

Indigenizing the North American Model of Wildlife Conservation

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Abstract

Although a diversity of approaches to wildlife management persists in Canada and the United States of America, the North American Model of Wildlife Conservation (NAM) is a prevailing model for state, provincial, and federal agencies. The success of the NAM is both celebrated and refuted amongst scholars, with most arguing that a more holistic approach is needed. Colonial rhetoric permeates each of the NAM's constituent tenets—yet, beyond these cultural and historical problems are the NAM's underlying conservation values. In many ways, these values share common ground with various Indigenous worldviews. For example, the idea of safeguarding wildlife for future generations, utilizing best available knowledge to solve problems, prioritizing collaboration between nations, and democratizing the process of conserving wildlife all overlap in the many ways that the NAM and common models of Indigenous-led conservation are operationalized. Working to identify shared visions and address necessary amendments of the NAM will advance reconciliation, both in the interest of nature and society. Here, we identify the gaps and linkages between the NAM and Indigenous-led conservation efforts across Canada. We impart a revised NAM—the Indigenizing North American Model of Wildlife Conservation (I-NAM)—that interweaves various Indigenous worldviews and conservation practice from across Canada. We emphasize that the I-NAM should be a continuous learning process that seeks to update and coexist with the NAM, but not replace Indigenous-led conservation.

Key words: coexistence, I-NAM, caribou, Indigenous knowledge systems, Two-Eyed Seeing, pathways forward, Western science

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Introduction

People have interacted with, had conflict with, and depended upon plants and animals since the origins of our species (Berkes et al. 1998; Decker et al. 2001; Woodroffe et al. 2005). Over thousands of years, societies have developed complex systems to organize collective responses to wildlife, i.e., wildlife management (Riley et al. 2002). Wildlife management systems have emerged through a historical trend of biodiversity, land uses and ownership, laws, cultures, and more recently, patterns of colonization and global exploitation (Schippmann et al. 2002; Berkes 2009). At broad scales, different wildlife management systems have been recognized in western Europe, Africa, North America, and the myriad of Indigenous cultures across the world (Kock 1996; Parlee and Caine 2018; Mahoney and Geist 2019).

Since time immemorial, Indigenous Peoples have formed relationships with the plants, animals, and ecosystems that encompassed the world around them (McGregor 2004; Michell 2005; Morris 2010).

Through these relationships, inter-generational knowledge has been fostered through lived experience, food availability, and kinship (Salmón 2000). Integral to many Indigenous cultures across the world is the process of harvest—the act of hunting, gathering, and securing of foods (George et al. 1995; Nuttall et al. 2004). The process of harvest is a unique interaction among place, culture, and food, which is foundational to many Indigenous systems of wildlife management, guardianship, conservation, and stewardship; we call this Indigenous-led conservation (ILC).

Over the last 100 years, across what is now known as the United States of America (USA) and Canada, or Turtle Island by many Indigenous cultures (Hunt and Stevenson 2017), the North American Model of Wildlife Conservation (NAM), is often viewed as a set of conservation principles and policies that halted the rapid overexploitation of wildlife in the wake of settler colonization through the 19th and early 20th century (Mahoney and Geist 2019). The extirpation of plains bison (*Bison bison*), and the extinction of the hyperabundant great auk (*Pinguinus impennis*) and passenger pigeon (*Ectopistes migratorius*), are well-known cases of unsustainable harvesting practices during this era (Halliday 1980; Bengtson 1984; Taylor 2011). Following colonization and the advent of the NAM, no species has gone extinct because of a regulated hunting season; market hunting pressures have abated, and regulations for both hunting and other environmental activities have created sustainable harvests for most high value game species as well as conservation measures for nongame species (Heffelfinger et al. 2013; Mahoney and Geist 2019).

Despite its success, the NAM has multiple cultural, economic, and ecological shortcomings that threaten its continued relevancy. These shortcomings suggest that there is a need to re-evaluate the effectiveness of the NAM for the next century to conserve North America's biodiversity and the rich connections that people have with nature (Peterson and Nelson 2017; Mahoney and Geist 2019). The need to replace or update the NAM has been questioned by few, yet the rationale for retaining the NAM often is: "It's not perfect, but what alternative options are available?" There are compelling reasons why this rationale is no longer sufficient to carry society through the complexity of biodiversity crises in the coming century and the "Seven Generations of Decedents" that will follow (Johansen and Mann 2000, p. 319).

Here, we outline a justification and pathway to update the NAM towards a more holistic vision for wildlife management in Canada that coexists with ILC (Fig. 1). We introduce the Indigenizing of the North American Model of Wildlife Conservation (I-NAM), which revises descriptive language of the NAM and centers the active, ongoing work in Canada to weave knowledge-systems and leadership across political and cultural boundaries (Fig. 1). To present a framework and rationale for the I-NAM, we break our perspective piece into four sections: First, we review the history and seven tenets of the conventional NAM. Second, we identify the shortcomings of the conventional NAM, focusing on the colonial exclusivity of the model. Third, we examine the gaps and linkages between the NAM and ILC by examining the overlapping conservation values, worldviews, and applied practices that promote wildlife conservation. Finally, we describe how many aspects of the I-NAM are well underway across Canada and how scholars and practitioners can further accelerate these efforts through continuous learning and inclusion of the diverse Indigenous worldviews that exist in North America (Fig. 2).

What is the North American Model?

