article also uses the term “braiding” in discussing the integration of ITEK and ESA implementation in that using these two forms of knowledge in tandem can provide a more robust framework for conservation overall.

TWO-EYED SEEING - Two-eyed Seeing is an Indigenous framework that was introduced by Dr. Albert Marshall, a Mi’kmaw elder and education professor in Ontario. In this framework, nature is viewed through two lenses: one lens is the view of western science, and the other lens is the view of Indigenous knowledge. By simultaneously looking through both lenses, one can view an ecological problem utilizing both perspectives and address environmental challenges through an integrated approach involving the two knowledge systems (Bartlett et al. 2012; Wright et al. 2019; Broadhead and Howard 2021). The “Two-eyed Seeing” framework

has been applied to create new methodologies for fisheries research and management (Reid et al. 2021; Almack et al. 2023). This framework is similar to the idea of braiding knowledge in that both of these philosophies hold space for multiple perspectives and forms of knowledge in an effort to provide a stronger understanding.

SEVENTH GENERATION PHILOSOPHY- The Seventh Generation Philosophy was introduced by the Haudenosaunee people, also known as the Iroquois. In their teachings, they proclaim that for every decision, one must consider the health and well-being of our descendants seven generations into the future. This philosophy creates a long-term conscientious strategy for responsible and sustainable stewardship of the natural world that we all depend on (Clarkson et al. 1992; Lyons 2010).

“WHAT HAPPENS TO ONE WILL HAPPEN TO THE OTHER” - The Anishinaabe people have a teaching that says: *“Aaniin ezhibwebizid ma’iingan, mii ge-izhibwebizid Anishinaabe, miidash Aaniin ezhibwebizid Anishinaabe, mii ge-izhibwebizid ma’iingan (What happens to the wolf will happen to the Anishinaabe, and what*

happens to the Anishinaabe will happen to the wolf)” (Benton-Benai 1988; Waasegiizhig-Price 2021). This teaching recognizes the intertwined fates of both the wolf and Indigenous people, namely the Anishinaabe, throughout history. For over 200 years, both the wolf and Anishinaabe people have simultaneously experienced extermination, territorial expulsion, and subjugation, as well as resurgence, revitalization, and restoration. What happened to one happened to the other. This spiritual teaching, along with the exercise of treaty rights and tribal sovereignty, has a profound impact on current management decisions by tribal governments over the grey wolf in Wisconsin, Minnesota, and Michigan (Gilbert et al. 2022).

INDIGENOUS DATA SOVEREIGNTY - The Indigenous data and knowledge that is gained through experience and observation belongs to the communities that hold it. This right and *“the right of Native nations to govern the collection, ownership, and application of its own data”* is referred to as Indigenous data sovereignty (Rainie et al. 2017). Indigenous data is defined as any information that impacts the lives of

Indigenous people and/or communities and can come in the form of traditional stories, prayer songs, ceremonial objects, or historical artifacts, as well as written and recorded information and empirical data (Rodriquez-Lonebear 2016).

Indigenous people did not always have control of their own data or information. Historically, government agencies, academic institutions, and churches collected and housed information on Native peoples which was not readily accessible to tribal citizens (Child 2014). For centuries, non-Indigenous researchers and government-funded ethnologists entered tribal communities and collected information on languages, demographics, cultures, and oral histories based on the promise that this research will benefit their tribal community. This data, in the form of interviews, photographs, artwork, artifacts and written documents, were used to further the careers of scientists and academicians, as well as the discipline of anthropology, but were of little-to-no benefit for the Indigenous communities that supplied them that information (Deloria 1999; Smith 2023b). This kind of intellectual theft created mistrust between Native nations and academic institutions.

This was, and continues to be, the long legacy of intellectual colonialism perpetrated upon Indigenous peoples by colonial-settler society (Smith 2023b).

In the implementation of the ESA, Indigenous knowledge keepers or tribal government representatives may use their ITEK to support the protection of imperiled species and restore their populations to viable levels, but it must be understood that tribal people have the inherent right to govern the collection, ownership, and application of their knowledge, regardless of who is funding this study. Acknowledging Indigenous data sovereignty is key to supporting the sovereignty and self-determination of tribal nations which aligns with both federal Indian law and trust responsibility, as well as reversing the harsh legacy of colonialism on Indigenous peoples (Carroll et al. 2019). However, there are challenges to putting this into practice. For instance, the Freedom of Information Act (FOIA) allows members of the public to request disclosure of U.S. government documents. Tribes may choose not to share data and knowledge with government agencies because they wish to keep certain information private and undisclosed to the public.



