**OVERLINE**

**Braiding Indigenous rights and**

**endangered species law**

*Recovery targets often fall short of restoring culturally-meaningful abundance*

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Endangered species laws effectively prevent species extinction, but fall short in restoring abundance for culturally-important species. Legal agreements between Indigenous peoples and countries recognize the importance of abundant culturally-important species that disproportionately contribute to peoples’ food, material, spirituality, and sense of place (*1*). Despite this, recovery targets under endangered species laws do not account for such abundance, instead targeting minimum viable populations sizes that leave many species in a state of reduced abundance compared to their historical baselines. Using three keystone species in North America—caribou, bison, and salmon—we explore the implications of the gap between culturally-meaningful abundance and minimum viable populations, and argue for the need to establish recovery targets and processes that restore abundance beyond minimum viable populations. Braiding endangered species law and Indigenous rights will help countries to uphold the rights of Indigenous peoples, prevent species extinction, and ultimately provide benefits to society at large.

Under endangered species laws in Canada and the United States, recovery targets are left vague or are based on a minimum viable population size. In Canada, the Species at Risk Act (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. In the USA, the focus of the Endangered Species Act (ESA) is on meeting targets of a minimum viable population (MVP) – a species abundance that 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 (*2*) (See Supplementary Materials for more detail on each act).

Critically, neither SARA nor ESA address how people interact with the species through harvest. Harvest reflects time–honored relationships that support food security, ceremonial practices, or other hallmarks of culture (*3*), yet harvested species are often excluded from listing under SARA due to socioeconomic concerns (*4*). A culturally–meaningful recovery target for such species 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 (*5*–*7*).

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 (*1*).

**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 (*5*). 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 (*5*). 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 have continued to permit extensive natural resource extraction in the heart of Klinse-Za caribou habitat ever since 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 (*8*).

Indigenous-led recovery efforts by West Moberly First Nations and Saulteau First Nations to recover the threatened Klinse-Za caribou have more than tripled caribou abundance in eight years (*5*). 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 Materials 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 per year 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 per person per year 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 (*6*). 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 (*9*).

The northern subspecies of American bison, wood bison (*Bison bison athabascae*) were listed as endangered under the ESA in 1979 and classified as endangered by the Committee on the Status of Endangered Wildlife in Canada (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, some Indigenous peoples are often still prevented from harvesting bison. For example, although limited harvest does occur across the wood bison range, many Indigenous Peoples in northern Canada were excluded from hunting within Wood Buffalo National Park despite the recovery of the population to a level that could sustain a harvest. Similarly, subsistence hunting rights remain curtailed in the Aishihik wood bison herd where Indigenous Peoples of the Yukon are not permitted subsistence hunting rights due to these animals originating from a transplant. 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 SARA or ESA came into effect (in 2002 and 1973, respectively). 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 (*6*). Yet, plains bison remain unlisted in either country despite clear scientific recommendations to do so (*10*).

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 (*6*). 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 (*7*).

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) (*11*). The most commercially–valuable and culturally–important salmon species in Canada, sockeye (*O. nerka*), declined in wild abundance by 69% over the last century in the country’s second-largest salmon watershed, the Skeena River (*12*). Salmon harvests by Indigenous communities in Canada have declined by over 80% in the last 50–70 years(*7*), with some First Nations having self-imposed harvest bans (*12*).

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**

While international agreements and domestic laws compel governments to recover endangered species, colonial governments are also obligated to honor 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*” (*13*). 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 (*8*). Treaty infringement was recently affirmed in the 2021 court case Blueberry River First Nations (Yahey) **v**. Province of British Columbia, which concluded that the Province of British Columbia had breached Treaty No. 8 and infringed the rights of Blueberry River First Nations. This was due to the cumulative impacts of rampant resource authorizations and development, affecting culturally–important species such as caribou and moose.

We see multiple paths forward that could support increased recognition of legal obligations to Indigenous peoples and recover species to culturally–meaningful abundances.

A first path includes defining more ambitious recovery targets while still working within the confines of endangered species laws. Recovery plans for culturally–important species could propose MVP targets as only 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 that assesses the degree a species has recovered, complimenting the Red List that has been measuring species’ risk of extinction since 1964. The Green List sets out ambitious recovery targets—such as `full recovery`, defined by restoring historic abundance, distribution, and ecological function—and measures species’ progress towards these targets (*14*). We recommend `full recovery` also include abundance targets that support food security, materials, and cultural relationships that rely on these animals. The 2016 wood bison recovery strategy provides a rare example of abundance targets to support Indigenous rights and particularly a culturally-meaningful harvest (*15*). Such culturally-meaningful recovery targets will likely be of similar magnitude to historic abundance, but must also accommodate the evolving practices, cultures, and communities of Indigenous peoples.

We acknowledge that full recovery will remain challenging for some species, such as plains bison, due to the conversion of their historic habitat from agriculture, urbanization, transportation infrastructure, and resource extraction. In such cases, a modified recovery target based on remaining or restorable habitat may be required. In all cases, culturally-meaningful recovery targets must be co-developed with Indigenous peoples and reflect their current and desired future relationships with a species and the Land.

A second path includes legal enforcement of Indigenous rights. Consider the Yahey decision that extends beyond legally endangered species and includes many species below culturally–meaningful abundance thresholds. Here, litigation triggered mechanisms of recovery based on protection of Indigenous rights (Figure 1), which to date have included Initial reparations of $65-million to Blueberry River First Nations in 2021, and, in January 2023, a $200-million Restoration Fund, an $87.5-million financial package, over 650,000 hectares of land protections, and obligations related to land use planning and wildlife management to begin healing the Land, increasing the abundance of harvested species, and protecting the Nations’ cultural way of life. Recovering species abundance to culturally-meaningful levels would satisfy important aspects of currently infringed treaties between Indigenous peoples and governments.

We outline two potential solutions to recover culturally-meaningful abundance, but it could be case that entirely new laws are needed to support such recovery in some countries. We see harmonization of biodiversity agreements with international agreements such as the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) as an opportunity to provide the foundation for recultivating available, accessible, and adequate food, with strong nutritional, cultural, and spiritual connections to a single species or entire ecosystems. Indeed, this foundation would support the creation of new laws to specifically address Indigenous rights violations and wildlife abundance shortfalls. 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:

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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. Historic abundance estimates are often less precise than current estimates using modern sampling and statistical techniques but can be translated into approximate ranges based on observed abundance in local areas, available habitat, or harvest records (See Supplementary Material 3 and Figure 2). Many, but not all, Indigenous Peoples have specific treaty rights in Canada and the USA, but all have constitutionally protected inherent Indigenous rights. Our discussion often uses the language of treaties, but the issues are generally relevant more broadly and thus we dually specify the Indigenous Rights Violation Zone to represent both cases.

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. Lines between abundance estimates are interpolated using local polynomial regression, and are meant for visual purposes only. See Supplementary Material 3 and Zenodo (https://zenodo.org/badge/latestdoi/630538182) for data and analysis.