Conservation systems or models in North America have been used by Indigenous groups who have interacted with and depended upon wildlife since time immemorial (McGregor 2004; Michell 2005; Reed et al. 2021). This is in contrast to the inception of the NAM, which can be traced to the USA in the late 19th and 20th century when Aldo Leopold, Theodore Roosevelt, Gifford Pinchot, Rachel Carson, and others conceptualized and ratified legislation and policies that prioritized wildlife and

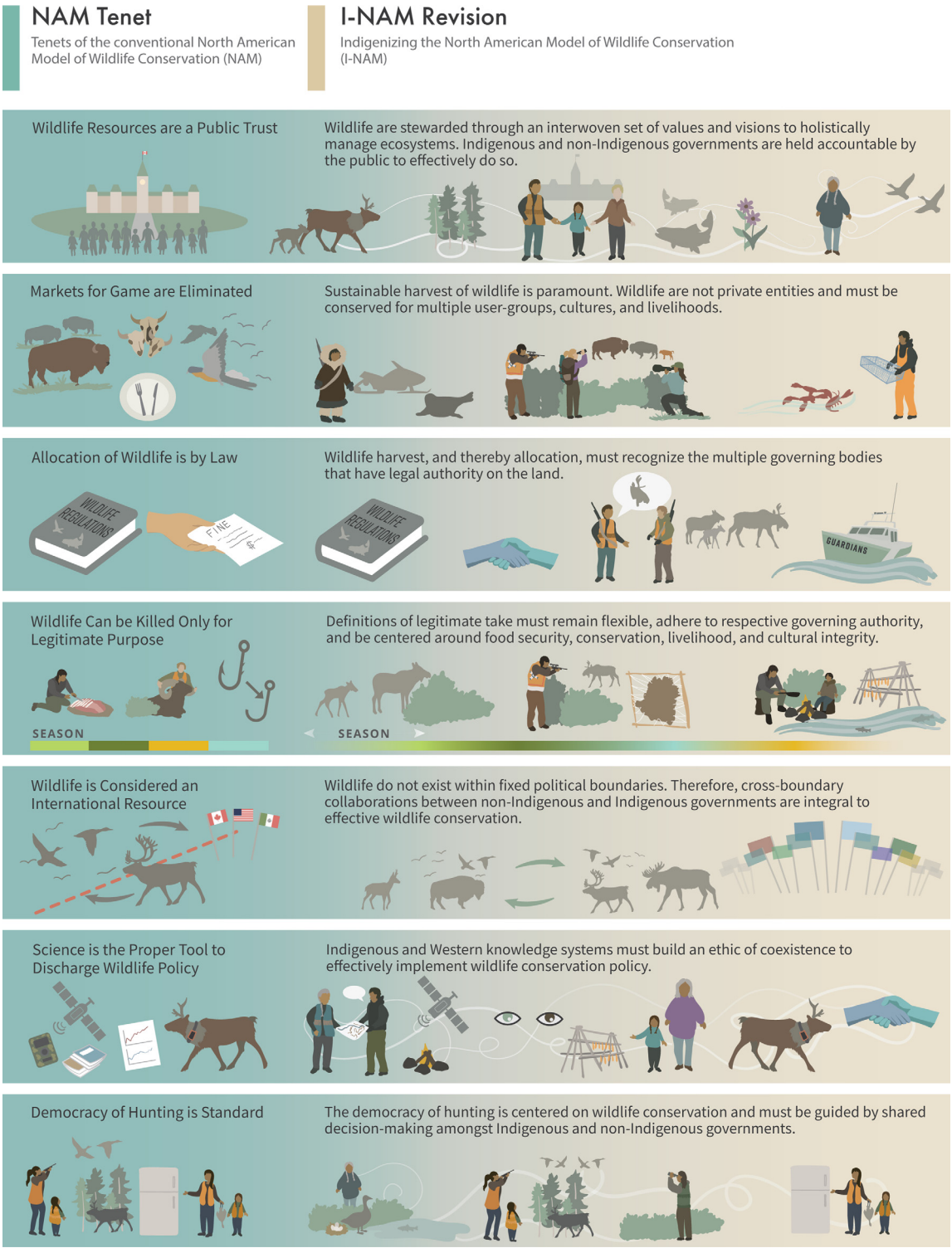


Fig. 1. Proposed revisions to the tenets of North American Model of Wildlife Conservation (NAM). The left column depicts the conventional seven tenet NAM derived from Organ et al. (2012). The right column depicts the proposed tenets of Indigenizing of the NAM (I-NAM), revisions that should continue to be shaped through continuous learning and collaboration with Indigenous Peoples to help as one of many models to guide wildlife conservation strategies in Canada moving forward. Animations depict the gaps and linkages between worldviews as well as proposed I-NAM revisions.

