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Relational place-based solutions for environmental policy misalignments

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Current reductionist approaches to environmental governance cannot resolve social-ecological crises. Siloed institutions fail to address linked social and ecological processes, thereby neglecting issues of equity, justice, and cumulative effects. Global insights can be gained from Indigenous-led initiatives that support the resilience of relationships within and among places.

Current approaches to environmental management and governance

Across much of the world, the management of ecosystems is dominated by siloed institutions and centralized governance processes serving economic interests [1,2]. In North America, for example, environmental management is structured around the benefits and impacts of extractive industries or user groups, such that issues of forestry, agriculture, fisheries, wildlife, and water are often addressed by separate government agencies operating under distinct laws and policies (Figure 1). This siloed structure means that policies serving one law can end up misaligned with policies serving other laws, impeding the ability of both to achieve their goals. Moreover, economic objectives have historically been privileged at the expense of biodiversity and environmental justice [2–5]. Consequently, intertwined social and environmental crises persist and are becoming more common across the globe.

To counteract **institutional mismatches** (see Glossary) and the **policy misalignments** they create, we† argue for a return to place-based approaches that are empowered by Indigenous governance and knowledge systems. **Indigenous knowledge systems** recognize spatially explicit reciprocal relationships among all living and non-living things, including people, and the responsibility to steward them [2,5–7]. For example, governance principles, such as **hišuk mah ćawaak**, recognize food web dynamics that link species and habitats, which accommodate and, in many cases depend on, cultural practices of harvest and stewardship by people [8]. These relationships arise from specific places and have coevolved through time.

Given the contemporary misalignment between connected social-ecological systems and the colonial agencies designed to manage them, our current approaches to environmental governance and management have had poor success at averting social-ecological crises. Moreover, outcomes of policy misalignments that degrade ecosystems may directly violate **Indigenous rights**. For example, in British Columbia, Canada, a recent supreme court decision ruled that cumulative effects arising from decisions made by multiple government agencies infringed upon **Treaty rights**, leading to suspension of industrial activity [9]. A more integrated approach to managing linked social-ecological systems is urgently needed to better align policies and outcomes. Here, we showcase three solutions in western North America where misalignments resulting from business-as-usual management systems are being disrupted and replaced with Indigenous-led, place-based, integrated initiatives.

Glossary

hišuk mah ćawaak: everything is one, everything is interconnected (governance principle of the Nuu chah nulth Nations, west coast of Canada).
Indigenous knowledge systems: systems of knowledge creation, transmission, application, and governance that are enacted and lived by Indigenous Peoples and embedded in Indigenous worldview.
Indigenous rights/Treaty rights: the specific rights of Indigenous Peoples that colonial governments enshrine in constitutions or recognize in treaties; notable in this context is the right to practice traditional livelihoods, including access to traditional foods.
Institutional mismatch: when the structure and mandates of an institution fails to match the social and ecological processes with which they interact; also known as problems of fit.
Policy misalignments: when separate policies conflict in their objectives, therefore inhibiting the ability of both/either to achieve their goals. This occurs when policies enable agencies to operate in isolation of, and without accountability to, each other.
Relational worldview: an understanding of the world as interconnected, where all beings have agency and are enmeshed in, and dependent on, a web of reciprocal relationships.
United Nations Declaration on the Rights of Indigenous People (UNDRIP): a nonbinding agreement to protect the collective and individual rights of Indigenous Peoples, signed by 148 Nation states.

Caribou conservation in altered forested landscapes

Caribou (*Rangifer tarandus* spp.) have been facing precipitous declines across much of their range in Canada, leading to loss of cultural practices for many Indigenous communities. The causes of caribou decline are not homogenous across their

