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RESEARCH ARTICLE

Examining Human-Nature Relationships Through the Lens of Reciprocity: Insights From Indigenous and Local Knowledge

Cultivating reciprocity and supporting Indigenous lifeways through the cultural transformation of natural resource management in North America

Jonathan James Fisk[1] | Richard E. W. Berl[2] | Jonathan Long[3] | Lara Jacobs[4] | Lily van Eeden[5,6] | Melinda M. Adams[7] | Álvaro Fernández-Llamazares[8,9] | Jazmin Murphy[10] | Michael Gavin[11] | Christopher K. Williams[12] | Jonathan Salerno[13] | Bas Verschuuren[14] | Nathan Bennett[15,16,17] | Rodrigue Idohou[18] | Alexander Mawyer[19]

Correspondence
Jonathan James Fisk
Email: jfisk@hawaii.edu

Present address
Richard E. W. Berl, U.S. Geological Survey, Eastern Ecological Science Center at the Patuxent Research Refuge, Laurel, Maryland, USA

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Abstract

1. Recent decades have seen increasing calls for implementing Indigenous Knowledges (IK) in natural resource management (NRM). However, efforts have been limited by the cultural incommensurabilities between (1) NRM institutions, which are rooted in worldviews that prioritize extraction for dominant cultures and assume dominance over nature and (2) Indigenous worldviews that prioritize kincentric reciprocity with the environment. This manuscript addresses how transforming NRM institutions enables management to better support Indigenous Knowledges and lifeways.
2. This manuscript examines incommensurabilities between NRM institutional cultures and Indigenous cultures, with the value and lifeway of reciprocity as the focal point. Through synthesizing interdisciplinary scholarship and examples from author experiences, we explore how NRM institutions in North America can transform to honour and facilitate reciprocity, especially within efforts to implement IK and support Indigenous lifeways.
3. NRM institutions are cultural products, and in North America were born of colonial histories and cultural roots connected to modern governance and power dynamics. These cultural foundations led to NRM approaches that prioritize maximizing economic growth while guarding against overexploitation. Kincentric reciprocal relations with the environment often emphasize

[Correction added after online publication on 18 June 2025: Duplicate text has been removed from the Abstract.].

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interdependency with more-than-human kin, place-based holistic Knowledges grounded in cultural practices and communal responsibility to cultivate social-ecological abundance for present and future generations.
4. Incommensurabilities between NRM institutional cultures and Indigenous cultures impede efforts to implement IK and support Indigenous lifeways as: (1) rigid institutional structures do not account for Indigenous worldviews and values but instead attempt to fit IK within dominant paradigms; (2) the siloing of NRM leads to the piecemealing and invalidation of IK at the expense of Knowledge Holders and (3) ineffective public engagement strategies limit the possibility of reciprocal relations between NRM institutions and communities throughout management processes.
5. Transforming NRM institutional cultures to better implement IK and support Indigenous lifeways is key for redressing long-standing issues and ensuring social-ecological resilience and abundance. Heavy investments of time, personnel and resources are necessary for transforming NRM institutions to appropriately cultivate reciprocal relations with Indigenous communities and lands. Strategies towards transformation include decentralization through decolonial frameworks, knowledge co-production and using place-based cultural evaluation processes to improve cultural alignment.

KEYWORDS
adaptive governance, culture, Indigenous Knowledges, kincentric worldviews, natural resource management, North America, reciprocity, social-ecological systems

1 | INTRODUCTION

In recent decades, Indigenous Peoples, academics, practitioners and the general public have called for better recognition and implementation of local and Indigenous Knowledges (IK) by natural resource management (NRM) institutions to improve outcomes for people and nature (Armitage et al., 2012; Hessami et al., 2021; Pascual et al., 2023). Research on social-ecological systems (SES) and the 'commons' has long highlighted the value of aligning NRM policy with the cultures and priorities of place (Berkes, 2007; Ostrom, 1990). Similarly, recent biocultural conservation and relational values scholarship emphasizes how accounting for and aligning with the values and worldviews of local and Indigenous Peoples can improve NRM institutional design and produce more just and effective outcomes (Gavin et al., 2015; Gould et al., 2019). The importance of respecting and upholding diverse knowledge systems, particularly IK, within governance processes has recently been prioritized in national-level government policies and global intergovernmental reports, partly to address long-standing shared social-ecological issues across Indigenous communities (Pascual et al., 2023; Prabhakar & Mallory, 2022a, 2022b).

Despite decades of increased attention to diverse knowledge systems and attempts to incorporate them in NRM, many cultures, particularly Indigenous cultures, are still not fully engaged with and accounted for in respectful, effective and ethical ways (Fisk et al., 2024). Motivations to focus on IK, specifically, within NRM arise from sustained contributions and criticisms from Indigenous scholars and cultural practitioners to NRM, the deep-rooted social-ecological consequences of colonialism that Indigenous Peoples continue to face, and global movements for decolonization and the restoration of Indigenous sovereignty (Jacobs, 2025; Smith, 2012). Within this trend, Indigenous scholars have stressed the ethical imperative to not engage extractively with IK but instead work with Knowledge Holders to co-design strategies for appropriately implementing IK, whether through policies rooted in Indigenous values, equitably including cultural practitioners during management plan design, or myriad other strategies (Jacobs, 2025; Reid et al., 2024). The interest in IK, initially framed in NRM as Traditional Ecological Knowledge, emerged within Western science towards the end of the 20th century (Ramos, 2018). Although some successes have been achieved when Indigenous cultural values and lifeways are supported by NRM institutions, these victories are often hard-fought by Indigenous communities, following decades of legal battles and community organizing (Eriksen & Hankins, 2014; Vaughan, 2018). Even then, NRM institutions often maintain power imbalances that disrupt and impede Indigenous lifeways and the transformation of NRM institutions has been limited by incommensurabilities between dominant NRM institutional cultures and Indigenous cultures (Fisk et al., 2024).

For North American NRM institutions to appropriately implement IK and support Indigenous lifeways, it is crucial to first recognize how NRM

is a cultural product. While the idea of culture is often associated with othered ethnic groups, it also applies to organizations and institutions, including governmental agencies. Given the many diverse conceptualizations of culture, we adopt a broad definition of culture as worldviews, knowledges, beliefs, values, attitudes, practices, institutions, norms and other traits, acquired in whole or in part from other individuals, that can affect and structure group behaviour (adapted from Boyd & Richerson, 2005, p. 5). Culture is learned and shared among individuals, often unconsciously and is the outcome of an accumulated history of social interactions and relationships; culture also drives behaviour at all scales, from individually to globally and co-evolves over time in concert with ecologies and other species (Boyd & Richerson, 1985). The internal culture of an organization is a system of beliefs and practices shaped by the norms and values of its members and is also influenced and directed by organizational aspects such as structure, legal foundations, policies and sources of revenue (Jacobson et al., 2022). It can often be difficult for individuals to recognize the cultural values and worldviews embodied and perpetuated within their own viewpoints and practices and those in NRM institutions are no exception. Consequently, dominant institutional norms in NRM often continue problematic legacies of extracting and attempting to 'integrate' IK and Indigenous practices in ways that undermine Indigenous Knowledges and relations with lands (Latulippe, 2015; Molnár et al., 2023).

Within this context, our group of authors investigated how understanding NRM institutions as cultural products can inform more effective approaches for institutional transformation to support Indigenous lifeways. We met for a series of virtual and hybrid in-person workshops from September 2022–September 2023 to interrogate the varied interactions between culture and NRM institutions and practices, identify common barriers and discuss how relationships between culture and NRM can be intentionally shaped to systemically improve environmental governance and stewardship, drawing from our own lived and learned expertise, experience and perspectives. We are primarily social science or transdisciplinary research practitioners working within environmental governance agencies and institutes (particularly, but not exclusively, within the United States at the state and federal levels) and academics positioned within higher education institutions who have over 100 years of collective experience working on aspects of Indigenizing NRM practices. The lead and several other authors identify as Indigenous (Taíno Boricua, Muscogee (Creek) Nation/Choctaw, N'dee (San Carlos Apache)), although the majority do not. We have made concerted efforts to centre the scholarship and perspectives of Indigenous Peoples in this manuscript. For most of the manuscript, we use third-person language (they/them/theirs) when discussing Indigenous Peoples as not all of our author group is Indigenous; however, when discussing kincentric reciprocity, the Indigenous authors felt it was important to use inclusive language (we/us/ours) to not exclude ourselves from our own communities and cultures given the intimate nature of kincentric reciprocity and how it connects to our sense of self and genealogy.