LEFT TO RIGHT:
RUSTY
PATCHED
BUMBLE BEE,
DAWN
MARSH/USFWS;
SPIKEDACE,
USFWS; BLACK
FOOTED
FERRET, RYAN
MOEHRING/FW
S; FASSETT'S
LOCOWEED,
JOEL
TRICK/USFWS.

5. CURRENT IMPLEMENTATION GAPS/ OPPORTUNITIES

LISTING - The ESA lists an imperiled species as either “threatened” or “endangered” and applies legal requirements to restore the population of the listed species to self-sustaining levels (Bean 2009). Currently, there are two pathways to delisting a species from the ESA: regulatory and statutory, although the statutory pathway is not stated in the ESA (Felton 2019). The regulatory pathway envisioned by Congress relies on biological and ecological empirical data to assess the vulnerability of the listed species, which is also subject to public comment and judicial review (Felton 2019). At this stage, incorporating ITEK into listing can provide a more complete picture of a species’ baseline populations, threats, and current status. The statutory pathway, in contrast, has often been political and not necessarily based upon “best available science.” In this process, specific bills are passed or riders are attached to Congressional appropriations bills and voted on by a legislative body that possibly ignores the scientific findings relative to a listed species, which is counter to the mandate of the ESA (Felton 2019).

RECOVERY PLANNING - Once a species has been listed as either “threatened” or “endangered,” the ESA requires either the USFWS or the NMFS to develop a recovery

plan to restore the population of an imperiled species to the point where it no longer qualifies as threatened or endangered. The plan must include population goals, measurable recovery criteria, and a timeline for the plan’s completion (Bean 2009). The recovery plan is meant to prevent extinction and establish a self-sustaining population, known as a recovery target, for a listed species based on “best available science.”

Many Indigenous communities still depend on subsistence hunting and gathering rights, and many tribal citizens continue to practice those cultural harvesting traditions year-round in their traditional homelands (Brightman 1993; Condon 1995; Donner 1997; McCorquodale 1997; Kemmerer 2004; Reo and Whyte 2012). Treaty rights guarantee that a nation, like the United States, respects and upholds its negotiated agreements with Indigenous nations regarding hunting, fishing, and gathering (GLIFWC 2022). These rights are also reaffirmed by the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP 2007). Most land cessions and treaty rights in the United States were negotiated in the 1800s (GLIFWC 2022; Blackhawk 2023). These rights ensured that future unborn generations of Indigenous people may have the freedom to provide for

themselves through traditional lifeways. Lamb et al. (2023) emphasizes that restoring a culturally significant species to its minimum viable populations (MVP) rather than “culturally meaningful recovery targets” impedes Indigenous rights to hunt, fish and gather. Achieving minimum viable population targets for a particular species is not enough to ensure treaty-protected harvests. According to the criteria of the ESA’s 4(a)(1), “recovery means improvement in the status of listed species to the point at which listing is no longer appropriate” 50 CFR 402.02. For ESA implementation to be consistent with federal law and Presidential executive orders, Supreme Court caselaw on the federal government’s trust responsibilities,

and to protect the treaty rights of Indigenous people, it should address “culturally meaningful recovery targets” for species that Indigenous people depend on to the maximum extent possible under the law. Species such as salmon, bison, and caribou, which were exploited to near extinction by colonial-settler society, are traditional food sources for Indigenous people that must be recovered to sustainable population levels so that traditional lifeways of hunting, fishing, and gathering may continue (Lamb et al. 2023).



