OVERLINE

Braiding Indigenous Rights and Endangered Species Law for Meaningful Species Recovery

Indigenous rights can pick up where endangered species laws fall short in recovering species to culturally-meaningful levels.

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Political pressure and International treaties (e.g., the Convention on Biological Diversity) have supported initiation of national and continental legislation (e.g., United States [USA] Endangered Species Act [ESA], Canada's Species at Risk Act [SARA], European Union Habitats Directive) that provide a powerful mechanism to formalize the conservation of nature. Endangered species laws enable species assessments, and formalize processes to establish and meet recovery targets. Under these laws, recovery efforts tend to focus on charismatic species, with notable successes including the recovery of peregrine falcons (*Falco peregrinus*), bald eagles (*Haliaeetus leucocephalus*), and gray wolves (*Canis lupus*) in North America. Despite endangered species legislation, many species continue to decline and remain at abundances far lower than historical baselines (*1*). Missing from endangered species laws are recovery targets and processes that restore culturally–important species—those species that disproportionately contribute to food, material, medicine, spirituality, and sense of place (*2*).

Under endangered species laws in North America, recovery targets are left vague or are based on a minimum viable population size (*3*). In Canada, SARA focuses on risks of extinction and does not explicitly define recovery, with a recent 2020 SARA policy document interpreting recovery in terms of reducing the risk of extinction or extirpation (*4*). In the USA, the focus of the ESA is on meeting targets of a minimum viable population (MVP) –a number that Western scientists believe will enable population persistence with minimal human intervention. Such risk- and MVP-based approaches generate modest recovery targets - tending to simply maintain populations at low levels in the majority of recovery documents (*5*).

Critically, neither SARA nor ESA address how people, specifically Indigenous peoples, interact with the species through harvest. While harvest reflects time–honored relationships to support food security, ceremonial practices, or other hallmarks of culture (*6*), harvested species are systematically excluded from Canada's listing process (*7*). A culturally–meaningful recovery target may require a greater abundance and/or different distribution than those prescribed by risk- or MVP–based approaches. Culturally–meaningful recovery also requires more inclusive policies to center Indigenous perspectives and people in the design and implementation of restorative actions (*8–10*).

Here we describe three recovery efforts that demonstrate continued inequities in biodiversity conservation policies. We highlight the need to reconsider recovery targets for culturally–important, harvested species in national endangered species laws and policies. We focus on three high-profile species in North America—caribou, bison, and salmon—which have formed central aspects of Indigenous peoples' diet, culture, and seasonal movements since time immemorial. In each case, the decline of these species impeded Indigenous peoples from carrying out cultural practices and exercising food sovereignty. Each of these 3 culturally-important species has since shown some level of recovery and we highlight how these recoveries—often considered conservation victories—remain distant from culturally–meaningful levels of recovery. This mismatch is partly due to a lack of formal legislation supporting culturally–meaningful recovery targets (Figure 1, Supplementary Material 1). The species highlighted here are emblematic of the many culturally-important species currently in a state of diminished abundance across the globe (*2*).

Caribou—Woodland caribou (*Rangifer tarandus)* have long been a primary food source for northern Indigenous Peoples in North America. Caribou have declined dramatically in the last century (Figure 2), especially in the southern portion of their range. Eleven of 38 southern mountain caribou subpopulations are extirpated, and the overall population has declined by over 40% during the last 20 years as observed using Western monitoring techniques (*8*). Indigenous Knowledge, whose relevance and value are increasingly being recognized by colonial governments and agencies, provides an invaluable historical baseline of abundance and harvest levels well before Western science was engaged in species recovery. For example, in British Columbia, Canada, Elders from the Treaty No. 8 adherent West Moberly First Nations said the Klinse-Za caribou subpopulation was once as abundant as "*bugs on the landscape*", yet by 2013 there were only 38 animals left (*8*). Facing a decline in caribou, West Moberly leadership and Elders imposed a moratorium on caribou harvest in 1970 that is still in effect today. Indeed, West Moberly First Nations sensed the endangerment of caribou well before colonial governments, who permitted extensive natural resource extraction in the heart of Klinse-Za caribou habitat for at least 50 years following West Moberly's cessation of hunting. The continued authorization of resource extraction reduces the abundance of caribou and causes extirpation, infringing upon constitutionally protected Indigenous rights to sustain a culturally meaningful way of life (*11*).