This paper builds upon scholarship identifying cultural incommensurabilities between dominant NRM institutional cultures and Indigenous cultures that have impeded effective application of IK and Indigenous co-management (e.g., Fisk et al., 2024), focusing here on the historical foundations of such incommensurabilities for NRM institutions, their social-ecological implications and strategies for institutional transformation. These incommensurabilities are often aspects of culture that are such ingrained assumptions that they are unquestioned in one culture yet may have no common measure or way to compare across cultures, potentially being philosophically and ethically incompatible with other cultures, such that communicating these concepts can be difficult (Fisk et al., 2024). Because of the authors' positionalities, our analysis of NRM institutions primarily centres on the NRM agencies of colonial governments throughout North America as a geopolitical project, including overseas jurisdictions given the presence of these agencies and dominant NRM cultural dynamics. Many other institutions, such as non-profit organizations and Tribal NRM agencies, are also NRM institutions entangled in these pervasive cultural dynamics, and Indigenous relations with the environment can also be understood as NRM institutions. However, given our focus on dominant cultural dynamics in North America, we principally refer to the dynamics of North American government agencies unless indicated otherwise. In this paper, we describe the cultural foundations of these NRM institutions, as compared with Indigenous relations with the environment, and assess how cultural incommensurabilities between the two affect not just NRM but have broader social-ecological ramifications. In particular, we focus on a key incommensurability regarding the value and lifeway of reciprocity between people and the environment, which is central to many Indigenous Peoples. We contrast this value with the institutionalized separation of people and nature, which has historically been a fundamental component of dominant NRM institutions. Discerning and reconciling these cultural incommensurabilities is a delicate and sensitive matter best navigated with urgency and intentionality. In doing so, we hope to provide both conceptual and practical guidance to assist NRM practitioners in recognizing and transforming cultural assumptions that hinder institutional abilities to support Indigenous lifeways. We propose that the decentralization of NRM authority, knowledge co-production and place-based 'cultural evaluation' processes are opportune strategies for NRM institutions to better align with diverse articulations of reciprocity and appropriately implement IK and support Indigenous lifeways.

2 | ORIGINS OF THE DOMINANT INSTITUTIONAL CULTURE OF NATURAL RESOURCE MANAGEMENT IN NORTH AMERICA

The history of NRM institutional culture in North America coalesces to a number of assumptions that shape the way management is approached (Bogert et al., 2022; Runte, 1997). These foundational assumptions involve not only the social norms, values and priorities for how people interact with each other regarding nature, but even views of nature, natural resources and management as concepts (Bogert et al., 2022; Cronon, 2000). In our workshops, we discussed how assumptions about these three constructs are central to the identity of NRM institutional culture yet often fundamentally conflict with core values of reciprocal cultures.

2.1 | Nature as separate from and for (some) people

Contemporary NRM institutions in North America emerged from the Christian European cultures that birthed the colonialist ideology of the Doctrine of Discovery, an international legal and ethical justification for European claim and rule over Indigenous Peoples and their lands (Miller, 2015). From 1845 and onward, this ethnocentric ideology of dominance fueled a campaign for expansion of the United States across the entirety of North America under religious entitlement to land, a Manifest Destiny: 'the right of our *manifest destiny to overspread and to possess the whole of the continent* which Providence has given us for the development of the great experiment of liberty and federated self-government entrusted to us' (O'Sullivan, 1845, as quoted in Miller, 2015, p. 95). Over time, these ideologies cemented beliefs that 'Americans and their institutions' have an inherent right 'to own North America' and exploit its resources (Miller, 2015, p. 98), disregarding the rights of Indigenous Peoples and socially and institutionally enshrining related values and worldviews such as human dominance over nature and European cultural superiority (Jacobs, Avery, et al., 2022).

These values reflect not only assumptions about nature but also whose worldviews of and relations with nature are the moral standard (Cronon, 2000). This 'divine' expansion of empire spread across the continent and overseas—including to Hawai'i, Borikén (Puerto Rico), Guåhan, Amerika Sāmoa and the Northern Mariana Islands—violently disrupting Indigenous Peoples' Traditional ways of caring for, relating with and providing for each other from the lands and seas (Teaiwa, 2008; Trask, 1999). Such disruptions were executed particularly through land theft, criminalizing practices and 'outright genocide… [through] militia expeditions' (Rizzo-Martinez, 2022, p. 209), including campaigns organized by states to kill Indigenous Peoples en masse (Rizzo-Martinez, 2022; Tuck & Yang, 2012). As Haunani-Kay Trask (1999, p. 25) emphasizes, colonialism is 'an extermination not a recognition of aboriginal peoples and their familial relationship with the earth.' Consequently, in broader North American society, including through NRM institutions' actions (Ramos, 2018), Indigenous Peoples' lifeways, Knowledges and perspectives have been systematically erased and assimilated—such as through boarding schools—'in order to disappear them from the land' (Tuck & Yang, 2012, p. 9).

2.2 | Nature is a collection of resources that science tells us how to manage

Manifest Destiny characterized environmental products and processes as free gifts to be used in civilizing the wilderness (Cronon, 2000). This commodification of nature, perceived as a collection of resources, was central during the westward expansion, which focused on industrialization and agricultural efficiency via logging, mining, grazing and other extractive enterprises (Runte, 1997). As the government encouraged settlers to clear land and develop homesteads, ranches and fenced areas for planting and grazing, wildlife were valued predominantly as game animals for food or furs, resulting in uncontrolled market hunting and rapid overexploitation (Hessami et al., 2021). Consequently, economically valued animals like bison (*Bison bison*) and predators like wolves (*Canis lupus*) who were perceived as threats, were nearly extirpated from the contiguous United States by the early 1900s (Hessami et al., 2021; Stark et al., 2022).

By the late 19th and early 20th century, legislation and policies began to be enacted for conservation purposes (Hessami et al., 2021; Runte, 1997). While there were conflicting perspectives between preservationists such as John Muir promoting stricter protections and conservationists such as Gifford Pinchot promoting sustainable use, both perspectives were premised on the same dominant cultural values that fueled Manifest Destiny (Cronon, 2000). Therefore, these early conservation efforts were culturally constructed within beliefs of human separation from and domination over nature, seen as resources to fuel growing economies in North America (Cronon, 2000; Hessami et al., 2021).

What are now recognized as the legal and professional systems responsible for forestry, grazing, wildlife and fisheries management and fire management on public lands emerged from this historical and cultural context, replacing the pre-existing systems of Indigenous Peoples who had been largely removed from their homelands and treated as environmental threats rather than rights-holding stewards (Jacobs, Avery, et al., 2022; Spence, 1999). For example, Yellowstone, the first National Park, was set aside as a 'pleasuring ground for the benefit and enjoyment of the people' and 'for the preservation, from injury or spoliation, of all timber, mineral deposits, natural curiosities, or wonders within said park, and their retention in their natural condition' (Runte, 1997, p. 47). Like other National Parks, Yellowstone was established for the enjoyment of some and the exclusion of others, in an area where Indigenous Peoples had been violently removed through military action and the U.S. military later tasked with enforcing its protection and management (Runte, 1997).

The siloing of nature into discrete collections of resources was also reflected in the scientific institutions that developed as ways to understand and address overexploitation. During the early decades of NRM, employees were predominantly white men with degrees from elite universities, resulting in relatively homogenous internal cultural norms, including the belief in the philosophy of science often termed 'Western science' as the superior knowledge system—thus becoming the dominant knowledge paradigm in NRM (Ramos, 2018)—and deference to agency professionals using science for the 'greatest good' of American society (Kennedy, 1988). These employees' values and worldviews reflected the industrial nature of the era, which focused on stabilizing extraction and economic growth (Kennedy & Quigley, 1994) and was premised on the colonial government's continued ownership and control of the land at the expense of Indigenous authority, land rights and stewardship (Long & Lake, 2018).

2.3 | NRM agencies governing in the public trust

NRM agencies were established with the purpose of governing in the public trust, to prevent resources from being controlled by a few profiteers and instead managed for the benefit of all citizens, which in extractionist capitalist contexts entails ensuring economic growth while guarding against overexploitation (Runte, 1997). For example, the formative years of the US Forest Service (hereafter 'the Forest Service') during the turn of the 20th century were focused on combating 'forest fires, short-run greed, and natural resource exploitation' while pursuing 'long-term sustainable commodity flows for an emerging industrial state', supplying timber as capital to encourage the prosperity of American society (Kennedy & Quigley, 1994, p. 16). Similarly, arguments to set aside early National Parks were justified by the lands' lack of economic value for lumber, mining, grazing or agriculture, and so environmental protection and leisure in wilderness could be promoted without threatening industry (Runte, 1997). After World War II, as booming construction demands outstripped timber supply from private lands, the Forest Service dramatically increased production and provision of softwood timber, facilitating continued exploitation of nature, although more sustainably, while shifting emphasis away from forest protection (Kennedy & Quigley, 1994). This industry and extraction orientation of the Forest Service, like other NRM institutions, reflects a core worldview that positions humans, particularly those with more systemic power, as the primary beneficiaries of environmental processes and products, narrowly constraining interpretations of governing in the public trust to tempering consumptive uses and increasing economic benefits (Feldpausch-Parker et al., 2017).