HIGGINS EYE PEARLY MUSSEL; GARY J. WEGE/USFWS



LOGGERHEAD SEA TURTLE; PETER PATTAVINA/FWS

CRITICAL HABITAT DESIGNATION-

Since human activity is the main driver of habitat loss and species decline, Congress amended the ESA in 1978 to include the Critical Habitat provision. “Critical habitat” designation is mandatory for all listed species (with some exemptions 16 U.S.C. 1533(b)(2)) and is meant to protect essential habitat of “threatened” or “endangered” species by regulating activities carried out, allowed, or funded by federal agencies activity on those lands (Zellmer 1998; Albert 2002). The ESA as written does not describe how “critical habitat” designation is implemented specifically on Indigenous territories, contributing to real and perceived jurisdictional conflicts with tribal nations (Albert 2002). One concern for tribal leaders is that, by implementing the “critical habitat” provision, the federal government can use its authority to effectively “seize” tribal lands in the protection of a “listed” species and diminish the sovereign authority of that particular tribe (Zellmer 1998; Albert 2002). Though designated land would remain in tribal hands, tribes may see the designation as undermining tribal sovereignty by “effectively impos[ing] a federal zoning system on Indian lands,” potentially limiting what tribes can do with their own land (Zellmer 1998). This can be especially galling given that tribal lands often serve as essential habitat for threatened and

endangered species precisely because such lands are refugia for those species since non-Indian parties have often degraded surrounding lands for economic benefit (Albert 2002; Zellmer 1998).

On June 5, 1997, the passage of Joint Secretarial Order 3206 (*American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act*) was meant to remedy the vagueness of jurisdictional priorities on tribal lands. Secretarial Order 3206 states that tribal governments are the appropriate governing entity to manage their homelands and that both the Interior and Commerce Departments will respectfully work with tribal leadership to address the protection and recovery of threatened or endangered species (Wilkinson 1997; Johnson 1998; Zellmer 1998; Albert 2002; Kraniak 2015; Wood 2015). Accordingly, conflicts over “critical habitat” designation should be minimized. Zellmer (1998) states that 3206 has no enforcement capability and is only giving “lip service” to the Order, yet as Sanders (2007) points out, S.O. 3206 has been successful in that, instead of USFWS and NMFS taking responsibility for implementing fiduciary responsibility over tribal sovereignty relative to the ESA, the tribes themselves are actively developing their own habitat management plans for the recovery of imperiled species on their ancestral homelands, thus avoiding critical

habitat designation (see case studies in section 7). Consequently, S.O. 3206 did not originate within the bureaucracy of the federal government but resulted from tribal leaders traveling to Washington D.C. and proposing policy initiatives to address concerns over ESA implementation on tribal lands (Zellmer 1998). This initiative is the epitome of tribal sovereignty and self-determination.

To avoid jurisdictional disputes over ESA implementation on tribal homelands, the White Mountain Apache and Zuni Pueblo developed Statements of Relationship (SOR) between their respective Tribal governments and the USFWS. These SORs are contractual agreements to develop and implement plans to recover a listed species within their homeland territory while, at the same time, uphold tribal sovereignty and jurisdiction (Albert 2002). This is a good example of tribal-federal cooperation in achieving common goals, and could in theory be expanded to other aspects of the ESA, such as the designation of experimental populations.

6. MOVING FORWARD: BUILDING AND RE-BUILDING TRUST AND RELATIONSHIPS

Misunderstandings of Native Americans, treaty rights, and tribal law have troubled diplomatic relations between governments, both federal and state, and tribal nations for over 100 years (Blackhawk 2023; Child 2014; Dunbar-Ortiz 2014). Much of this misunderstanding was interwoven with paternalism and racism; paternalism because many government officials wanted to retain control over tribal policies and finances; racism because many people viewed Native Americans as an inferior race. These learned attitudes and prejudices continue to dominate opinions and decisions today regarding tribal-federal relationships. In order to build or re-build trust and effective relationships between governments, academic institutions, NGOs, and tribal nations, an unlearning and reeducation of Native American history and culture are warranted (Deloria and Wildcat 2001; Smith 2009; Smith 2023b; Treuer 2023).

Tribal nations and their citizens are rightsholders, not just stakeholders. The status of tribal citizens as rightsholders is determined by treaty law, federal court decisions, executive orders and legislative policies that recognize the legal status of tribal nations and their citizens (Ettawageshik and Norman 2020).

Policymakers and government officials usually fall short in recognizing the status of tribal nations, which, in turn, results in Native people being marginalized or labeled only as stakeholders. Tribal nations are usually grouped with other stakeholders such as private landowners, corporations, and state and county governments, that have a stake in the decision-making process. In many cases, managers fail to see that tribal nations have “rightsholder” status based upon legal frameworks of the United States and federal Indian law (Ettawageshik and Norman 2020). In the implementation of the ESA, it is important for government agencies and NGOs to understand that Indigenous peoples are rightsholders relative to tribal sovereignty and the federal trust responsibility, and government-to-government consultation is a requirement for effective federal-tribal partnership and decision-making on tribal lands.