Indigenous-led recovery efforts by West Moberly First Nations and Saulteau First

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Nations to recover the threatened Klinse-Za caribou have more than tripled caribou abundance in eight years (*8*). Averting the looming extirpation of these caribou is an undeniable conservation success, yet their abundance remains below a level where First Nations can participate in a culturally–meaningful harvest. In 2022, there were 114 Klinse-Za caribou – an abundance that met a recovery target of >100 set by the Canadian government under the MVP–based approach. However, 114 caribou would provide only ~3 caribou annually for a sustainable Indigenous harvest—not meeting historical levels of use by the community (See Supplementary Material 2 for harvest calculations). A West Moberly Elders' wish was to "*eat caribou before I die*", which could be translated to a baseline cultural recovery target. If caribou are to be meaningfully harvested again there should be enough for each community member to have some significant level of cultural engagement and food security met by caribou. For example, providing just one meal for each of the 1600 West Moberly and Saulteau First Nations members would require approximately 6 caribou, which could be annually harvested from a population of about 200 caribou. Providing 15 meals each would require a population of about 3000 caribou—more reflective of the historic "*bugs on the landscape*" abundance. The discrepancy between the current 114 caribou and the potential for >3000 caribou is a measurable gap in Western and Indigenous perspectives on recovery and reconciliation.

American bison—Prior to colonization, American bison (*Bison bison*) numbered 30–60 million across North America (*9*). Many Indigenous peoples were deeply dependent upon this once-abundant species, which ranged from Alaska to Mexico (Figure 2). By the turn of the 20th century, however, the great bison herds had been slaughtered down to only a few hundred animals, in part driven by explicit policies of cultural genocide. Such dramatic bison declines caused starvation, in-fighting, and erosion of Indigenous culture (*12*).

The northern subspecies of American bison, wood bison (*Bison bison athabascae*) were listed as endangered under the ESA in 1979 and classified as endangered in Canada by COSEWIC in 1978 (pre-dating SARA). Recovery actions included establishing new wood bison populations, leading to an increased abundance of nearly 10,000 individuals within Canada by 2013. As a result, COSEWIC downlisted them to Threatened, with *at least* 5 free-ranging populations of 1,000 bison as the MVP goal. Despite this example of MVP recovery, Indigenous peoples are often still prevented from harvesting bison, for example, in Canada's Wood Buffalo National Park. Although limited harvest occurs outside National Parks, subsistence hunting rights remain curtailed in many areas (*13*). Thus, wood bison recovery highlights the continued mismatch between MVP recovery and culturally–meaningful recovery of wood bison.

The precipitous decline of the southern subspecies, plains bison (*Bison bison bison),* occurred well before the endangered species laws of Canada (2002) or the United States of America (1973) came into effect. Nevertheless, wild plains bison are still clearly endangered. Today, the species remains at <1% of its historic abundance and occupies a dramatically reduced range (Figure 2). Despite early recovery efforts, wild free-ranging plains bison populations represent only 10% of the current abundance of plains bison, the remaining 90% are privately owned (*9*). Yet, plains bison remain unlisted in either country despite clear scientific recommendations to do so (*14*).

Recently, an inspiring example of Indigenous leadership in plains bison restoration began unfolding. On September 23, 2014, thirteen First Nations and Native American tribes signed the first intertribal Treaty in 150 years—the Buffalo Treaty— focused on ecological and cultural recovery of plains bison (*9*). Supported in part by the Buffalo Treaty, Banff National Park, Canada, initiated a plains bison restoration program in 2017. The long-term reintroduction goal in Banff is to include culturally meaningful co-management of bison harvest with Buffalo Treaty signatories. The contemporary successes of bison restoration have increased the likelihood of bison recovery under MVP criteria. But bison recovery will remain incomplete until peoples' cultural connection—including perhaps a prominent role in diet—with bison is restored across broader landscapes.

Pacific salmon—Millions of salmon (*Oncorhynchus* spp.) annually return to rivers across western North America (Figure 2), providing sustenance for people, wildlife, and ecosystems. Indigenous Peoples in the Pacific Northwest often refer to themselves as "salmon people", signifying their deeply rooted cultural connections with salmon (*10*).