A major cultural shift occurred in the 1960–70s as agencies responded to the burgeoning environmental movement and many related laws, such as the Wilderness Act of 1964, which started recognizing a wider range of uses and values, such as outdoor recreation, watershed health, biodiversity and scenic beauty (Kennedy & Quigley, 1994). A key influence was the philosophy of Aldo Leopold, often considered the father of wildlife management, whose land care ethic gained popularity after his death (Hessami et al., 2021). Institutional culture shifts were marked by a recognition of the worth of 'ecosystem management' (Kennedy & Quigley, 1994) and interdisciplinary teams with greater gender and ethnic diversity (Kennedy, 1988). Despite these shifts in institutional culture, many Indigenous Peoples still felt the Forest Service did not sufficiently consider their rights and values (Long & Lake, 2018). For example, the principles of the North American Model of Wildlife Conservation, which drew in part from Leopold's scientific contributions and has been lauded and replicated across international conservation contexts, still frames wildlife as utilitarian public trust resources (Hessami et al., 2021). This rhetoric, rooted in North America's colonial histories and dominant NRM cultures, perpetuates worldviews premised upon human dominance over and entitlement to the environment, conflicting with many Indigenous worldviews and prioritizing certain 'publics' over others (Hessami et al., 2021).

3 | RECIPROCITY IN INDIGENOUS CULTURES

Contrasting the historical value within NRM institutions of human dominance over and entitlement to the environment is the concept of reciprocity. Reciprocity is a core principle shared across countless Indigenous (and non-Indigenous) cultures, with culturally specific articulations, that guides how many Indigenous Peoples relate with the environment and, consequently, the Knowledges they cultivate in relation to it (Jacobs, 2025; Kalle et al., 2024). We focus on operationalizing the concept of reciprocity because doing so addresses how values and worldviews are put into practice, highlights that Indigenous Knowledges are more than just data to be 'integrated', and demonstrates how the dominant NRM institutional cultures can conflict with Indigenous lifeways and diminish management effectiveness. There are many ways to define and describe reciprocity. Some Indigenous scholars define reciprocity as a process of exchanges through which cyclical benefits are offered, while integrating Indigenous understandings of 'socioecological, ceremonial, cosmological, and spiritual connections within Indigenous communities, kinship systems, lands, and waters' (Jacobs, Avery, et al., 2022, p. 285; Jacobs, 2025). A curated list of examples across the globe of culturally specific articulations of reciprocity are included in Appendix S1.

3.1 | Reciprocity within kincentric worldviews

Kincentric reciprocity is a core value for many, but not all, Indigenous Peoples that guides how we relate to and respect the environment and more-than-human beings, ensuring the holistic and communal welfare of current and future generations while also caring for ancestors and kin. For Indigenous Peoples, reciprocity is often holistically oriented within kincentric worldviews (Adams, 2023b)—'an awareness that life in any environment is viable only when humans view the life surrounding them as kin… includ[ing] all the natural elements of an ecosystem' (Salmón, 2000, p. 1327). Reciprocity is essential for relationalities within kincentric ecologies since it underscores the entangled interdependency between humans and the environment in Indigenous worldviews (Jacobs, 2025). Through kincentric ecology, Indigenous Peoples understand ourselves as necessary elements of an extended ecological family, sharing genealogies with other species, lands, waters and other ecological elements (Fisk, 2025; Osorio, 2021). Such kincentric reciprocal worldviews incorporate the cosmological (spiritual systems) and metaphysical as well as understandings of the very tangible biophysical and geochemical processes of our SES all living beings participate in—after death, human bodies decompose and return to the land and waters, eventually becoming the plants, animals and fungi that then nurture future generations and perpetuate our communities for millennia (Jacobs, 2025). Therefore, we are only possible as Peoples and ecologies because of the health of the ecological cycles that sustain us—through these processes, the lands quite literally *are* our ancestors and we are *of* the land in kinship

with it and its other more-than-human inhabitants (Osorio, 2021; Salmón, 2000). These understandings are recorded, passed down and continually assessed and honed in our stories, chants and Knowledges, which often serve to teach us how to uphold our communal responsibility to protect and care for place as one would protect and care for family (Osorio, 2021; Salmón, 2000). In Muscogee (Creek) understandings, reciprocity is defined as ARAKKUECKV, which translates roughly to 'respect', because systems of reciprocity cannot exist without respecting the entire system in which reciprocal interactions occur (Jacobs, 2025).

3.2 | Practicing reciprocity, knowing place

Indigenous cultural practices that utilise fire and flooding as forms of cultivation and caretaking exemplify kincentric reciprocal relations with the environment and lived, holistic Knowledges of place (Hart-Fredeluces et al., 2022). Many Indigenous Peoples maintain kincentric reciprocal relations through practices, including gathering and using cultural fire to sustain the health and stimulate the abundance of culturally important plants (Adams, 2024; Hart-Fredeluces et al., 2022). For example, the Kalapuya and other Indigenous Peoples historically practised low-intensity fire management in what is today known as Willamette Valley, Oregon, providing ecological growth opportunities for Traditional foods (e.g. camas: *Camassia* spp.) and material needs such as basketry fibres (e.g. common beargrass: *Xerophyllum tenax*) while reducing the risks of severe wildfires (Chisholm Hatfield et al., 2021). This way of relating with the land—using human activity, including disturbances and harvest, as means for social-ecological rejuvenation and enhanced abundance, and celebrating the gift of cultivating kin in such ways—reinforces the kincentric foci of Indigenous values and stewardship (Adams, 2023b; Tom et al., 2023). These kincentric worldviews and practices come from centuries of observing social-ecological dynamics of place and the effects of human interactions to understand how to best fulfil cultural responsibilities of being in reciprocity with more-than-human kin and providing for community (Adams, 2023a; Tom et al., 2023). As Native cultural fire practitioners have observed, the rematriation (redistribution of power, Knowledges and place) of Traditional practices such as cultural burns after generations of dispossession and social-ecological degradation signals shifting cultural currents and inspires hope for more abundant futures as more-than-human kin are again tended by and respond to kincentric reciprocal practices (Tom et al., 2023).

3.3 | Communal responsibility, cultivating abundance

For many Indigenous Peoples, upholding kincentric reciprocity is understood as a communal responsibility, rooted in genealogical connection to place, to cultivate continued and growing social-ecological abundance (Jacobs, 2025). Within the context of 'Ike Hawai'i (Hawaiian Knowledges), for example, genealogies are central, connecting people to specific lands and seas, and those places to elemental and phenomenological processes and their associated deities (Kamakau, 1976; Osorio, 2021). In part because of this genealogical intimacy with the environment and an understood dependency on the environment, within 'Ike Hawai'i there is also a strong value of having kuleana (rights, responsibilities and privileges, often rooted in place-based genealogies) to care for the lands and seas (Goodyear-Ka'ōpua, 2009; Osorio, 2021). This includes the kuleana to cultivate the SES to provide communal abundance and protect and nurture the associated Knowledges and practices (Goodyear-Ka'ōpua, 2009). Kuleana can be a highly subjective and personal matter, but can also be institutionalised through kapu: place-based regulations and restrictions often set by those with particularly salient genealogical relationships to and Knowledges of place, based on their observations of the environment, lineages, personal relations and kuleana (Kahā'ulelio, 2006; Poepoe et al., 2007). Kapu can take many forms, such as regulating which species are allowed to be harvested from specific loko i'a (fishponds) or fishing grounds, or instituting rest periods during spawning periods to protect juveniles or after times of more intensive harvest to allow for recovery (Poepoe et al., 2007; Vaughan et al., 2016). Kapu can function as place- and time-specific relational boundaries upholding kincentric reciprocity, helping ensure that kin (more-than-human and human alike) are respected and that abundance can be cultivated. As changing social-ecological contexts are observed—such as spawning dynamics for aholehole (flagtails, *Kuhlia* spp.) along a reef—kapu can be enacted or revised to reflect changing understandings of the environment and how to be in good relations with it (Kahā'ulelio, 2006; Poepoe et al., 2007).