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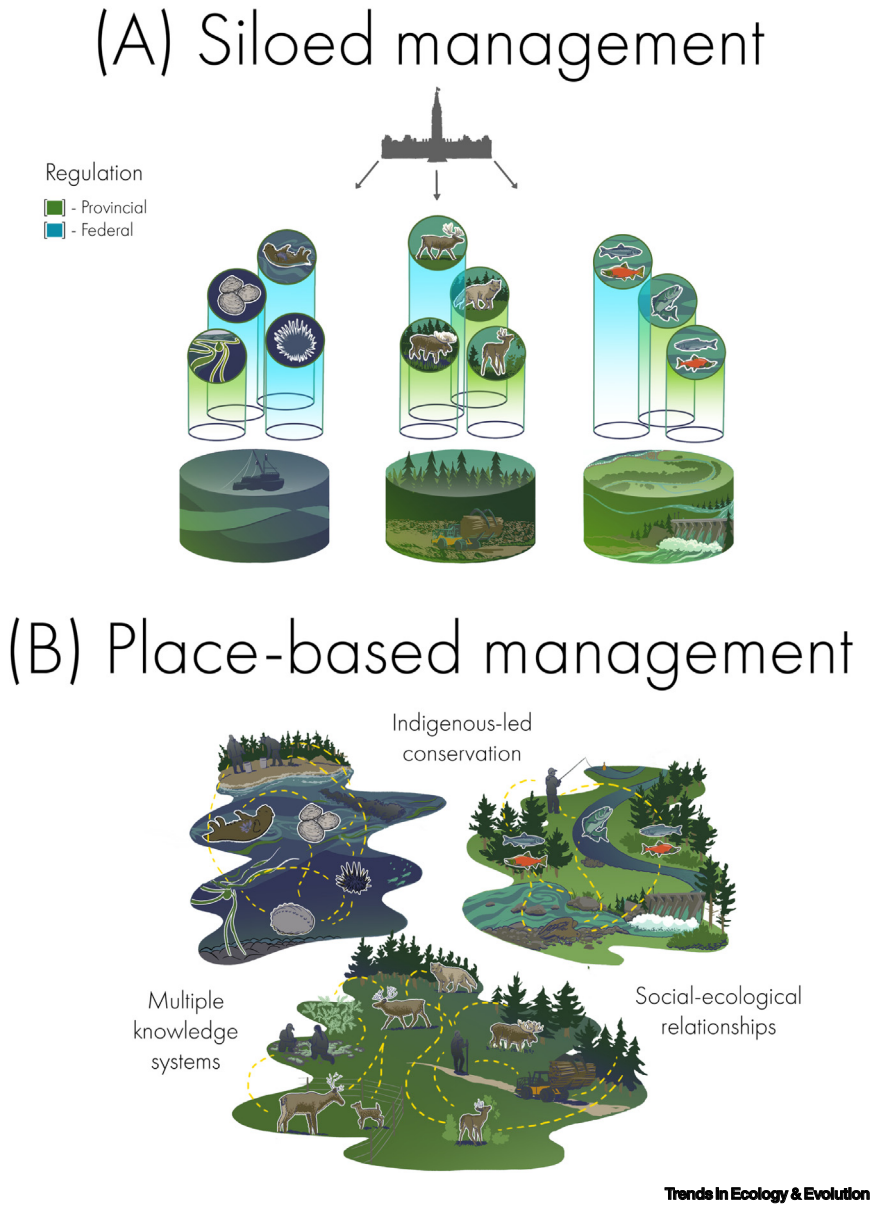

Figure 1. Environmental management and conservation approaches. (A) Centralized decision making by dominant siloed institutions that, in Canada, are structured around industries and/or user groups, removed from place, and managed by different levels of government under distinct laws and policies (shown by silos) regularly leading to policy mismatches. (B) Place-based management that reflects reciprocal social-ecological relationships (yellow broken lines) unique to place, relies on multiple knowledge systems, and where decision-making power is devolved to place. While each place is visualized separately, social-ecological relationships extend across multiple scales/ecosystems. Illustration by Nicole Marie Burton, Petroglyph Studios.

range, but are tied to landscape disturbance resulting in elevated predation from wolves and other large carnivores that exceeds historical baselines. Human disturbance, through resource extraction and climate change, has increased populations of moose (*Alces alces*) and white-tailed deer (*Odocoileus virginianus*). These primary prey support wolf (*Canis lupus*) populations, and act as 'apparent competitors' with caribou [10,11]. Under Canada's Species at Risk Act, federal support for caribou recovery is limited to federally managed lands (e.g., national parks) and caribou-specific recovery efforts. Yet, caribou populations in some national parks are facing dramatic declines or extirpation [10], likely from influences occurring in landscapes adjacent to park boundaries. Thus, to support caribou and cultural recovery, efforts are needed to better unify multiagency and multispecies approaches across large geographical areas.

In the range of the Klinse-za caribou population within Treaty 8 territory in northeastern British Columbia, Canada, the West Moberly and Saulteau First Nations have been leading a caribou conservation initiative that uses a systems-oriented approach with both short and long-term recovery actions [10]. Through predator reduction programs, habitat protection, and a maternal pen, the initiative is restoring the Klinse-za caribou population toward a trajectory of renewed cultural engagement and harvest. Within 10 years, this population has increased threefold in size [10]. The success of these efforts came through an agreement between Indigenous, provincial, and federal governments. Researchers, Indigenous Guardians, community members, and non-government groups are also contributing to research and monitoring efforts to guide adaptive management of caribou recovery [11]. Without Indigenous leadership to spearhead recovery efforts, the Klinse-za herd would likely have followed the same type of trajectory as so many other declining populations [11].

Salmon restoration in transboundary watersheds

Over the past century, North American salmon (*Oncorhynchus* spp.) populations have been adversely affected by human-induced environmental degradation, climate change, and industrial fishing practices [4,12,13]. Due to their migratory life

cycle, salmon are vulnerable to impacts from management across both marine and freshwater habitats, including impacts from land use. However, current management of salmon, and the ecosystems that sustain them, is disjointed across multiple agencies and levels of government [4,12]. In Canada, for instance, hydroelectric dams, logging, and water withdrawals (all activities known to negatively impact salmon habitat), are regulated by provincial agencies whose decisions are independent of the federal agency that manages salmon. Economic goals, such as maximum sustained yield of commercial and recreational salmon fisheries, have long been prioritized, undermining more diverse ecological and cultural values, and impinging on Indigenous rights, livelihoods, traditional practices, food sovereignty, and responsibility for stewardship [4,12,13].