The distribution and abundance of salmon have decreased over the last century through the effects of human activities (Figure 2). In the Columbia Basin, USA, salmon abundance has declined by ~75%; an estimated 7.5–16 million salmon returned annually to the Columbia prior to the 20th century, and now only 1–4 million return (Figure 2) (*15*). The most commercially–valuable and culturally–important salmon species in Canada, sockeye (*O. nerka*), declined in wild abundance and diversity by ~70% over the last century in the country's second-largest salmon watershed (*16*). Salmon harvests by Indigenous communities in Canada have declined by over 80% in the last 50–70 years (*10*), with some First Nations having similar self-imposed harvest bans as for caribou (*16*).

Salmon recovery is demonstrably underserved by existing endangered species legislation. No salmon population has been listed in Canada under SARA and while many have been listed in the USA under the ESA, abundance remains a fraction of historic levels. Given the lack of formal protection, several Indigenous-led recovery plans for salmon have recently been developed. For example, after having endured ~60 years of diminished sockeye salmon returns, the Wet'suwet'en Nation on the west coast of Canada have implemented a rebuilding plan with an abundance target set to provide for community and ecosystem needs. However, ongoing commercial fisheries and industrial development projects undermine salmon recovery efforts. Thus, there remains a need for increased recognition of Indigenous rights that support protection of diminished populations beyond endangered species legislation.

Indigenous rights can propel recovery beyond targets set by endangered species laws

While international agreements and national laws compel governments to recover endangered species, colonial governments are also obligated to honour the legal treaty and constitutional rights of Indigenous peoples, including rights to fish, hunt, and trap. In some cases, culturally–important species are at the center of the interaction between Indigenous and non-Indigenous governments. For example, during negotiations of Treaty No. 8 in 1899, Canada promised Indigenous Peoples in Treaty 8, which encompasses nearly 10% of Canada, that they "*would be as free to hunt and fish after treaty as they would if they never entered into it*" (*17*). A century and a half of colonization on these lands have significantly impeded Treaty 8 First Nations' ability to hunt and fish as they once did (*11*). Treaty infringement was recently affirmed in the 2021 Blueberry River First Nations (Yahey) **v**. Province of British Columbia, which concluded that the Province had breached Treaty No. 8 by authorizing rampant resource development, leading to cumulative impacts, affecting culturally–important species such as caribou and moose.

Increased recognition of legal obligations to Indigenous peoples may provide a path to recovering species abundance to culturally–meaningful levels. Recovery plans for culturally–important species could propose MVP targets as a preliminary step towards full recovery.

For species above a MVP, recovery status could be assessed against a new global standard, the International Union for Conservation of Nature (IUCN) Green list of species. Such an approach could propel abundance beyond MVP towards `full recovery` defined by restoring historic abundance, distribution, and ecological function (*1*). We recommend `full recovery` also include abundance targets that support food security, materials, and cultural relationships that rely on these animals. A rare example of this goal can be found in the 2016 wood bison recovery strategy that includes abundance targets to support Indigenous rights and particularly a culturally-meaningful harvest. Full recovery will remain challenging for some species, such as plains bison, due to the conversion of their historic habitat to agriculture, urbanization, and transportation infrastructure. In such cases, a modified recovery target based on remaining or restorable habitat may be required, along with consideration of policy tools such as reparations. Beyond legally endangered species, a proactive approach to conservation would consider species not yet at the precipice of extirpation, but below culturally–meaningful abundance thresholds, thus, triggering mechanisms of recovery based on protection of Indigenous rights (Figure 1).

Harmonization of biodiversity agreements with international agreements such as the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) could provide the foundation for recultivating available, accessible, and adequate food, with strong nutritional, cultural, and spiritual connections to a single species or entire ecosystems (*19*). Dozens of other examples of such endangered 'biocultural' species exist across the globe (*2*). Given a fundamental reason for conserving species relates to human values of biodiversity, nature, and a responsibility to all life, restoring the very connections that propel recovery will serve to make efforts more successful while protecting critical relationships between people and the Land.

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Supplementary Materials:

Supplementary Material 1**:** Examples of discrepancies between endangered species laws or criteria and culturally-meaningful recovery

Supplementary Material 2: Caribou harvest calculations

Supplementary Material 3: Data and citations for Fig 2.