Kapu exist in the context of place-based stewardship practices in Hawai'i rooted in kincentric reciprocity and the kuleana to cultivate abundance. Such practices include caring for loko i'a—actively building and tending to habitat, often by building rock walls along the coast to work with the currents and coastline to cultivate the seas, constructing nurseries to raise food for local communities and young fish who stock and similarly feed nearshore and pelagic ecosystems (Innes-Gold et al., 2024; Kikiloi, 2003). In many ways, kapu function as a complement to stewardship practices, helping avoid overexploitation and, more so, ensuring that the abundance cultivated through stewardship can persist and compound. Even as kapu are established and changed in context-specific manners to fit the needs of communities and more-than-human kin, upholding kapu of the place someone is in, no matter where they are from, is understood within 'Ike Hawai'i to be everyone's obligation since those rules of conduct are vital for the welfare of *all*, human and more-than-human, present and future (Kamakau, 1976; Vaughan, 2018). This reflects values shared across many Indigenous cultures—for many Indigenous Peoples, the responsibility to respect and uphold kincentric reciprocity has always been understood as a communal responsibility—an obligation shared by all community members because communal behaviours affect all other livelihoods, human and more-than-human alike (Fisk, 2025; Jacobs, 2025).

4 | CULTURAL BARRIERS TO SUPPORTING INDIGENOUS LIFEWAYS IN NRM

The fundamental cultural differences between dominant NRM institutions and Indigenous cultures rooted in reciprocity offer insights into why appropriately implementing IK in NRM has remained challenging and sustainability scholarship highlights how addressing these misalignments in NRM institutions can improve social-ecological well-being and resilience (Bogert et al., 2022). We describe several key points of friction within NRM that highlight how certain reconceptualisations and institutional cultural shifts are vital for effectively implementing IK.

4.1 | Making space for multiple relationships with nature

The core dominant worldview embodied by NRM agencies, historically and into the modern day—that nature exists for human use and benefit—is reflected in institutionalized NRM objectives related to maximizing human use and benefits, for example in legal directives of agencies to manage for 'multiple use sustained yield' (Kline et al., 2013) or 'optimum yield' (Magnuson-Stevens Fishery Conservation and Management Act, 2007). From this perspective, anything perceived as impeding the maximization of derived human benefits can be seen as a management problem; consequently, dominant conservation strategies often seek to control ecosystem dynamics to achieve desired outcomes, for example by limiting people's access to harvest activities or eradicating undesired taxa (Jacobs, Avery, et al., 2022; Stark et al., 2022). These established strategies further reinforce values of human dominance over, and therefore human separation from, nature.

Kincentric reciprocity based on understandings of interdependency between humans and the environment does not fit logically within a problem framing that sees practices such as fishing 'only enough to eat' and 'giving thanks by throwing back the first fish' as inefficiencies (Vaughan et al., 2016, pp. 9–10). Further, the worldview that nature needs protection from human activity, which is perceived as inherently harmful to the environment, is incongruent with worldviews that stress the role and responsibility of people's actions in caring for nature (Eriksen & Hankins, 2014; Fisk et al., 2024). Because of this contradiction, cultural stewardship practices might be unduly restricted as a result of NRM institutions misunderstanding how those practices and relationships helped to cultivate the contemporary ecosystem conditions that those institutions seek to manage (Long & Lake, 2018). Without ways to sufficiently understand and account for a diversity of value systems and relationalities with nature on their own terms, NRM institutions will continue to be rigid cultural products unable to appropriately account for non-dominant worldviews and knowledges within decision processes and will face challenges in supporting Indigenous lifeways.

4.2 | Multiple ways of knowing

Reducing nature to a collection of commodities managed as separate resource sectors has become the global norm for natural resource research and management, reflected in international frameworks such as the United Nations Sustainable Development Goals (Sterling et al., 2020). Such delineation is also reflected in the dominant culture of science and research that privileges knowledges that are empirical, measurable and universal, seeking to reduce complexity down to individual components rather than embrace the holistic and contextual character of natural systems (Ramos, 2018; Reid et al., 2021). These assumptions about natural resources and how best to understand them have led to the invalidation of knowledges that do not conform to Western science, particularly IK and even criminalization of associated practices (Adams, 2023b; Reid et al., 2021). For example, NRM based on the perception of fire as a threat to resource maximization resulted in centuries where cultural burns were banned for many Indigenous communities, denying their ability to fulfil reciprocal responsibilities and perpetuate cultural Knowledges (Eriksen & Hankins, 2014; Fisk et al., 2024).

Recently, increased attention to IK has resulted in Knowledge Holders being asked to provide greater input within management processes, adding burden while often being asked to work as volunteers rather than paid experts, and with their holistic Knowledges being piecemealed to fit into disconnected lines of professional NRM science and practice (Jacobs, 2025; Latulippe, 2015). While causing epistemic harm against Indigenous Peoples by often distorting and misrepresenting IK (Smith, 2012), this siloed approach to knowledges and NRM also hinders achieving ecosystem-based approaches to NRM (Fisk et al., 2024). The importance of IK has recently been recognized in high-level international frameworks (e.g. IPBES; Pascual et al., 2023), but the underlying cultural models these frameworks utilize are only beginning to appropriately and effectively engage with diverse worldviews. However, there are examples of how this might be achieved. For example, a new California fire bill, AB-642 Wildfires (Wildfires, 2021), for the first time defines a cultural fire practitioner—equating this status to state-certified burn bosses, individuals who are qualified to plan, organize and execute prescribed burns (Adams, 2023a). This bill was invoked during a 2022 training where three Indigenous cultural fire practitioners (two women) legally held that status and trained representatives from CAL FIRE—the state agency responsible for fire management—to learn stewardship through intentional fire that was Indigenous-led, executed to meet the biocultural objectives of surrounding Tribes and centred on the leadership and Knowledge systems of Indigenous women (Adams, 2023a). This represents an instance of institutional cultures shifting towards valuing holistic Knowledges, redistributing authority to and working alongside Knowledge Holders and, ultimately, appreciating Indigenous worldviews of people as lasting, integral *parts of* nature and its processes (Fisk et al., 2024).

4.3 | Centring community priorities through reciprocal processes

The ways in which NRM institutions think about what resources are and why they manage them delineates how those institutions conceptualize who should be part of management processes and how they should be engaged (Bogert et al., 2022). While a public trust model is often regarded as 'common sense' in the context of safeguarding against overexploiting resources (Runte, 1997, p. xxii), it leaves little room and few incentives for an additional form of reciprocity—NRM institutions being in reciprocity with Indigenous communities through accountable, mutually beneficial relations—since reciprocity is not a core value of NRM institutions (Fisk et al., 2024). The possibility of sharing responsibility for decision-making and implementation is starting to be realized through instances of co-management, yet legal minimums for public engagement still prioritize public input into institutionally defined problems and objectives, often requiring only 'consultation', maintaining existing power structures (Armatas et al., 2023).

There is growing recognition that the way NRM problems and priorities are formulated privileges certain voices and values, deprioritizing others and intentional efforts to develop shared visions that address historical injustices and account for diverse worldviews and knowledge systems are needed for more just and effective NRM (Armatas et al., 2023). Efforts that do not take this insight into account may only increase the amount of ineffective public engagement practices due to bureaucratic inertia and systemic barriers to organizational change, which can exacerbate tensions and distrust communities may have with NRM institutions (Armatas et al., 2023). While there are some promising examples of co-management with Indigenous Peoples, this approach can be difficult to implement within current NRM frameworks (Hoagland & Albert, 2023). Co-management shifts the frame of reference from solely an institution-derived problem to a collectively approached problem that requires the co-development of context-specific governance processes, which can make it challenging to implement, time- and resource-intensive and dominated by those with the capacity and, often, privilege to participate (Armatas et al., 2023). However, co-management also represents a fundamental transformation in the relationship between NRM institutions, communities and the nature of governance and stewardship compared to historic norms (Armitage et al., 2009; Winter et al., 2021).

5 | STEERING THE SHIP WITH INTENTION TOWARDS DECOLONIAL FUTURES

Colonialism is not an event but rather a process without a finite ending, maintained through power imbalances and the perpetuation of particular worldviews (Tuck & Yang, 2012), and so the process of redressing social-ecological harms and supporting Indigenous lifeways in NRM entails ongoing, sustained efforts of decolonizing NRM (Fisk et al., 2021; Jacobs, Avery, et al., 2022). Decolonization entails critically examining the values, worldviews, power concentrations and practices within institutions that reproduce harm, personally to systemically and dissolving and transforming those factors in accountable relations with Indigenous Peoples to cultivate more abundant and just social-ecological systems (Fisk, 2025; Fisk et al., 2021). While processes of decolonization are often context-specific and vary across communities, they primarily involve unsettling and decentring colonially rooted power structures and worldviews, replacing these systems with place- and people-based systems grounded in values and lifeways that originated before colonization and that live on today (Fanon, 1963; Jacobs et al., 2025). Key strategies used by Indigenous Peoples and allies include social movements such as #LANDBACK, a diffuse campaign embodying centuries of land reclamation activism (Fisk et al., 2021; Stark et al., 2022), and the rematriation of access to and decision-making power over land and responsibilities as stewards (Tuck & Yang, 2012). Decolonization entails all peoples examining and reconfiguring our relations with each other and the environment in reclamation of what was, a process of collective healing, growth and care—'the veritable creation of new [people]' (Fanon, 1963, p. 36)—a process that 'implicates and unsettles everyone' (Tuck & Yang, 2012, p. 7).