The 2021 Executive Memorandum “Indigenous Traditional Ecological Knowledge and Federal Decision-Making” committed to strengthening the relationship between the federal government and Tribal Nations and Indigenous Peoples. As noted above, the memorandum specifically commits to “regular, meaningful, and robust

consultation” with tribes to inform federal research and decision making (particularly, but not limited to, decisions directly affecting tribes). This memorandum is a first step in laying the foundation for more respectful and meaningful engagement between the federal government and tribes. So too, the DOI’s recently published “Procedures for the Inclusion and Application of Indigenous Knowledge” (DOI 2025) details important considerations and practices for tribal engagement (e.g., outlining the importance of appropriate compensation). However, along with these commitments must come tangible action. A recent demonstration of such action is the co-stewardship agreement between USFWS and the Miccosukee Tribe. This agreement provides a foundation for cooperative management of “national wildlife refuges within the Greater Everglades and adjacent to traditional Miccosukee lands” and the opportunity for Miccosukee citizens to “fish, hunt, conduct ceremonies and gather medicinal and culturally significant plants” in these areas (USFWS 2025).

It is important to note that this report is being published in a tumultuous political time where many previous EOs and Interior memos that benefited biodiversity and the environment are being rescinded. To continue the progress made towards the important partnerships discussed in this paper, there is a great need to restore these measures and continue forward.



PHOTO: STAFF AND INTERNS AT THE GREAT LAKES INDIAN FISH AND WILDLIFE COMMISSION (GLIFWC) CONDUCTING SEA LAMPREY SURVEYS AT BAD RIVER FALLS IN WISCONSIN. PHOTO BY CHARLIE RASMUSSEN

7. CASE STUDIES INVOLVING ESA AND TRIBAL GOVERNANCE

The following case studies highlight past examples where the Services have interacted with Tribes regarding ESA-listed species. Some of these cases specifically involve instances where ITEK was considered for a listing decision while others are included to demonstrate positive or negative examples of relationships between federal government and Tribes more broadly in the conservation space.

MEXICAN SPOTTED OWL - In 1993, the Mexican Spotted Owl (*Strix occidentalis lucida*) was officially listed as a “threatened” species. In 2004, as the result of a lawsuit from the Center for Biological Diversity, “critical habitat” designation of 4 million acres in southcentral Arizona was enacted in accordance with the ESA (Jones 2004). A portion of this proposed “critical habitat” designation was on the homelands of the White Mountain and Jicarilla Apache and the Southern Ute. The Apache Tribes avoided the designation by quickly developing their own management plans (SORs) to protect the spotted owl and its habitat. However, as a result of failed communications, lands of the Southern Ute Tribe were designated as “critical habitat” by the USFWS (Zellmer 1998). It was also discovered that tribal consultation had not been properly conducted prior to the Owl’s

listing (Albert 2002). The Mexican Spotted Owl case represents the best- and worst-case scenarios in ESA implementation relative to tribal sovereignty.

SOUTHERN WILLOW FLYCATCHER -

In 1995, the Southwestern Willow Flycatcher (*Empidonax traillii extimus*) was officially listed as an “endangered” species (Sanders 2007). In July 1997, a final rule of critical habitat designation was enacted that included lands of the Yavapai-Apache in Arizona and Pala Mission Tribe in California. In May 2001, as a result of a suit filed by the Center for Biological Diversity, the 10th Circuit Court of Appeals vacated the 1997 final rule that included Tribal lands and instructed the USFWS to issue a new rule. In September 2003, the Center for Biological Diversity filed a complaint requesting the USFWS to expedite a new rule. By October 2005, as a result of the federal district court of New Mexico, a new rule for critical habitat designation for the Southwestern Willow Flycatcher was enacted but did not include any tribal lands. In this new rule, the USFWS stated that Tribal governments work to manage their lands and resources and that flycatcher conservation activities had been ongoing (Sanders 2007). As envisioned by Joint Secretarial Order 3206,



DEVON PRADHUMAN

Tribal governments stepped up and exercised their management capabilities to protect an imperiled species as well as their Tribal sovereignty.