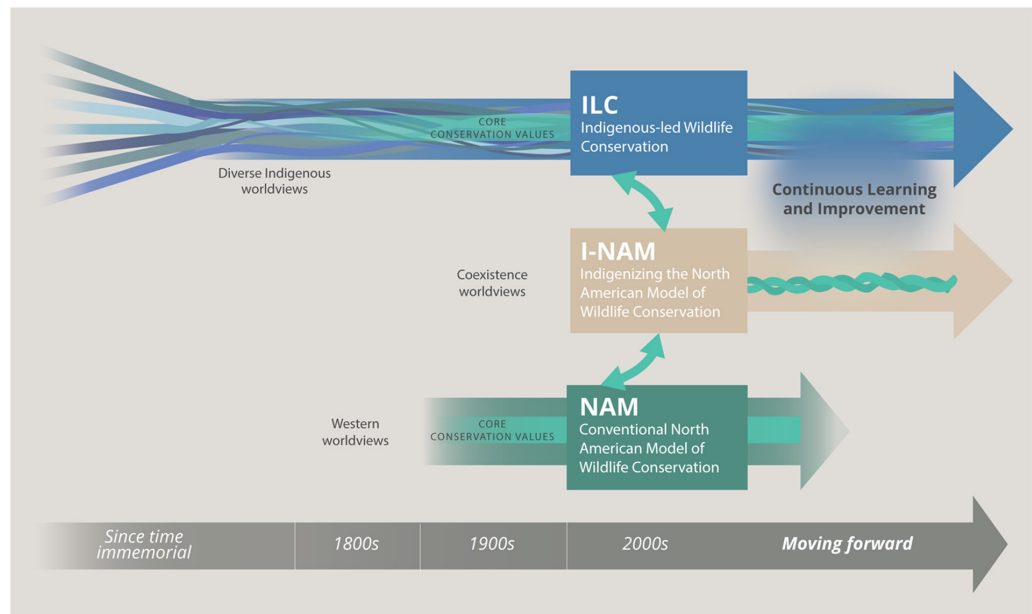


Fig. 2. A temporal and conceptual visualization of the Indigenizing of the North America Model of Wildlife Conservation (I-NAM). The bottom arrow depicts the conventional North American Model of Wildlife Conservation (NAM), the timeline of its inception, and its fading relevance. The middle arrow depicts the I-NAM and its interweaving of shared conservation values from the NAM and ILC (top arrow).

landscape conservation (Kelly 2018; Mahoney and Geist 2019). Under the NAM, wildlife are viewed as a public resource, the role of science is central to wildlife management, and consumptive users (i.e., hunters) are centered as stakeholders (Organ et al. 2012; Feldpausch-Parker et al. 2017). These practices are intertwined with a land governance system that generally promotes the Public Trust Doctrine and equitable access to public land.

Public land (or Crown land in Canada) is a land ownership and tenure system that allows multiple user-groups to recreate (e.g., hunt, ski, camp) or extract resources (e.g., industry) on government owned and managed lands but does not permit the wholesale ownership of land by nongovernment entities (Hessing and Summerville 2014). Access to public land in the USA and Canada differs from other wildlife management models around the world where land ownership dominates, democracy is not standard, and hunters often pay private landowner fees for hunting privileges (McCance 2019). Similarly, the ability to sell wild game commercially is allowed in Germany and other European countries (Cashore et al. 2005). In modern day North America, there is an anti-commercialization ethic that underpins the NAM, and broadly speaking, these market hunting features are absent. Some exceptions occur such as the retail sale of cervid antlers (Wagner 2016), private land game farm hunting in Texas (Roache 2015), guide outfitting operations, commercial fisheries, fur trapping, and the rights of Indigenous governments to practice certified standards of trade or sale of wildlife (Kennedy and Donihee 2006).

At the start of the 21st century, a group of Western wildlife scientists and scholars brought together these elements of modern policy and underlying motivations into a set of seven tenets that became known as the NAM (Geist et al. 2001). While the origins of the NAM predominately come from the USA, Canada also experienced unregulated pressures on wildlife from European colonization and instituted similar laws and policies to conserve and structure decision-making for wildlife populations

(Hewitt 1921; Hawkins 1984). Today, many Canadian wildlife management agencies subscribe to the constructs of the NAM (Geist 1993; Burnett 2003; Mahoney and Geist 2019). Yet one important difference between the USA and Canada's adoption of the NAM is that Canada does not share the same robust funding models (i.e., firearm tax, dedicated funding models) for wildlife conservation as the USA (Organ et al. 2012). Here we provide a brief overview of the seven tenets of the NAM, but refer the reader to Geist et al. (2001) and Organ et al. (2012) for a richer description.

Wildlife resources are a public trust

The Public Trust Doctrine is a foundational principal of the NAM related to who owns wildlife and how wildlife management decisions are made (Geist and Organ 2004; Prukop and Regan 2005; Smith 2011). Under the Public Trust Doctrine, wildlife are managed for the common good, held in custodianship by trained professionals who serve as trustees (Brulle and Pellow 2006), and are made accountable by the beneficiaries—the public (Organ et al. 2012). Moreover, this tenet hinges on a philosophy of human dominion and custodianship over wildlife, which are viewed as a resource.

Elimination of markets for wildlife

Unregulated market hunting and commercial demand for wild game and nongame species led to drastic and sometimes catastrophic declines of wildlife populations across North America in the 18th, 19th, and 20th centuries (Geist and Organ 2004). The elimination of such markets (i.e., restaurants selling wild game), was an essential step in halting rapid declines for wildlife species (Geist et al. 2001). However, market processes are still in place in some jurisdictions for furs, antlers, and bounties.

Allocation of wildlife is by law

This tenet describes how wildlife is to be allocated amongst citizens via an equitable democratic process. Geist et al. (2001, pp. 177–178) stated that “surplus wildlife is allocated to the public for consumption by law, not by the market, land ownership, or special privileges”. The motivation for this tenet is that statutory-based hunting regulations, seasons, licenses, and draws form the governance structure that determines who and where a person can legally harvest an animal and what procedures they have to follow afterwards. These laws invoke safety, principles of “fair chase”, and ways to provide opportunity to engage in hunting (Posewitz 1994).

Wildlife can only be killed for legitimate purpose

As outlined by Geist et al. (2001), to harvest an animal, the reasoning must be for legitimate purposes, in accordance with the law, and not for frivolous purpose. Access to wildlife for hunting must be allotted through legal mechanisms such as hunting seasons, bag limits, and license requirements. The origins of this tenet date back to the start of the 20th century, when the New York Sportsmen's Club and the Boone and Crockett Club developed game laws and fair chase ethics to address imperiled wildlife populations in the wake of market hunting (Geist et al. 2001).

Wildlife are considered an international resource

This tenet highlights the importance of collaboration and allyship between governments in the interest of wildlife conservation. Geist et al. (2001, pp. 18–19) emphasized that: “wildlife transcend boundaries, and one sovereign state's interests can be affected by another's management.” A notable success in international wildlife conservation is the Migratory Bird Treaty Act of 1916, which triggered a unified science-based approach to increase the abundance of migratory waterfowl and protect their habitats in the interest of conservation and hunting opportunity (Organ et al. 2012). Today, collaboration on a broad suite of wildlife conservation issues across North America continues to be paramount to conserving wildlife.