Current power concentrations within NRM institutions act as a force solidifying many colonial cultural dynamics, even when not explicitly understood as such by individuals within the institutions, hindering potential transformation and institutional growth beyond the cultural value on maximizing resource use (Feldpausch-Parker et al., 2017; Fisk et al., 2024). The process of building NRM institutions that are capable of successfully facilitating kincentric reciprocity, embodying Indigenous values and worldviews, and supporting Indigenous lifeways will likely require far different structures and processes from what are presently used in order to be successful, resulting in a shift in powers and procedures that can be both unsettling and generative (Berl et al., 2022). Decolonial thought can provide guidance for transforming NRM institutions to restore kincentric reciprocal relationships with the environment and other Indigenous value systems (Fisk et al., 2021; Jacobs, Payan Hazelwood, et al., 2022). We outline below three strategies that can aid in transforming NRM institutions to nurture new SES grounded in kincentric reciprocity and to better support Indigenous Knowledges and lifeways.

5.1 | Decentralizing authority

Given that Indigenous dispossession is an environmental injustice, decolonial theory indicates that rematriating Indigenous governance and relationalities is necessary for achieving effective and lasting transformation, and decentralizing NRM is a prime strategy for this effort (Fisk et al., 2021; Jacobs, Payan Hazelwood, et al., 2022). Decentralizing NRM authority and processes could allow Indigenous Peoples to shape a contemporary NRM governance system that embodies their values and worldviews, including kincentric reciprocity (Fisk et al., 2024). Such polycentric governance, wherein a multitude

of institutions govern based on place-based understandings of how to be in good relation with each other and more-than-human kin, could allow for balancing place-based specificity and large-scale dynamics in NRM by coordinating within nested structures across geographies (Marshall, 2008; Ostrom, 1990). In this way, there could be structural facilitation for steps towards decolonization and Indigenous communities operationalizing kincentric reciprocity on their own terms beyond 'integration' (Fisk et al., 2024). Decentralizing NRM institutions towards decolonization would not only transform institutional cultures to support reciprocity, as institutional designs are produced under diverse and place-based cultural values and philosophies, but could also change how people relate to the environment at a societal level. As Indigenous Knowledges are (re)implemented and stewardship practices are supported in contemporary NRM and begin to spread more broadly, sense of place and responsibility can deepen as people observe increased biocultural abundance and diversity, the products of their care, which would further cultivate values of reciprocity (Fisk et al., 2021; Tom et al., 2023).

Because of Indigenous communities' varying interests and capacities as well as the varying social-ecological contexts they live in, there is no silver bullet for such decentralization processes nor for gauging whether communities are interested in or have the resources and capacity for a complete transference of authority, collaborative governance, co-management, community-based management or other models for their direct involvement in governance (Fisk et al., 2024). These contours also require reciprocal, accountable relations so that NRM institutions and the relationalities between different governments and communities can adapt in response to dynamic changes in social-ecological systems and power dynamics. Even when minimal decentralization of governance powers is possible, the provision of formal support for cultural practitioners to conduct their practices and carry out kincentric reciprocal responsibilities is one meaningful way of shifting institutional cultures to support IK (Fisk et al., 2024). This can include decriminalizing and legalizing cultural practices, revising policies and guidelines that act as barriers for cultural practitioners, and providing funding and structural support—including hiring and contracting practitioners—when desired by communities of practice (Fisk et al., 2021, 2024). Supporting cultural practitioners carrying out their responsibilities and perpetuating IK intergenerationally not only transforms NRM institutional cultures to align with Indigenous values and uphold reciprocity but also is a pivotal step for redressing long-standing social-ecological issues (Eriksen & Hankins, 2014).

5.2 | Knowledge co-production

Another key strategy for transforming NRM institutions is funding, supporting and expanding capacity for applied transdisciplinary and participatory research that explicitly incorporates human dimensions, particularly disciplines from the interface between the social sciences, humanities and conservation (Bennett et al., 2017). While these disciplines have their own colonial histories and internal cultures, they have also been changing internally over time, particularly through the efforts of Indigenous scholars and scholars from other marginalized communities, to centre practices that embody and seek to understand diverse cultural norms, ways of knowing and how they affect desired management outcomes. Such research has often been neglected by NRM institutions but is crucial for considering plural worldviews and value systems as well as for co-producing knowledges *with* communities to meet the synergistic goals of communities and NRM institutions, pursuant to reciprocal relations between NRM institutions and communities (Reid et al., 2024; Winter et al., 2021). This endeavour especially includes research led by local and Indigenous communities as well as partnering with Knowledge Holders who are not necessarily valued or credentialed within dominant systems (Jacobs et al., 2025). Such research collaborations often require ethical standards surpassing minimum legal requirements to avoid perpetuating harm and damaging relationships with communities or misrepresenting cultural Knowledges and contributions, and to engage in genuine relational commitment, trust building and reciprocity in ways that resonate with communities. The full depth of ethical and reciprocal methodologies and partnerships, particularly with Indigenous communities, is outside the scope of this paper and has been elaborated elsewhere (David-Chavez et al., 2020; Jacobs et al., 2025; Kukutai & Taylor, 2016; Reid et al., 2024; Smith, 2012; Wilson, 2008); here, we synthesise several foundational principles common to these texts:

- Cultivate and formalize transparent, accountable relationships with partner communities well before the onset of initiatives to improve the capacity for reciprocity and allow for processes to move at whatever pace is needed to build and maintain full consent and trust between parties, however that may change during processes.
- Design initiatives through and accountable to community leadership and guidance to ensure alignment with community concerns and interests.
- Prioritize the people and institutions *of* partner communities, adapting funding standards and sharing protocols to meet their needs and align with their cultures, thereby minimising the risk of exploitation.
- Solicit and respect community interests in data sovereignty and self-determination (see especially Kukutai & Taylor, 2016) such that communities retain control over their own cultural Knowledges, histories and associated information.
- Ensure that research and other engagement with communities is directed towards addressing community priorities, not only those of NRM agencies.

Transforming how NRM institutions approach research presents an opportunity to co-produce knowledges with and in service for communities wherein kincentric reciprocity is the methodology, the focus of the data and the priority of resultant management actions. Research built from this approach can be decolonial and transformative, but requires researchers and institutions to be accountable,

take initiative and cultivate strong, reciprocal relationships with community and place.

5.3 | Cultural evaluations

The aforementioned actions are valuable but have necessarily been expressed in general terms, with execution varying greatly across a diversity of social-ecological contexts as well as the cultures and priorities of Indigenous communities. More concrete actions can help NRM institutions enact transformations towards kincentric reciprocity and implement IK in accountable, place-based manners while making space for cultural heterogeneity. Adaptive governance literature highlights how the social-ecological fit of NRM institutions—and the relationalities they support or hinder—has serious implications for management efficacy, especially amidst social-ecological disruptions and uncertainty including climate change (Folke et al., 2005; Gavin et al., 2015). Adaptive governance approaches are particularly successful when leveraging IK and local & Indigenous leadership (Winter et al., 2020), but this raises the question of whether NRM institutions are fit to appropriately implement and support such Knowledges and Peoples, respectively. In particular, examining NRM institutions as cultural products can help to more keenly inspect the *cultural fit* of NRM institutions with their respective SES and provide guidance for adaptation and transformation (Folke et al., 2007).

Developing tools and methodologies for the continual cultural evaluation of NRM institutions can enable both reflexive and community-guided assessments of how well NRM institutional policies, procedures and structures embody and support the cultures and values of place, especially Indigenous worldviews. Indigenous scholars are already developing such cultural evaluation efforts; for example, Fisk et al. (2021) offer a decolonial framework and guiding questions to help parks and protected area managers exercise reflexivity around which cultures park policies support and to redress harms against Indigenous Peoples. The concept of relational values—'preferences, principles, [and] virtues about/based on meaning-saturated relationships', intertwined with instrumental and intrinsic values (Chan et al., 2018, p. A3)—has shown great power for contextualizing the deep reasonings underlying relationships within SES, including in regard to NRM institutions given their culturally produced nature (Gould et al., 2019). The relational values framework can support the development of analytical methods to detail NRM institutional cultures, measure the degree to which they align with Indigenous cultures and fit local SES and identify concrete actions that could transform institutions to improve their cultural fit.