GREY WOLF, WISCONSIN - Many believe that the delisting of the grey wolf (*Canis lupis*) in January 2021 was political and not based on “best available science” as mandated by the ESA. This political decision pitted the State of Wisconsin against the Ojibwe Tribes of the Great Lakes region in the regulation of wolf sport harvest. Wisconsin is the only state in the nation that mandates a statewide wolf hunt, called Wisconsin Act 169, when the wolf is not listed either federally or within the state, and it allows hunters to use dogs

to hunt and track wolves (Gilbert et al. 2022). The wolf hunt, which began on February 21, 2001, ended abruptly when hunters killed 20% of the state’s wolf population (218 wolves) in just 63 hours. In accordance with the treaties of 1837 and 1842, as well as subsequent court decisions on treaty rights, the Ojibwe Tribes are entitled to 50% of the harvest in the ceded territories, which roughly comprises the northern half of the state. The Tribes wanted to use their treaty rights quota to protect the wolf from sports hunting, but the Natural Resources Board (NRB) of the Wisconsin Department of Natural Resources failed to acknowledge Tribal treaty rights and ignored the consultation process. Soon afterwards, the Tribes filed suit against the state of

Wisconsin (Gilbert et al. 2022), but the lawsuit was stayed after a federal judge in California relisted the grey wolf in 2022 (Einhorn 2022). The issue of wolf hunting in Wisconsin remains contentious and Tribal governments are ready for another fight to protect their wolf relatives.

EULACHON - In 2007, the Cowlitz Tribe in Washington petitioned the NMFS to list the eulachon as a “threatened” species in need of federal protection. The small, smelt-like fish has been a traditional food source for many Tribes in the Pacific Northwest for centuries. The common name for the eulachon is “candlefish” because, when dried, the fish is so oily that it ignites like a candle (Apsens et al. 2020). Many Tribes also called the eulachon “Savior Fish” because the small fish would arrive in the coastal rivers in the late winter just when food stores in Tribal communities were running low. The eulachon is anadromous meaning that it spends most of its life in seawater and part of its life in freshwater during the spring spawn. Tribal fishermen know when the eulachon arrives in the rivers by observing the presence of whales, sea lions, seals, eagles, and gulls feeding on the new arrivals in the early spring. The arrival of the eulachon also affected the feeding behaviors of dolphins, sharks, wolves, bears, ravens, and salmon (Willson et al. 2006). The eulachon is truly a cultural keystone species in the Pacific Northwest (Garibaldi and Turner 2004).

Beginning in 1993, Tribal fishermen noticed

declines in eulachon populations. Because they are not commercial fish, little to no data existed on the species, but because of the long cultural history with Tribal peoples, the Tribes quickly noticed changes. In 2010, the NMFS listed the southern eulachon as a “threatened” species. In September 2017, the NMFS approved a recovery plan for the southern Eulachon in northern California, Oregon, and Washington and designated 335 miles of critical habitat (National Marine Fisheries Service 2017). Four Tribes within the critical habitat area were excluded from designation after the NMFS assessed the benefits of exclusion associated with Tribes’ ability to manage their lands and resources (NOAA Fisheries 2011).

GUNNISON SAGE GROUSE - On January 11, 2013, the USFWS proposed to list the Gunnison Sage Grouse (*Centrocercus minimus*) as “endangered” and designate 1,704,227 acres as critical habitat in southwestern Colorado and southeastern Utah. Industrial Economics, Inc. was contracted by the USFWS to conduct an economic analysis of the proposed designation. The sage grouse’s habitat is sagebrush savanna. Human activities in the area included livestock grazing, agriculture, mineral and fossil fuel extraction, and residential development. Other factors that may degrade the Grouse’s habitat were renewable energy development, motorized and non-motorized recreation, and road construction. Within the proposed critical habitat area, 12,000 acres belong to the Ute

Mountain Ute Tribe, which utilizes the land for grazing operations. In their economic analysis, IE Inc. concluded that negative economic impacts to the grazing operations could negatively impact economic and re-employment opportunities for Tribal members. The USFWS and the Ute Mountain Ute Tribe began discussions on developing a conservation plan that could minimize the detrimental economic impact resulting from critical habitat designation of the area (Industrial Economics, Incorporated 2013).

capturing sage grouse in the Gunnison basin population and relocating them to other viable populations in Pinon Mesa, San Miguel Basin, Crawford, and Monticello. The recovery plan also called for federal agencies in the region to develop sage grouse conservation plans. The recovery target for the Gunnison basin was a 752 high male count, corresponding with a total population of 3,687 for a running 3-year average for at least seven out of nine consecutive years (USFWS 2020).