Science is an important tool for discharging wildlife policy

The application of best-available science is key to guiding wildlife management and policy. Rooted in the writings of Aldo Leopold's (1933) book, *Game Management*, Leopold called for decision-making to be based on evidence, scientific study, and expert opinion rather than the interests of capital, political gain, or unsubstantiated interest. Importantly, the definition of science-based decision-making is evolving, relevant to the best-available tools to discharge (i.e., operationalize) wildlife policy (Decker et al. 2009).

Democracy of hunting is standard

The seventh tenet revolves around the premise of fair and public deliberations for setting hunting regulations, conserving wildlife, as well as the opportunity to harvest wildlife. In essence, this tenet echoes the first regarding a public trust, and is based on the principle that "the opportunity for citizens in good standing to hunt in Canada and the U.S. is a hallmark of our democracy" (Organ et al. 2012, p. 23).

Shortcomings of the conventional North American Model

Although we focus on the shortcomings of the NAM with respect to coexistence with ILC—other important limitations of the NAM have been recognized. For example, some have argued that the NAM excludes nonconsumptive users (e.g., bird watchers) from playing a more active role in wildlife management (Feldpausch-Parker et al. 2017). The role of science in the NAM has been questioned by Artelle et al. (2018a) who found that most species management plans lack clear monitoring objectives or processes commonly associated with scientific methods, such as hypotheses testing. Others have suggested that the limitations of the NAM have less to do with its structure as its selective implementation (Peterson and Nelson 2017; Serfass et al. 2018). For example, hunting derbies that promote commercial gains for harvest and occasionally mass killing and nonuse of carcasses are practiced in many North American jurisdictions and violate some of the central tenets of the NAM regarding the legitimate reasons for killing animals (Preacher 2019). In addition to these critiques, the NAM has thus far failed to adequately decolonize wildlife management and equitably include Indigenous governments in wildlife conservation decision-making (Eichler and Baumeister 2018).

The NAM fails to articulate the legacy, presence, and knowledge of Indigenous Peoples in the discharge of wildlife policy and conservation (Eichler and Baumeister 2018; Loring and Moola 2020). This exclusion is problematic because Indigenous Peoples of Canada have a long history of lived experience and intergenerational knowledge that is integral to the restoration, conservation, and management of wildlife species (McGregor 2004; Berkes 2009; Schuster et al. 2019). A symptom of this deficiency in the NAM is the eruption of political and cultural conflict over wildlife (Brockington and Igoe 2006). These conflicts threaten the emotional and physical well-being of Indigenous and non-Indigenous communities in Canada (Julien et al. 2017). Moreover, conflicts can circumvent logistical and financial capital to conserve wildlife species, which in turn can prompt adverse outcomes for society and ecosystems (Assembly of First Nations 2012). Recent cases of conflict include lobster (*Homarus americanus*) fisheries for communities of the Mi'kmaq in Nova Scotia (e.g., Sipekne'katik First Nation) (MacDonald 2020), moose (*Alces alces*) management input by Algonquin Peoples in Quebec (Greig 2020), and hunting rights of Syilx Peoples in south central British Columbia (Kilawna 2020). Status quo approaches by wildlife managers will continue to foment conflict until a more inclusive approach is put in place (Artelle et al. 2018b). In addition to these polarizing forces, misinformation about who is harvesting wildlife and how much is being harvested by different sectors is pervasive, further undermining a shared vision for successful conservation outcomes (Ford et al. 2021). Consequently, reconciliation remains an elusive concept in many Canadian communities.

Proponents of the NAM, including some of the original scholars acknowledge the deficiency and shortcomings we address above. Regarding Indigenous Peoples, [Mahoney and Geist \(2019, p. 132\)](#) stated: “Failure to effectively incorporate First Nations peoples and their traditions, perspectives and rights within the conservation system of North America is a historic weakness of the Model and one with enduring implications...” [Mahoney and Geist \(2019\)](#) further articulated society’s shifting baselines towards how wildlife is conserved and foreshadows an inevitable realignment or departure from the NAM in the USA and Canada. In spite of widespread criticism and acknowledgement that the NAM needs revision, there has been little work done to articulate what the pathway towards a new NAM might look like.

Gaps and linkages between Indigenous-led conservation and the conventional North American Model

Of the many critiques leveled at wildlife conservation in North America, few have examined the core conservation values that the NAM and ILC share. We identified four overlapping conservation values that guide the beliefs, ideologies, and prescriptive efforts to conserve wildlife populations between the NAM and various ILC models across Canada: (i) safeguarding wildlife for future generations, (ii) utilizing best available knowledge to solve problems, (iii) prioritizing collaboration between nations, and (iv) democratizing the process of conserving wildlife. We recognize that there is no single ILC model or worldview, and do not advocate that the NAM should integrate or co-opt ILC. Instead, we offer some points of departure where further and richer discussions about the NAM and ILC are warranted and likely to be productive ([Fig. 2](#)). We visit the seven tenets and examine gaps and linkages with ILC, drawing on published case studies on ILC and Indigenous worldviews across Canada. We highlight what language and practices in the NAM need revision and why ([Fig. 1](#)).

Wildlife are a public trust

The history of the Public Trust Doctrine, a foundational principle iterated throughout the NAM, is rooted in a colonial, settler legacy ([Eichler and Baumeister 2018](#)). The inception of the NAM and language surrounding public trust, democracy, and common good, were conceived in the wake of Indigenous persecution and, thus, circumvented any consultation, recognition, or inclusion of the unique perspectives and conservation practices Indigenous Peoples practiced on landscapes they lived on for thousands of years ([Eichler and Baumeister 2018](#)). Currently, the notion that the public holds the trustees (i.e., government) accountable for wildlife conservation ([Organ et al. 2012](#)) seemingly excludes Indigenous Peoples as belonging to the public because few jurisdictions in Canada or North America afford Indigenous governments equitable input in wildlife conservation decision-making ([Eichler and Baumeister 2018](#); [Artelle et al. 2019](#)). As a result, the language and historical context of the public trust in the NAM is exclusive to colonial culture.