Because kincentric reciprocity is locally adapted and subjectively interpreted, such cultural evaluations should be guided by place-based articulations of reciprocity and desired outcomes. This would support more decentralized, polycentric governance models that foster improved resilience, adaptability and social–ecological fit while helping ensure Indigenous agency and accountability to cultures of place within NRM institutions (Pascual et al., 2023). Such an approach is corroborated by SES and biocultural scholarship highlighting the value of empowering local communities, especially Indigenous Peoples, and operationalising pluralistic worldviews and values within polycentric NRM governance models that centre cultures of place (Gavin et al., 2015; Marshall, 2008; Ostrom, 1990; Sterling et al., 2017). Such place-based definitions and articulations can be inclusive of NRM institutions supporting and facilitating Indigenous Peoples perpetuating stewardship practices intergenerationally and can also reinforce Indigenous sovereignty over Indigenous relations with the environment (Fisk et al., 2021; Jacobs, Payan Hazelwood, et al., 2022). For Indigenous cultures wherein kincentric reciprocity is deeply rooted in intergenerational relations with local ecosystems and in cultural feedback with more-than-human kin, the transformation of NRM institutions' cultures to better fit and support place-based articulations of reciprocity could also be conceived as better aligning with and supporting the cultures of local ecosystems.

6 | CONCLUSION

Transforming institutional cultures to increase their alignment with Indigenous cultures will be integral to NRM institutions seeking to meaningfully and appropriately implement IK and support Indigenous lifeways. Developing keen understandings of how colonial histories produced the dominant NRM institutional cultures in North America, being reflexive about how such histories and cultures have shaped and continue to underlie institutional structures and processes, and redressing the ongoing consequences of those histories are vital aspects of such cultural transformation. With many of these institutions being direct cultural products of the Manifest Destiny era, their values and functions were, and continue to be, premised on worldviews of nature being separate from people and existing for the inherent use and benefit of certain publics at the expense of Indigenous Peoples and their reciprocal stewardship practices and lifeways. The value and lifeway of kincentric reciprocity highlight the incommensurabilities between dominant NRM institutional cultures and Indigenous cultures as well as how deep structural and cultural transformation is a necessary condition for NRM institutions to implement and support Indigenous values in ways appreciable to Indigenous Peoples. Examining such transformation as processes of intentional cultural change led us to emphasize three key strategies, the third being particularly novel:

1. Decentralization towards more place-based, nested governance structures, including rematriating authority over land and stewardship responsibilities to more-than-human kin when possible and desired by Indigenous communities, is congruent with decolonial theory. Even when only co-management, rather than full rematriation, is possible, such pivots in power dynamics can allow for the cultures that have been in reciprocity with place for generations to be embodied and supported by NRM institutions.

2. Knowledge co-production with and accountable to community and land, done by foregrounding the leadership, expertise, methodologies and priorities of Indigenous Peoples and local communities. Such research would guide the transformation of NRM institutions through cultivating reciprocal and accountable relations with human and more-than-human communities, particularly Indigenous stewards and Knowledge Holders.
3. Reflexive and community-based cultural evaluations using place-based definitions of kincentric reciprocity and articulations of desired outcomes to guide adaptive governance processes and ensure social-ecological fit. Such cultural evaluations, if done intentionally and effectively, would help improve cultural competency within NRM institutions while also guiding the alignment of institutional cultures with communities of place, particularly Indigenous communities, thereby improving management efficacy by increasing congruence between institutional conduct and communities' values and priorities.

NRM institutions and their cultures will continue to change, as they have since their inception—if NRM institutions are to cultivate and maintain reciprocal relationships with the land and communities, it will be vital to be intentional and critical in guiding such a trajectory and in creating decision-making processes that centre Indigenous cultures and lifeways on Indigenous lands, lest their dispossession be perpetuated.

AUTHOR CONTRIBUTIONS

Jonathan James Fisk and Richard E. W. Berl conceived the initial ideas and designed the approach; Jonathan James Fisk, Richard E. W. Berl, Jonathan Long, Lily van Eeden, Álvaro Fernández-Llamazares, Jazmin Murphy, Michael Gavin, Christopher K. Williams, Jonathan Salerno, Bas Verschuuren, Nathan Bennett and Rodrigue Idohou participated in the workshops in which the manuscript framing and concepts were developed; Jonathan James Fisk and Richard E. W. Berl led the writing of the manuscript. All authors contributed critically to the drafts and gave final approval for publication.

AFFILIATIONS

[1]University of Hawai'i at Mānoa, Honolulu, Hawai'i, USA; [2]U.S. Geological Survey, National Wildlife Health Center, Madison, Wisconsin, USA; [3]Formerly affiliated with USDA Forest Service, Pacific Southwest Research Station, Davis, California, USA; [4]Office of Undergraduate Education, STEM Education Research and Innovation: STEM Ed PACER, Michigan State University, Lansing, Michigan, USA; [5]Department of Energy, Environment and Climate Action, Arthur Rylah Institute for Environmental Research, Heidelberg, Victoria, Australia; [6]Applied Chemistry and Environmental Sciences, STEM College, RMIT University, Melbourne, Victoria, Australia; [7]Department of Geography and Atmospheric Science, University of Kansas, Lawrence, Kansas, USA; [8]Departament de Biologia Animal, Biologia Vegetal i Ecologia (BABVE), Universitat Autònoma de Barcelona, Barcelona, Spain; [9]Institut de Ciència i Tecnologia Ambientals (ICTA-UAB), Universitat Autònoma de Barcelona, Barcelona, Spain; [10]Wolf Conservation Center, South Salem, New York, USA; [11]Department of Human Dimensions of Natural Resources, Colorado State University, Fort Collins, Colorado, USA; [12]Department of Entomology and Wildlife Ecology, University of Delaware, Newark, Delaware, USA; [13]Graduate Degree Program in Ecology, Department of Human Dimensions of Natural Resources, Colorado State University, Fort Collins, Colorado, USA; [14]Forest and Nature Conservation Policy Group, Wageningen University, Wageningen, The Netherlands; [15]Global Science, WWF, University of British Columbia, Washington, District of Columbia, USA; [16]People and the Ocean Specialist Group, Commission on Environmental, Economic and Social Policy, Gland, Switzerland; [17]Institute for Oceans and Fisheries, University of British Columbia, Vancouver, British Columbia, Canada; [18]National University of Agriculture, Benin, Republic of Benin and [19]Center for Pacific Islands Studies, University of Hawai'i at Mānoa, Honolulu, Hawai'i, USA

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CONFLICT OF INTEREST STATEMENT

The authors of this manuscript declare that they have no conflicts of interest associated with this research. One of the authors, Álvaro Fernández-Llamazares, is an Associate Editor for People and Nature, but recused themselves from and was not involved in the peer review and decision-making process for this manuscript.

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This manuscript does not include any data.

ORCID

Jonathan James Fisk https://orcid.org/0000-0002-3563-7779
Álvaro Fernández-Llamazares https://orcid.org/0000-0002-7813-0222
Christopher K. Williams https://orcid.org/0000-0001-9210-3127

REFERENCES

Adams, M. M. (2023a). Indigenous ecologies: Cultivating fire, plants, and climate futurity. *Artemisia Native Plant Society Journal*, *49*(2), 20–29.

Adams, M. M. (2023b). *Storytelling through fire: The socio-ecological and cultural reclamation of indigenous cultural fire in Northern California* [Dissertation, UC Davis]. https://escholarship.org/uc/item/4083f1gs

Adams, M. M. (2024). Indigenous fire data sovereignty: Applying indigenous data sovereignty principles to fire research. *Firehouse*, *7*(7), 222. https://doi.org/10.3390/fire7070222

Armatas, C. A., Cerveny, L. K., Quiocho, K., Sánchez, J. J., Leong, K. M., Gaither, C. J., Bottitta-Williamson, G., Williams, D. R., & Schwarzmann, D. (2023). *Embracing the public participation process for developing desired conditions: Building relationships for actionable knowledge* (p. 72). Interagency Visitor Use Management Council. https://www.google.com/url?q=https://visitorusemanagement.nps.gov/Content/documents/IVUMC_DC_cont_paper_2023_0928_508.pdf&sa=D&source=docs&ust=1724182232770526&usg=AOvVaw20Vm5KECAUNhciRZyCVles

Armitage, D. R., de Loë, R., & Plummer, R. (2012). Environmental governance and its implications for conservation practice. *Conservation Letters*, *5*(4), 245–255. https://doi.org/10.1111/j.1755-263X.2012.00238.x

Armitage, D. R., Plummer, R., Berkes, F., Arthur, R. I., Charles, A. T., Davidson-Hunt, I. J., Diduck, A. P., Doubleday, N. C., Johnson, D. S., Marschke, M., McConney, P., Pinkerton, E. W., & Wollenberg, E. K. (2009). Adaptive co-management for social–ecological complexity. *Frontiers in Ecology and the Environment*, *7*(2), 95–102. https://doi.org/10.1890/070089