Figure legends

Figure 1. Conceptual diagram of species abundance over time. Violation of Indigenous rights such as harvest occurs at a much higher abundance than the focus of current endangered species laws around achieving minimum viable populations.

Figure 2. Examples of culturally-important species across North America whose abundance does not meet culturally meaningful levels. A) historic (tan) and current (purple) distributions for woodland caribou, American bison, and Pacific salmon. Data sources for distributions detailed in Supplementary Material 3. Bison distribution only considers free-ranging populations; B) abundance trajectory for the species, or a focal population with sufficient data to characterize a broader regional trend (shown as a dot on the map above). Estimated abundance prior to colonization and large-scale industrial impacts shown at year 1700. Lowest recorded population estimate post-colonization is shown between 1900-2013, and the most current estimate is shown. Klinse-Za pre-colonization abundance translated from Indigenous Knowledge of a "sea of caribou" to ~1500-6000 caribou. See Supplementary Material 3 for data and citations.

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Supplementary Material 1: Examples of discrepancies between endangered species laws or criteria and culturally-meaningful recovery

Canada

The Species at Risk Act of Canada (SARA) (*1*) states that "nothing in this Act shall be construed so as to abrogate or derogate from the protection provided for existing aboriginal or treaty rights of the aboriginal peoples of Canada." Nevertheless, neither the Act itself nor the 2020 "Policy on Survival and Recovery" (*2*) include traditional Indigenous use specifically in the definition of recovery or the criteria used to determine whether a species is recovered. In the Policy document, recovery is defined to be a "return to a state in which the risk of extinction or extirpation is within the normal range of variability for the species, as indicated in part by its population and distribution characteristics. This is informed by the species' natural condition in Canada, which is defined as its condition prior to the significant impact of human activities that

led to the species being listed as Endangered, Threatened, or Extirpated under SARA." Taking post-colonial human activities to be those threatening the species, a return to the conditions prior to these activities could be seen to be consistent with defining recovery when a population is able again to support Indigenous Traditional use and sustain Indigenous ways of life. Yet, none of the Recovery Strategies analyzed by (*3*) aimed to restore populations to historic levels (explicitly stated). Instead, to date, the focus of SARA with respect to Indigenous peoples has been on consultation with Indigenous communities and incorporation of Traditional Knowledge, rather than aiming for recovery that ensures Indigenous Traditional use (*4*).

United States

The US Endangered Species Act (ESA) (*5*) recognizes the importance of Indigenous peoples' use of and connections with wildlife and requires federal agencies to consider the potential impacts of ESA actions on tribal lands, resources, and cultures. Recovery plans developed under the ESA can include measures that support sustainable Indigenous use of a species while still achieving the species' recovery objectives.

Regarding species abundance targets under recovery plans, the ESA requires that recovery plans include "objective, measurable criteria which, when met, would result in a determination, in accordance with the provisions of this section, that the species be removed from the list" of endangered or threatened species (16 U.S.C. § 1533(f)(1)). The criteria for delisting a species must be based on the "best available scientific and commercial data".

The ESA does not specifically require that species abundance targets under recovery plans consider restoring abundance to pre-colonial levels that would fully support Indigenous ways of life. In practice, this translates to recovery objectives that are consistently below historic

levels (*3*). The ESA does require that recovery plans be developed "with the cooperation, to the maximum extent practicable, of all Federal and State agencies and all persons interested in participating in the development and implementation of such plans, including Native Americans" (16 U.S.C. § 1533(f)). This provision recognizes the important role that Indigenous peoples can play in species conservation and recovery and provides opportunities for their input into recovery plans. However, in practice, this duty to consult with all stakeholders and rightsholders—Indigenous peoples, private land owners, industries, etc.—often results in recovery targets that may be more modest than pre-colonial abundances (*3*) and what might be required to sustain practices such as harvest and exercising of food security.