Despite the outdated language and historical exclusivity of the Public Trust Doctrine—many Indigenous worldviews share the core values implicated throughout the NAM’s first tenet. For example, many Indigenous worldviews prioritize safeguarding wildlife for future generations and uphold the notion that no individual owns wildlife ([Asch 2014](#); [Tran et al. 2020](#)). However, Indigenous worldviews can have differing and more complex perspectives and priorities regarding by who or how the process of conserving wildlife is organized ([Kimmerer 2013](#); [Reid et al. 2021](#)). For example, wildlife is referred to as a resource throughout the NAM’s first tenet ([Organ et al. 2012](#)), contradicting many Indigenous worldviews that instead define wildlife, and people, as an interdependent, connected, and related component of living systems ([Aikenhead and Michell 2011](#); [Kimmerer 2013](#)). As denoted by Henry [Lickers \(2007\)](#), Biologist and member of the Turtle Clan of the Seneca Nation: “First Nations people view themselves not as custodians, stewards or having dominion over the Earth, but as an integrated part in the family of the Earth.”

In the interest of reconciliation, practitioners of the NAM must understand these gaps and linkages surrounding the public trust and work to equitably represent Indigenous governments into statutory and nonstatutory decision-making (Artelle et al. 2019). More inclusive language in this tenet can better acknowledge the coexistence of different worldviews (Fig. 1).

Elimination of commercial markets for wild game

Many Indigenous Peoples of Canada inhabit remote areas that prevent convenient and affordable access to global supply chains of food, medicine, clothing, and modern amenities (Langton 2003; Snook et al. 2020). Thus, a small, yet significant, number of Indigenous communities across Canada depend on wildlife as a critical part of their food security and sovereignty (Lambden et al. 2007). At times, wildlife harvest is not restricted to direct consumption. For example, Inuit have hunted and traded seals (*Pinniped species*) for over 3000 years (Jírová 2019). While the commercial sale of seal pelts is a culturally important practice providing much needed economic support, misplaced actions by animal rights activists have interrupted this commodity (Farquhar 2020). It is the explicit effort to achieve a sustainable harvest that links this second tenet of the NAM and ILC. *Netukulimk*, is a guiding principle used by the Mi'kmaq that works to ensure the use of wildlife or nature occurs without jeopardizing the integrity of the environment for future generations and ensures adequate standards of community nutrition and well-being (Prosper et al. 2011; McMillan and Prosper 2016).

It is important for non-Indigenous user groups to understand the scale of these Indigenous markets (i.e., marine mammals, fur, fisheries) and the impacts that harvest has on wildlife populations (Stephany 2015; Daigle 2019). Commercial fisheries and Indigenous Peoples rights to trade and sell wildlife species are excluded from discussions of the NAM. Yet practices of trade and reciprocity are foundational to social structures, community well-being, and situation of wealth within and between communities (Berkas et al. 1998; Salmón 2000). Disruption, or lacking recognition of such structures undermines the self-determination and traditional practices of Indigenous communities (Farquhar 2020). For instance, the 1975 (to present) hunt moratorium of the Mealy Mountain Caribou (*Rangifer tarandus*) herd in Nunatsiavut (Labrador) has had enduring implications to Inuit whose cultural identity and livelihood are centered around caribou (Snook et al. 2020). A holistic understanding and update to this tenet could commence change in how Canadian wildlife practitioners and policy makers shape and influence decision-making in the 21st century (Borrows 2019).

Allocation of wildlife is by law

Social constructs (i.e., ethics, norms, laws) and regulations are foundational to the protection and effective management of wildlife species in Canada (Passelac-Ross 2006; McCance 2019). Under Section 35 of the (1982) Canadian Constitution Act, treaty and nontreaty Indigenous governments have jurisdiction over all wildlife on their reserves except where endangered species legislation may be applied (McNeil 1988; Organ et al. 2012). In addition, Indigenous Peoples are predominately limited to harvest wildlife in their respective Traditional Territory or Treaty Land, and often need permission from the Chief and Council of the host nation if they are to hunt off their land (Borrows 2019). Indigenous harvest laws may differ substantially from non-Indigenous laws and regulations. Throughout Canada, these differences in wildlife conservation laws have set the stage for significant cultural conflict, spread of misinformation, and hindrances to cooperative wildlife management and conservation (Nadasdy 2003; Whiteman 2009).

Absent from the NAM is the acknowledgment that many Indigenous communities across Canada did, and still do, practice laws and regulations pertaining to wildlife harvest (Sherry 1999; Nisga'a Lisims Government 2018; Popp et al. 2019). Indigenous laws and regulations differ from Western constructs by complexity and relationship to the land but can share similar values, such as safeguarding wildlife for future generations (McGregor 2018). As expressed by Robin Wall Kimmerer (2013, p. 190)

“Living by the precepts of the Honorable Harvest—to take only what is given, to use it well, to be grateful for the gift, and to reciprocate the gift.” Honorable Harvest drives many Indigenous harvest practices across Canada. In the Yukon, Gwitchin First Nation caribou hunters would “let the leaders pass” to avoid shooting caribou leaders of the Porcupine herd to ensure continued migration fidelity (Sherry 1999). Similarly, the Gitanyow Nation of northwest British Columbia, who manage moose in accordance with their Indigenous laws, have set strict prohibitions on the harvest of cow moose. Gitanyow hunting is regulated through a system where people must ask permission from the Chiefs and indicate which specific areas they wish to hunt (Popp et al. 2019). With detailed communication between community members and Chiefs, the Gitanyow are able to set harvest quotas that close once harvest reaches a certain threshold (Koch 2016).