Bennett, N. J., Roth, R., Klain, S. C., Chan, K., Christie, P., Clark, D. A., Cullman, G., Curran, D., Durbin, T. J., Epstein, G., Greenberg, A., Nelson, M. P., Sandlos, J., Stedman, R., Teel, T. L., Thomas, R., Veríssimo, D., & Wyborn, C. (2017). Conservation social science: Understanding and integrating human dimensions to improve conservation. *Biological Conservation*, *205*, 93–108. https://doi.org/10.1016/j.biocon.2016.10.006

Berkes, F. (2007). Community-based conservation in a globalized world. *Proceedings of the National Academy of Sciences of the United States of America*, *104*(39), 15188–15193. https://doi.org/10.1073/pnas.0702098104

Berl, R. E. W., Manfredo, M. J., Gasta, M., Smith, D., Sullivan, L., Jacobson, C. A., Bishop, C., Camuso, J., Eason, T., Hayes, J. P., Jacobson, R., Melcher, C., Newmark, J., Novotny, P., Pauley, S. P., Smith, C., Sparks, C., Stoner, K., Strong, J. d., & Ver Steeg, J. (2022). Building a systems framework to facilitate adaptive organizational change in state fish and wildlife agencies. *Conservation Science and Practice*, *4*(2), e591. https://doi.org/10.1111/csp2.591

Bogert, J. M., Ellers, J., Lewandowsky, S., Balgopal, M. M., & Harvey, J. A. (2022). Reviewing the relationship between neoliberal societies and nature: Implications of the industrialized dominant social paradigm for a sustainable future. *Ecology and Society*, *27*(2), art7. https://doi.org/10.5751/ES-13134-270207

Boyd, R., & Richerson, P. J. (1985). *Culture and the evolutionary process* (Paperback ed). University of Chicago Press.

Boyd, R., & Richerson, P. J. (2005). *The origin and evolution of cultures*. Oxford University Press.

Chan, K. M. A., Gould, R. K., & Pascual, U. (2018). Editorial overview: Relational values: What are they, and what's the fuss about? *Current Opinion in Environmental Sustainability*, *35*, A1–A7. https://doi.org/10.1016/j.cosust.2018.11.003

Chisholm Hatfield, S., Marino, E., Jones, C., Jacobs, L. A., & Avery, C. B. (2021). Tribal cultural resources. In M. Dalton & E. Fleishman (Eds.), *Fifth Oregon climate assessment* (pp. 157–161). Oregon Climate Change Research Institute, Oregon State University. https://blogs.oregonstate.edu/occri/oregon-climate-assessments/

Cronon, W. (2000). *Uncommon ground: Rethinking the human place in nature*. W.W. Norton & Co.

David-Chavez, D. M., Valdez, S., Estevez, J. B., Meléndez Martínez, C., Garcia, A. A., Josephs, K., & Troncoso, A. (2020). Community-based (rooted) research for regeneration: Understanding benefits, barriers, and resources for Indigenous education and research. *AlterNative: An International Journal of Indigenous Peoples*, *16*(3), 220–232. https://doi.org/10.1177/1177180120952896

Eriksen, C., & Hankins, D. L. (2014). The retention, revival, and subjugation of indigenous fire knowledge through agency fire fighting in eastern Australia and California. *Society & Natural Resources*, *27*(12), 1288–1303. https://doi.org/10.1080/08941920.2014.918226

Fanon, F. (1963). *The wretched of the earth*. Grove.

Feldpausch-Parker, A. M., Parker, I. D., & Vidon, E. S. (2017). Privileging consumptive use: A critique of ideology, power, and discourse in the north American model of wildlife conservation. *Conservation and Society*, *15*(1), 33–40.

Fisk, J. J. (2025). A caring upheaval: Transnational abolitionism as a pathway to more reciprocal futures. In L. A. Jacobs (Ed.), *Indigenous voices: Critical reflections on traditional ecological knowledge*. Oregon State University Press.

Fisk, J. J., Jacobs, L. A., Russo, B. U. K., Meier, E., Nakachi, '. A., Spencer, K. K. P., Kaulukukui-Narikawa, K., Datta, A. W., & Quiocho, K. (2021). Cultivating sovereignty in parks and protected areas: Sowing the seeds of restorative and transformative justice through the #LANDBACK movement. *Parks Stewardship Forum*, *37*(3), 517–526. https://doi.org/10.5070/P537354734

Fisk, J. J., Leong, K. M., Berl, R. E. W., Long, J. W., Landon, A. C., Adams, M. M., Hankins, D. L., Williams, C. K., Lake, F. K., & Salerno, J. (2024). Evolving wildlife management cultures of governance through Indigenous Knowledges and perspectives. *The Journal of Wildlife Management*, *88*(6), e22584. https://doi.org/10.1002/jwmg.22584

Folke, C., Hahn, T., Olsson, P., & Norberg, J. (2005). Adaptive governance of social-ecological systems. *Annual Review of Environment and Resources*, *30*(1), 441–473. https://doi.org/10.1146/annurev.energy.30.050504.144511

Folke, C., Pritchard, L., Berkes, F., Colding, J., & Svedin, U. (2007). The problem of fit between ecosystems and institutions: Ten years later. *Ecology and Society*, *12*(1), 38. https://www.jstor.org/stable/26267849

Gavin, M. C., McCarter, J., Mead, A., Berkes, F., Stepp, J. R., Peterson, D., & Tang, R. (2015). Defining biocultural approaches to conservation. *Trends in Ecology & Evolution*, *30*(3), 140–145. https://doi.org/10.1016/j.tree.2014.12.005

Goodyear-Ka'ōpua, N. (2009). Rebuilding the 'Auwai: Connecting ecology, economy and education in Hawaiian schools. *AlterNative: An International Journal of Indigenous Peoples*, *5*(2), 46–77. https://doi.org/10.1177/117718010900500204

Gould, R. K., Pai, M., Muraca, B., & Chan, K. M. A. (2019). He 'ike 'ana ia i ka pono (it is a recognizing of the right thing): How one indigenous worldview informs relational values and social values. *Sustainability Science*, *14*(5), 1213–1232. https://doi.org/10.1007/s11625-019-00721-9

Hart-Fredeluces, G. M., Burnham, M., Vaughan, M. B., Hart, G., Hart, J. A., Martin, E. S., Ward, J., & Ticktin, T. (2022). Indigenous caretaking of beargrass and the social and ecological consequences of adaptations to maintain beargrass weaving practices. *Ecology and Society*, *27*(4), art22. https://doi.org/10.5751/ES-13588-270422

Hessami, M. A., Bowles, E., Popp, J. N., & Ford, A. T. (2021). Indigenizing the north American model of wildlife conservation. *Facets*, *6*, 1285–1306. https://doi.org/10.1139/facets-2020-0088

Hoagland, S. J., & Albert, S. (2023). *Wildlife stewardship on tribal lands: Our place is in our soul* (1st ed.). Johns Hopkins University Press.

Innes-Gold, A. A., Madin, E. M. P., Stokes, K., Ching, C., Kawelo, H., Kotubetey, K., Reppun, F., Rii, Y. M., Winter, K. B., & McManus, L. C. (2024). Restoration of an Indigenous aquaculture system

can increase reef fish density and fisheries harvest in Hawai'i. *Ecosphere*, *15*(3), e4797. https://doi.org/10.1002/ecs2.4797

Jacobs, L. A. (Ed.). (2025). *Indigenous voices: Critical reflections on traditional ecological knowledge*. Oregon State University Press.

Jacobs, L. A., Avery, C. B., Salonen, R., & Champagne, K. D. (2022). Unsettling marine conservation: Disrupting manifest destiny-based conservation practices through the operationalization of Indigenous value systems. *Parks Stewardship Forum*, *38*(2), 275–306. https://doi.org/10.5070/P538257522

Jacobs, L. A., Payan Hazelwood, S., Avery, C., & Sangster-Biye, C. (2022). Reimagining U.S. federal land management through decolonization and indigenous value systems. *Journal of Park and Recreation Administration*, *40*(1), 195–206. https://doi.org/10.18666/JPRA-2021-10973

Jacobs, L. A., Yamane, C. Y., Hernandez, J., McAllister, T., Carlson, A. K., Fisk, J. J., Milligan-McClellan, K., Gazing Wolf, J., Jennings, L. L., Grenz, J., & Avery, C. (2025). A critical declaration of decolonization and indigenization for scientific research and the academy. In L. A. Jacobs (Ed.), *Indigenous voices: Critical reflections on traditional ecological knowledge*. Oregon State University Press.

Jacobson, C. A., Sullivan, L., Gasta, M., Manfredo, M. J., Camuso, J., Novotny, P., Jacobson, R., & Witthaus, K. (2022). State fish and wildlife agency culture: Access points to leverage major change. *Conservation Science and Practice*, *4*(2), e607. https://doi.org/10.1111/csp2.607

Kahā'ulelio, D. (2006). *Ka 'Oihana Lawai'a: Hawaiian fishing traditions* (M. P. Nogelmeier, Ed.; M. K. Pukui, Trans.). Bishop Museum Press.