IUCN

The IUCN acknowledges “Indigenous peoples' rights to the lands, territories and natural resources they have traditionally owned, occupied and used, and the need to ensure the full and effective participation of Indigenous peoples in all conservation initiatives and policy developments that affect them”. Nevertheless, the ability of a population to sustain these rights are not incorporated in the definition of a species’ conservation status under the IUCN red list (*6*). Consequently, a species that was traditionally an important food source could be defined as recovered (e.g., passing from vulnerable to near threatened), even though Indigenous harvest and cultural connections may still be prevented or hindered. Higher standards of recovery would be needed to ensure such access.

Supplementary Material 2: Caribou harvest calculations

We approximated the number of caribou that could be sustainably harvested each year from the

2021 Klinse-Za subpopulation and future potential population sizes. These calculations are meant to contextualize the link between population size, annual harvest, and food soveriegnty. These calculations were done through a Western lens and do not necessarily reflect the harvest views or plans of West Moberly First Nations or Saulteau First Nations.

There were 114 caribou in the Klinse-Za subpopulation in 2021. The subpopulation has been increasing at ~12-14% per year since 2013 (*7*). An annual harvest rate of 3-4% was deemed sustainable (bull only) for increasing caribou subpopulations in British Columbia (*8*). Using the conservative end of the harvest spectrum (3%), we estimated that 3 bull caribou could be sustainably harvested each year.

We then estimated the number of meals that these caribou could provide. A bull caribou provides about 100 lbs of meat (*9*). Assuming a standard meat portion size of 6oz (0.38 lbs), and accounting for the 1,270 people that compose Saulteau First Nations and 366 that compose West Moberly First Nations, one meal for everyone would require 621 lbs of meat. Thus, approximately six bull caribou would need to be harvested to provide a single meal for each community member.

A single meal of caribou for all community members would likely be a strongly symbolic and joyous celebration. But a single meal would not provide a meaningful contribution to food security nor reconnection to harvesting practices by the community due to only 3 animals available for harvest each year. We are not able to prescribe, at this time, what an optimal harvest to satisfy all cultural needs would be, but we can approximate the meals, hunting opportunity and caribou needed to facilitate more. The “sea of caribou” that were once present in Klinse-Za cannot be directly translated into a number to satisfy most western ways of thought, but we can translate this number into a minimum number of caribou that might garner such a description. A

few thousand caribou across the ~6,500 km^2 herd area, that moved in congregated herds, would likely begin to appear like a "sea of caribou", and would be consistent with historical records for mountain caribou in British Columbia (*10*). We redid the harvest calculations above to estimate the hunting, cultural, and sustenance opportunities provided by this larger caribou abundance. Using ~3,000 caribou as the projected abundance, we estimate that ~90 caribou could be harvested annually, providing hunting opportunities for many more Indigenous community members (i.e., creating and sustaining cultural knowledge) and ~9,000 lbs of meat. This meat would provide ~24,000 meals or ~15 meals for each community member annually. This is not necessarily the prescriptive target from the community perspective, but the increased abundance of caribou provides increased hunting opportunity, more meat, and more meals. Collectively, increases in culturally-important species can support more community gathering, connectedness, and rekindling of important cultural practices such as caribou hunting.

Supplementary Material 3: Data and citations for Fig 2.

Table S1. Species abundance estimates, ranges, and citations for Figure 2. In cases where no error was given for the population estimate, we used +/-15% for the plot in Figure 2.

SPECIES	REGION	YEAR	N	LOWER	UPPER	CITATION	COMMENT
AMERICAN BISON	Range-wide (North America)	1700	45000000	30000000	60000000	(*11*)	
AMERICAN BISON	Range-wide (North America)	1890	200			(*12*)	

AMERICAN BISON	Range-wide (North America)	2022	30000			(*12*)	
CARIBOU (KLINSE-ZA)	Klinse-Za	1700	3500	1000	6000	(*13*)	translated "sea of caribou" into a number (thousands) with uncertainty
CARIBOU (KLINSE-ZA)	Klinse-Za	2013	38			(*7*)	
CARIBOU (KLINSE-ZA)	Klinse-Za	2022	114			(*7*)	
PACIFIC SALMON (COLUMBIA RIVER)	Columbia River	1700	12000000	7500000	16000000	(*14*)	
PACIFIC SALMON (COLUMBIA RIVER)	Columbia River	1938	1500000			(*14*)	
PACIFIC SALMON (COLUMBIA RIVER)	Columbia River	2022	2300000			(*14*)	

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