Since the late 1990s, the Syilx First Nation has led an alliance of Indigenous rights holders and federal and provincial governments to restore the decimated Okanagan (southern British Columbia) sockeye salmon (*Oncorhynchus nerka*) populations. Drawing on Indigenous knowledge and western science, the Okanagan Sockeye Program has been a social-ecological restoration effort. Following the guidance from Elders and oral histories, the Program began by reinstating cultural ceremonies. Building from this foundation, the Program now includes restoring spawning habitat and passage, educating youth in schools, supplementing salmon with yearly fry releases, monitoring of hatchery impacts on resident native freshwater fish (i.e., Kokanee *O. nerka* and rainbow trout *Oncorhynchus mykiss*), and making water management more fish-friendly through tri-government agreements [13]. Their multidecade collaborative effort has paid off with increasing salmon returns. In 2022, over 660 000 Okanagan sockeye were counted, the highest number since record keeping began in 1938[i]. Salmon are being restored as a food source for Syilx people, as are the reciprocal relationships supporting salmon and the ecosystems they depend on.

Sea otter recovery on a peopled coast

Once extirpated due to industrialized hunting during the 18th and 19th-century maritime fur trade, the previously endangered sea otter (*Enhydra lutris*) has recovered in parts of its former range along the northwest coast of North America due to national and international conservation policies. Despite their role as a keystone predator driving shellfish declines and alternative ecosystem states, endangered species legislation and management plans continue to define sea otter recovery objectives in isolation of other species and diverse human values and objectives. Efforts to promote recovery do not recognize over 10 000 years of persistent social-ecological relationships that existed before the incursion of settler-colonial laws or the current tradeoffs associated with high sea otter density recovery targets. Yet, where sea otters are present, access to shellfish for food is impeded for Indigenous Peoples, which violates Indigenous rights, governance principles, and the **United Nations Declaration on the Rights of Indigenous People (UNDRIP)** [6], the latter of which has been ratified into law in Canada.

In coastal British Columbia and Alaska, Indigenous leaders are reinstating their knowledge and governance of the relationships between sea otters, people, shellfish, and kelp forest habitats [6,14]. Diverse restoration activities, while at different stages of implementation in different places, reflect system-oriented thinking. For example, coastal First Nations in British Columbia are embarking on restoring sea otter–human relationships through knowledge co-production processes[ii] built on shared Indigenous governance principles [6]. Shellfish are being stewarded through the resurgence of practices such as clam gardens to magnify shellfish production[iii]. In Sitka Sound Alaska, spatially explicit management of sea otters has spurred localized recovery of sea urchin populations (*Mesocentrotus franciscanus* and *Strongylocentrotus droebachiensis*) from near zero to 0.25 kg m^{-2}, creating a mosaic of rocky reef habitats [14]. These efforts represent the resurgence of millennia of wisdom and evidence that humans can intentionally manage for persistent and resilient relationships among people, sea otters, and their shared invertebrate prey [6].

Place-based relational solutions

The three examples we highlight center Indigenous governance, management practices, and knowledge. This is no accident. In these Indigenous-led examples, people are intentionally engaged in maintaining social-ecological relationships in place, which is reflective of the **relational worldviews** of each respective Indigenous People and their place-specific knowledge. Each case reasserts the idea that desired outcomes for all living things, including people, derive from a larger system of persistent and resilient relationships. Therefore, management objectives consider the system as a whole, including multiple social, cultural, and ecological outcomes and the functional role of people in achieving them. Moreover, desired outcomes are not target numbers or biomass of shellfish, sea otters, caribou, moose, and salmon, but rather the persistence of reciprocal relationships among all components of nature, including people.

Commonalities among these examples reflect principles of social-ecological resilience [15]. First, the relational worldviews of Indigenous Peoples are reflected in place-based, systems-oriented thinking, whereby the primary integrated management objective is the persistence of spatially explicit relationships [5–7]. Second, all cases involve the mobilization of co-

produced knowledge drawn from multiple yet sovereign knowledge systems. Third, decision-making authority in all three cases is held by locally networked governing bodies that have long standing relationships and responsibilities to place, meaning that managers are locally accountable and can be more responsive and adaptive to disturbances and ensure that diverse local values are reflected in management.

Restoring the authority of Indigenous Peoples to manage relationships within landscapes according to their values, laws, and cultural practices is an important pathway to avert the negative consequences of policy misalignments, and to challenge existing systems that continue to fail to address linked social and ecological crises. Restoring the authority of Indigenous Peoples will require a fundamental redistribution of power in environmental governance and a reframing of the goals and objectives of the governance and management of social-ecological relationships [2]. It may not be easy, but the restoration of place-based, Indigenous governance will leave us better poised to meet the interwoven goals of biodiversity conservation, social equity, and environmental justice for which we are legally and morally accountable [3,5,7,8].

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Declaration of interests

The authors declare no competing interests.

Resources

[i]www.syilx.org/fisheries

[ii]www.coastalvoices.net

[iii]www.seagardens.net/clamgardens

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