The Canadian Guardians program compliments this third tenet of the NAM by operationalizing conservation enforcement and monitoring for wildlife set forth by Indigenous communities (Reed et al. 2021). Important to non-Indigenous Peoples of Canada, the Guardians program strengthens wildlife conservation and monitoring by weaving ILC and self-determination to better understand, manage, and protect the wildlife and vast landscapes of Canada (Wells et al. 2020). The NAM must update its language to reflect the geographical, geopolitical, ecological, linguistic, and cultural differences that shape Indigenous laws and regulations surrounding the harvest of wildlife (Fig. 1) (BC Government 2020).

Wildlife should only be killed for a legitimate purpose

Defining human-animal relationships is at the heart of the fourth tenet and constitutes what legitimate take is (Geist et al. 2001; Nelson et al. 2011). Prevalent throughout the NAM is objectified language describing the relationship between humans and wildlife, almost entirely under a consumptive Western lens (Feldpausch-Parker et al. 2017). For example, words used to describe harvested wildlife, such as: sport, game, and trophy center a narrow and perhaps even ego-driven motivation to harvest wildlife (Darimont et al. 2017). These words and inherent motivations contradict many Indigenous interpretations of the relationship among wildlife, people, and the land. For example, the Indigenous value system known as “All My Relations,” described as: “... the web of kinship to animals, to the birds, to the fish, to the plants, to all the animate and inanimate forms that can be seen or imagined” (King 1990, p. 71) illustrates a multidimensional relationship with the natural world that the NAM does not relate to. Subsistence, culture, and ceremony are central to the purpose of harvesting wildlife for many Indigenous worldviews (Berkes 1998). Wildlife harvest is also associated with keeping traditions alive, intergenerational knowledge transfer, acquiring materials for utility and art, as well as building and maintaining social bonds (Garibaldi and Turner 2004).

The linkages in this tenet are obscured by the archaic, objectified language in the NAM used to justify the harvest of wildlife, which are absent from a majority of Indigenous worldviews (Eichler and Baumeister 2018). Moreover, 21st century Western linkages to ILC and Indigenous worldview surrounding legitimate take and harvest of wildlife are narrowing. The demographics and socio-political narrative of consumptive-user groups is evolving to a younger, more diverse group that are motivated by the health, ethical, and sustainability benefits of procuring wild organic food from the natural world (Den Hoed 2016; Mahoney and Geist 2019). The NAM must take into consideration more diverse perspectives of what legitimate take entails and alter stereotypes that putatively threaten the social license of hunting (Darimont et al. 2021).

Wildlife is considered an international resource

The Indigenous concept “A Dish with One Spoon” developed by Indigenous People of the Great Lake’s region describes how land can be shared to the mutual benefit of all its inhabitants (Mann and Fields 1997). Indigenous and non-Indigenous governments of Canada adhere closely to the

understanding that wildlife transcend political boundaries and must be conserved cooperatively (Organ et al. 2012). For instance, Canada is a signatory on The United Nations Declaration on the Rights of Indigenous People (UNDRIP), and now has a legal obligation to share governance with Indigenous governments (Champagne 2013).

Cross-boundary collaboration is a central component of Indigenous governance and has been for millennia (Berkes 2012). Yet there is no mention of Indigenous partnerships or co-management efforts from the conventional NAM (Eichler and Baumeister 2018). Cooperative management, agreements, treaties, and Indigenous Protected and Conserved Areas (IPCAs) all align directly with the values of this tenet—to work together across boundaries, governments, and nations to maximize oversight of wildlife species (Zurba et al. 2019; Intergovernmental Partners 2020). For example, populations of Snow Geese (*kanguit* in Inuktitut; *Chen caerulescens*) and Ross's geese (*kangunnait* in Inuktitut; *Chen rossii*), referred to as light geese, are a food source for Inuit communities in northern and eastern Canada. These migratory waterfowl are also important to non-Indigenous People of Canada and the USA, as they are commonly hunted for food and sport and generate revenue for conservation (Vrtiska et al. 2013; Sears et al. 2018; Buderman et al. 2020). As part of the Government of Canada and Tuungavik Federation of Nunavut Land Claim Agreement (1993), Inuit Peoples have shared decision-making regarding habitat and light geese management (Ndeloh Etiendem et al. 2020). In the Pacific Northwest, the Sagelands Heritage Program is an international (USA, Canada, Yakima, Colville) partnership initiative, spearheaded by Indigenous governments to enhance and restore shrub-steppe landscapes from the British Columbia Okanagan Valley to Washington state's south-central desert, the Horse Heaven Hills (Conservation Northwest 2020). Included in this initiative is the re-introduction of pronghorn antelope (*Antilocapra americana*). Lastly, in September of 2014, 13 Indigenous governments from the USA and Canada signed a cross-border ILC treaty to restore plains bison to 25 000 km² of land between both countries (Wilson 2014). The motivations of this treaty are rooted in the vision to restore bison, a large mammal that was the lifeblood of Indigenous Peoples across North America. These case studies are a small capture of Indigenous governments operationalizing the fifth tenet of the NAM across international political boundaries but do not encompass the many Indigenous government to government collaborations across Canada. The inclusion of Indigenous histories, case studies, and agreements on international collaboration must be included in subsequent publications of the NAM, as well as provincial and federal frameworks for managing wildlife (Fig. 1).

Science is the proper tool to discharge wildlife policy

Indigenous Peoples have developed complex, deeply rooted systems of knowledge to inform place-based relationships between humans, animals, and plants (Salmón 2000; Reed et al. 2021). However, Indigenous knowledge is not formally recognized by the NAM, as the sixth principle states “science is the proper tool to discharge wildlife policy,” with an apparent focus on Western science paradigms (Organ et al. 2012, p. 21). Indigenous knowledge has been defined as “a cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission about the relationship of living beings (including humans) with one another and with their environment” (Berkes 2012, p. 8).