In 2014, the sage grouse was officially listed as “threatened” and a recovery plan was developed. The recovery plan included



MEMBERS OF THE YAKIMA TRIBE EMPLOYING TRADITIONAL DIP NETS; USFWS

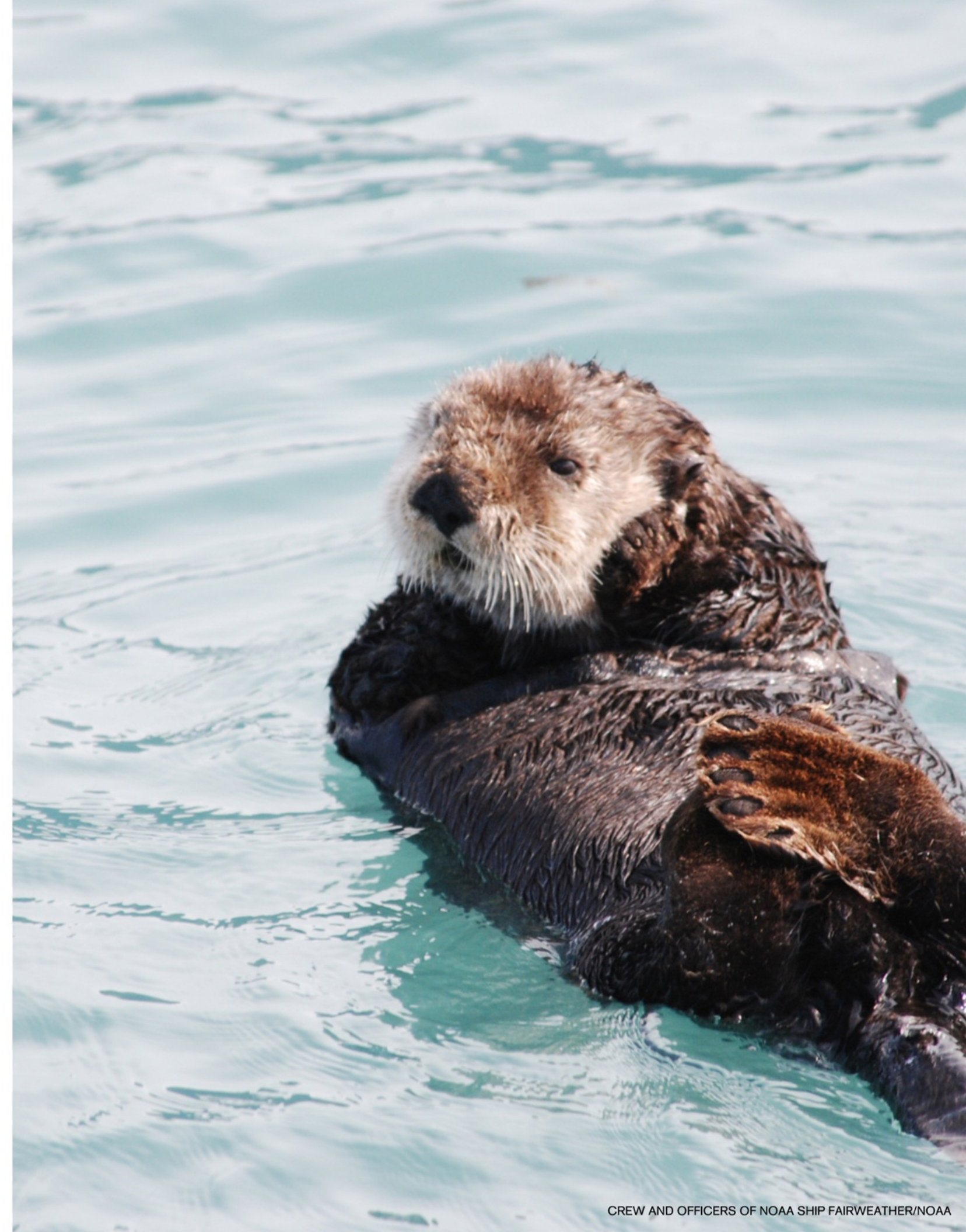
8. CONCLUSION

In the 1970s, when the Endangered Species Act was passed, there was a television public service announcement hosted by the “Keep America Beautiful” campaign which portrayed Iron Eyes Cody, an old Indian man, with a tear in his eye in response to the environmental pollution that he witnessed (Waldman 1999). This TV commercial had a profound impact on public opinion during the height of the Green Movement. At the same time, Chief Seattle’s famous 1854 speech was gaining notoriety across the country about environmental responsibility and Native American tribal rights (Crowley 1999). Even though it was later discovered that Iron Eyes Cody was not Indigenous, and the validity of Chief Seattle’s original speech was in question, an awareness was taking root about American Indians and their environmental cultural values. Prior to Iron Eyes Cody and Chief Seattle’s speech, most people had gotten their education about American Indians from watching John Wayne movies. It was during this time that the Endangered Species Act was enacted with full bipartisan support.