Both Indigenous knowledge and Western science produce detailed empirical information about processes in the natural world, but with differing approaches (Polfus et al. 2016). With detailed local information over greater time scales, Indigenous knowledge systems can provide an understanding of our changing environment in ways Western scientific methods alone cannot (Gagnon and Berteaux 2009; Polfus et al. 2016; Thompson et al. 2020; Reid et al. 2021), which in turn aids in the understanding of local adaptation to environmental change (Drew 2005; Smith and Sharp 2012). Western scientific methods, on the other hand, may be important for understanding specific mechanisms of change within

ecosystems, determining fine-scale management units (i.e., population vital rates) within species, and for precise quantification when necessary (Riedlinger and Berkes 2001; Artelle et al. 2018b; Bowles et al. 2021). In the Koeeye watershed of coastal British Columbia, the Traditional Territory of the Heiltsuk First Nation People, molecular demographic analysis from hair samples revealed a regionally significant population of salmon-feeding grizzly bears (*Ursus arctos*) in a key conservation area. This effort was led by the Heiltsuk, as were the noninvasive Western scientific methods for identifying grizzly bears; importantly, all of this work respected *Gwi'ilas*™, or customary law (Housty et al. 2014). These knowledge systems and worldviews are best operationalized when they coexist, cooperate, and weave strengths and weaknesses to work towards solutions (Popp et al. 2019; Reid et al. 2021).

Models exist for weaving Indigenous and Western ways of knowing (Levac et al. 2018), such as the *Kaswentha* or Two-Row Wampum (McGregor 2008, p. 150) and *Etuaptmumk* or Two-Eyed Seeing (Bartlett et al. 2012). The details of the aforementioned models vary in how knowledge systems are woven but retain the integrity of coexistence. Notions of one wildlife management system integrating or incorporating the other undermine the strengths of their unique identity. In Two-Eyed Seeing, Western science is seen through one eye while Indigenous knowledge systems are seen through the other; the knowledge from both systems then transforms the holder who is obliged to act (Bartlett et al. 2012). Two-Eyed Seeing is exemplified by “Learning Together” (Polfus et al. 2016), a project where the Dene Nation in the Northwest Territories worked collaboratively with Western scientists to examine the biocultural diversity of caribou. Many different models for coexistence of knowledge are already being applied in Canada and can provide a path to Plural Coexistence or “a model of cross-cultural relations that acknowledges and respects Indigenous ontologies, or ways of being, and at the same time is attentive to the historical and current dominance of Eurocentric thinking within natural resource management” (Reid et al. 2021, p. 246; Howitt and Suchet-Pearson 2006; Zanotti and Palomino-Schalscha 2016).

Co-management of wildlife is an adaptive approach to governance, characterized by collaboration, negotiation, joint learning, and problem solving (Pinkerton 2003; Berkes 2009; Popp et al. 2019). The framework under which co-management operates includes shared power and responsibilities between governments (Berkes 2009), cooperative decision-making (Ndeloh Etiendem et al. 2020), and agreed upon visions for conservation, preservation, or management of wildlife (Houde 2007). Proposals to update the definitions or worldviews of science (Artelle et al. 2018a; Eichler and Baumeister 2018) within the NAM are importantly in deliberation and motion throughout Canada (Housty et al. 2014; Henri et al. 2020; Popp et al. 2020). For instance, the landmark partnership agreement (signed in 2013) between the West Moberly and Saulteau First Nations, the province of British Columbia, and the Government of Canada, sets forth a process by which Indigenous governments will lead efforts to recover the Klinse-Za mountain caribou herd (Intergovernmental Partners 2020). In the eight years since this partnership agreement, the Klinse-Za caribou population has more than doubled, habitat protection has been afforded, and cross-cultural relationships have been fostered. This case study should serve as a blueprint for multiple knowledge and governance systems working together to produce measurable outcomes for wildlife populations (Fig. 1).

Democracy of hunting is standard

The equitable opportunity for all citizens to hunt wildlife “... is a hallmark of our democracy” as stated by Organ et al. (2012). While democratic access and opportunity to hunt wildlife across Canada is not pluralistic between Indigenous and non-Indigenous people, neither is the underlying process to conserve wildlife. The latter is perhaps the most important disjunct to address in Indigenousizing the NAM because shared decision-making surrounding wildlife conservation has and will continue to play a key role in reconciliation (Henri et al. 2020; Popp et al. 2020).

The Government of British Columbia's "Together for Wildlife Strategy" (T4W) seeks to democratize the process of conserving and harvesting wildlife between Indigenous and non-Indigenous governments by including significant input from Indigenous Peoples across the province (Morris 2015; Conroy 2016; BC Government 2020). Five core goals and actions are enshrined within T4W. The fifth goal of T4W speaks clearly to the need for reconciliation as a foundational approach to wildlife conservation: "Collaborative wildlife stewardship advances reconciliation with Indigenous governments" (BC Government 2020). Implementation of T4W is being supported through a wildlife advisory council comprised of Indigenous and non-Indigenous community leaders and experts, including the council chairs. T4W came to fruition as the Government of British Columbia formerly ratified UNDRIP (Bill 41) in November of 2019 (Little 2019)—the first government in Canada to do so. While implementation of T4W is still emerging, its governance structure holds promise for British Columbia and if successful could serve as a blueprint for other jurisdictions in Canada who are seeking to democratize and coexist with ILC.

Indigenizing the North American Model of Wildlife Conservation and Management

We believe Indigenous and non-Indigenous collaboration and coexistence by means of reconciling knowledge systems and available policies is the most lucrative and timely approach to conserving Canada's unique biodiversity and ecosystems. The I-NAM is at the frontier of this undertaking as it confronts some of the major deficiencies in the conventional NAM and contributes to a potential solution for Canada's current wildlife conservation framework. The original seven tenet constructs (left column, Fig. 1) overlap considerably with ILC and Indigenous worldviews, and thus we see value in maintaining the seven tenets and shared conservation values in the I-NAM but abandoning the colonially centric language and perspectives (right column, Fig. 1).

The I-NAM offers the institutions, agencies, and policies of colonialism a means to translate the conventional NAM to better support and coexist with ILC. Fortunately, work towards the coexistence underpinnings of the I-NAM is already underway in some areas of Canada, including British Columbia's T4W strategy, the government of Nunavut's *Land Claims Agreement* (1993), and Parks Canada's "Mapping Change: Fostering a culture of reconciliation with Parks Canada" (BC Government 2020; Parks Canada 2020a).

Notably, Parks Canada acknowledges a historical disjunct between Indigenous Peoples and the dozens of protected areas they manage (Parks Canada 2020a). Since the 1800s, Parks Canada has had a long history of excluding and displacing Indigenous Peoples from living on and hunting/gathering within national parks under the guise of conservation. In growing recognition of this injustice, Parks Canada is working to reconcile wildlife monitoring, tourism, and public relations with the nations whose Traditional Territories overlap with National Parks. For example, members of the Simpcw First Nation conducted a hunt inside Jasper National Park in 2017 (Muzyka 2017). In Pacific Rim National Park Reserve, a wolf (*Canis lupis*) and human coexistence project is bringing together natural and social scientists with Indigenous leaders to find new ways to reduce conflict with coastal wolves in a culturally appropriate manner consistent with Carter et al. (2012). Indigenous knowledge from members of ten Nuu-chah-nulth Nations—who have a deep history of coexistence with wolves—is helping to make one of Canada's most visited protected areas to be safer for people and wildlife (Parks Canada 2020b).

Other efforts are underway across Canada to reconcile ILC with current practices of conservation and wildlife management (Zurba et al. 2019; Popp et al. 2020; Reed et al. 2021; Reid et al. 2021). Critical evaluation of these various efforts will help better inform the evolution of the I-NAM. In formulating

the I-NAM, we purposefully chose the term Indigenizing to reflect an active process of listening, learning, and change (Reid et al. 2021). We see risk in tokenistic approaches to inclusive wildlife management and therefore want to steer adoption of the I-NAM away from a misperception that a deeply colonial construct can simply be Indigenized by changing some key words (Fig. 2). The active phrasing of the I-NAM is consistent with active tense used in Canada's landmark Truth and Reconciliation Commission (Truth and Reconciliation Commission of Canada 2015): "reconciliation is about *establishing* and *maintaining* a mutually respectful relationship between Aboriginal and non-Aboriginal peoples in this country." [emphasis added].

The pathway to I-NAM will require an ethic of continuous learning and improvement within the differing strategies employed to conserve wildlife in Canada and abroad. Continuous learning and improvement (Bartlett et al. 2012), is a concept that embodies Two-Eyed Seeing and remedies power relations, respects differences, and upholds a constantly evolving goal of transformative change (McMillan and Prosper 2016). We suggest that as the conventional NAM evolves or is replaced by the I-NAM, that an eighth tenet emerge to capture continuous learning and improvement as a means to support reconciliation and coexistence with ILC (Fig. 2).

Conclusion

The objective of this paper is to provide wildlife practitioners, policy makers, and scholars a framework within which their current understanding of the NAM can evolve to advance conservation strategies in Canada in a more just and effective manner. We supported our revision with a collection of history and case studies that highlighted disjuncts and co-existence between the NAM and ILC. Our approach was emblematic of Two-Eyed Seeing as our authorship is equally split between Indigenous and Western scholars as well as gender. This diverse composition of perspective, gender, and culture is representative of successful leadership frameworks in modern society (Chin and Trimble 2014; Homan et al. 2020). This said, we recommend that the proposed revisions we shared be only a starting point, and that the I-NAM continue to improve through input from the many diverse Indigenous worldviews across Canada and North America.

The shortcomings of the NAM are well documented and understood (Mahoney and Geist 2019). However, of the various critiques that highlight these shortcomings, many stop short in offering a viable pathway to modify or divorce from the NAM. Here, we provide a means to diversify rather than abandon the current framework, and in so doing we see it necessary to revise many local, provincial, and federal frameworks of wildlife conservation in Canada. We hope that the I-NAM offers a starting place to push wildlife management towards the more holistic, just, and effective approaches needed to solve conservation challenges in the next century.

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Author contributions

MAH and ATF conceived and designed the study. MAH, EB, JNP, and ATF performed the experiments/collected the data. MAH, EB, and ATF analyzed and interpreted the data. MAH, EB, JNP, and ATF contributed resources. MAH, EB, and ATF drafted or revised the manuscript.

Data availability statement

All relevant data are within the paper.

Positionality statement

The authors include Indigenous researchers from the Wyandotte Nation (Mateen A. Hessami), Wiikwemkoong Unceded Territory of the Anishinabek Nation (Dr. Jesse N. Popp), and non-Indigenous scholars and allies residing on unceded Syilx Territory when this study took place (Drs Adam T. Ford and Ella Bowles). Our study relied on published accounts of Indigenous Peoples and governments to support our arguments, but we recognize that there are many diverse Indigenous worldviews and perspectives that we did not capture; we recommend readers engage directly within and beyond this cited material to better understand the context of perspectives and knowledge systems we used in this perspective piece. We emphasize that we present here only a starting place and suggest the I-NAM continue to grow through embracing Indigenous knowledge systems and perspectives not captured in scientific publications.

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