The Endangered Species Act has now been in place for over 50 years. During the time since its enactment, Indigenous people have participated, either inadvertently or intentionally, in the protection of imperiled species in the United States. Tribal

governments used their sovereign status as nations and their cultural knowledge as a people to protect culturally important species as well as implement the ESA for federally “listed” species on their tribal homelands, but it has been an awkward 50-year relationship (Smith 2023a).

One thing is for certain, Indigenous peoples and federally recognized tribal nations are important collaborators in the implementation of the ESA. Protecting non-human relatives/species and healing our landscapes are at the core of many Indigenous values and traditions. Understanding the complexities of American Indian history and treaty law, Indigenous cultural values, and the unique relationships that Indigenous people have with their homelands can lead to effective partnerships with government agencies, states, and NGOs in the protection of species, ecosystems, and biodiversity.



9. TAKEAWAYS TO STRENGTHEN THE BRAIDING OF INDIGENOUS TRADITIONAL ECOLOGICAL KNOWLEDGE AND WESTERN SCIENCE IN ESA IMPLEMENTATION

Below are nine key takeaways for braiding Indigenous Traditional Ecological Knowledge with western science in ESA implementation:

- 1) Achieve a working respect for and understanding of Indigenous Traditional Ecological Knowledge and how this knowledge complements western science in applying “best available science” for ESA implementation. Ensure agency staff receive sufficient training and oversight to ensure this is carried out.
- 2) Understand the concepts of tribal sovereignty and trust responsibility and how they fit into federal decision making. Ensure agency staff receive sufficient training and oversight to carry this out.
- 3) Include Indigenous knowledge-keepers as legitimate partners in the planning and execution of ESA implementation on tribal lands and ceded territories.
- 4) Engage in regular, meaningful, and robust consultation with tribal nations on ESA implementation.

5) Work with tribal nations to develop guidance for implementing recovery plans and other components of the ESA. Guidance should include advice on how to incorporate ITEK for a listed species and associated habitat. Agencies should also ensure that tribal scientists and ITEK knowledge holders are included in recovery implementation teams.

6) Engage in discussion with tribal nations in establishing culturally meaningful recovery targets for “listed” species within their tribal lands or ceded territories that are consistent with both the ESA and respect for tribal values.

7) Consider the possibility of developing Statements of Relationship (SOR) for effective collaboration in ESA implementation that lay out in detail the responsibilities of the parties.

8) Respect and implement the principles of Indigenous Data Sovereignty when working with Indigenous people on tribal lands and ceded territories ensuring that data sovereignty is recognized through guidelines, policies, and staff training.

9) Acknowledge tribal nations and their citizens as “Rightsholders” rather than merely “Stakeholders.” Incorporate that language and tribal sovereignty and rights under treaty law, federal court decisions, executive orders, and legislative policies into written guidance and policies.

APPENDIX A: INDIGENOUS AUTHORS CITED IN THIS WORK:

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Gregory Cajete	Santa Clara Pueblo
Kathleen Absolon	Anishinaabe/Flying Post First Nations
Kyle Whyte	Citizen Band of Potawatomi
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Margaret Kovach	Nêhiyaw/Saulteaux
Michael Waasegiizhig-Price	Anishinaabe/Wikwemikong First Nations
Ned Blackhawk	Western Shoshone
Nicholas Reo	Sault Ste. Marie Tribe of Chippewa Indians
Oren Lyons	Haudenosaunee, Onondaga Nation
Oscar Kawagley	Yup'ik
Robin Kimmerer	Citizen Band of Potawatomi
Ronnie Lupe	White Mountain Apache
Sidney Nadjiwon	Chippewas of Nawash First Nations
Vine Deloria, Jr.	Standing Rock Dakota

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