Kalle, R., Svanberg, I., Leas, M., Prakofjewa, J., Sartori, M., Danto, A., Schiavone, A., Pehlak, H., Plaan, J., Pieroni, A., & Sõukand, R. (2024). Commons are cared for: Coexistence between humans and wild birds on the Island of Kihnu, Estonia. *People and Nature*, *14*, pan3.10669. https://doi.org/10.1002/pan3.10669

Kamakau, S. M. (1976). *The works of the people of old: Na hana a ka po'e kahiko*. Bishop Museum Press.

Kennedy, J. J. (1988). The symbolic infrastructure of natural resource management: An example of the U.S. Forest Service. *Society & Natural Resources*, *1*(1), 241–251. https://doi.org/10.1080/08941928809380656

Kennedy, J. J., & Quigley, T. M. (1994). Evolution of Forest Service organizational culture and adaptation issues in embracing ecosystem management. In M. E. Jensen & P. S. Bourgeron (Eds.), *Ecosystem management: Principles and applications* (Vol. *2*, pp. 16–26). U.S. Forest Service. https://www.fs.usda.gov/pnw/pubs/pnw_gtr318.pdf#page=24

Kikiloi, K. (2003). A new synthesis in oceanic domestication: The symbiotic development of loko i'a aquaculture in pre-contact Oceania. *Traditional Marine Resource Management and Knowledge Information Bulletin*, *15*, 3–10.

Kline, J. D., Mazzotta, M. J., Spies, T. A., & Harmon, M. E. (2013). Applying the ecosystem services concept to public land management. *Agricultural and Resource Economics Review*, *42*(1), 139–158. https://doi.org/10.1017/S1068280500007668 [Opens in a new window].

Kukutai, T., & Taylor, J. (2016). *Indigenous data sovereignty: Toward an agenda*. ANU Press. https://search.ebscohost.com/login.aspx?direct=true&scope=site&db=nlebk&db=nlabk&AN=3093595

Latulippe, N. (2015). Situating the work: A typology of traditional knowledge literature. *AlterNative: An International Journal of Indigenous Peoples*, *11*(2), 118–131. https://doi.org/10.1177/117718011501100203

Long, J. W., & Lake, F. K. (2018). Escaping social-ecological traps through tribal stewardship on national forest lands in the Pacific northwest, United States of America. *Ecology and Society*, *23*(2), 14. https://doi.org/10.5751/ES-10041-230210

Magnuson-Stevens Fishery Conservation and Management Act. (2007). Pub. L. No. Public Law 94-265, 170. https://www.fisheries.noaa.gov/s3//dam-migration/msa-amended-2007.pdf

Marshall, G. R. (2008). Nesting, subsidiarity, and community-based environmental governance beyond the local level. *International Journal of the Commons*.

Miller, R. J. (2015). The doctrine of discovery, manifest destiny, and American Indians. In S. Sleeper-Smith, J. Barr, J. M. O'Brien, N. Shoemaker, & S. M. Stevens (Eds.), *Why you can't teach United States history without American Indians* (pp. 87–100). University of North Carolina Press. http://ebookcentral.proquest.com/lib/uhm/detail.action?docID=3039536

Molnár, Z., Fernández-Llamazares, Á., Schunko, C., Teixidor-Toneu, I., Jarić, I., Díaz-Reviriego, I., Ivascu, C., Babai, D., Sáfián, L., Karlsen, P., Dai, H., & Hill, R. (2023). Social justice for traditional knowledge holders will help conserve Europe's nature. *Biological Conservation*, *285*, 110190. https://doi.org/10.1016/j.biocon.2023.110190

Osorio, J. H. (2021). *Remembering our intimacies: Mo'olelo, aloha 'āina, and ea*. University of Minnesota Press.

Ostrom, E. (1990). *Governing the commons: The evolution of institutions for collective action*. Cambridge University Press.

Pascual, U., Balvanera, P., Anderson, C. B., Chaplin-Kramer, R., Christie, M., González-Jiménez, D., Martin, A., Raymond, C. M., Termansen, M., Vatn, A., Athayde, S., Baptiste, B., Barton, D. N., Jacobs, S., Kelemen, E., Kumar, R., Lazos, E., Mwampamba, T. H., Nakangu, B., … Zent, E. (2023). Diverse values of nature for sustainability. *Nature*, *620*(7975), 813–823. https://doi.org/10.1038/s41586-023-06406-9

Poepoe, K. K., Bartram, P. K., & Friedlander, A. M. (2007). The use of traditional knowledge in the contemporary management of a Hawaiian community's marine resources. In N. Haggan, B. Neis, & I. G. Baird (Eds.), *Fishers' knowledge in fisheries science and management* (Vol. *4*, pp. 119–143). UNESCO Publishing.

Prabhakar, A., & Mallory, B. (2022a). *Guidance for federal departments and agencies on Indigenous Knowledge*. Executive Office of the President of the United States: Office of Science and Technology Policy & Council on Environmental Quality. https://www.whitehouse.gov/wp-content/uploads/2022/12/OSTP-CEQ-IK-Guidance.pdf

Prabhakar, A., & Mallory, B. (2022b). *Implementation of guidance for federal departments and agencies on Indigenous Knowledge*. Executive Office of the President of the United States: Office of Science and Technology Policy & Council on Environmental Quality. https://www.whitehouse.gov/wp-content/uploads/2022/12/IK-Guidance-Implementation-Memo.pdf

Ramos, S. C. (2018). Considerations for culturally sensitive traditional ecological knowledge research in wildlife conservation. *Wildlife Society Bulletin*, *42*(2), 358–365. https://doi.org/10.1002/wsb.881

Reid, A. J., Eckert, L. E., Lane, J., Young, N., Hinch, S. G., Darimont, C. T., Cooke, S. J., Ban, N. C., & Marshall, A. (2021). "Two-eyed seeing": An Indigenous framework to transform fisheries research and management. *Fish and Fisheries*, *22*(2), 243–261. https://doi.org/10.1111/faf.12516

Reid, A. J., McGregor, D. A., Menzies, A. K., Eckert, L. E., Febria, C. M., & Popp, J. N. (2024). Ecological research 'in a good way' means ethical and equitable relationships with Indigenous Peoples and Lands. *Nature Ecology & Evolution*, *8*(4), 1–4. https://doi.org/10.1038/s41559-023-02309-0

Rizzo-Martinez, M. (2022). *We are not animals: Indigenous politics of survival, rebellion, and reconstitution in nineteenth-century California*. University of Nebraska Press.

Runte, A. (1997). *National Parks: The American experience* (3rd ed.). University of Nebraska Press.

Salmón, E. (2000). Kincentric ecology: Indigenous perceptions of the human-nature relationship. *Ecological Applications*, *10*(5), 1327–1332. https://doi.org/10.1890/1051-0761(2000)010[1327:KEIPOT]2.0.CO;2

Smith, L. T. (2012). *Decolonizing methodologies: Research and indigenous peoples* (2nd ed.). Zed Books.

Spence, M. D. (1999). *Dispossessing the wilderness: Indian removal and the making of the national parks*. Oxford University Press.

Stark, K. J., Bernhardt, A. L., Mills, M., & Robison, J. A. (2022). Re-indigenizing Yellowstone. *Wyoming Law Review*, *22*(2), 397–487.

Sterling, E. J., Filardi, C., Toomey, A., Sigouin, A., Betley, E., Gazit, N., Newell, J., Albert, S., Alvira, D., Bergamini, N., Blair, M., Boseto, D., Burrows, K., Bynum, N., Caillon, S., Caselle, J. E., Claudet, J., Cullman, G., Dacks, R., … Jupiter, S. D. (2017). Biocultural approaches to well-being and sustainability indicators across scales. *Nature Ecology & Evolution*, *1*(12), 1798–1806. https://doi.org/10.1038/s41559-017-0349-6

Sterling, E. J., Pascua, P., Sigouin, A., Gazit, N., Mandle, L., Betley, E., Aini, J., Albert, S., Caillon, S., Caselle, J. E., Cheng, S. H., Claudet, J., Dacks, R., Darling, E. S., Filardi, C., Jupiter, S. D., Mawyer, A., Mejia, M., Morishige, K., … McCarter, J. (2020). Creating a space for place and multidimensional well-being: Lessons learned from localizing the SDGs. *Sustainability Science*, *15*(4), 1129–1147. https://doi.org/10.1007/s11625-020-00822-w

Teaiwa, T. K. (2008). Globalizing and gendered forces: The contemporary militarization of Pacific/Oceania. In K. E. Ferguson & M. Mironesco (Eds.), *Gender and globalization in Asia and the Pacific: Method, practice, theory* (pp. 318–332). University of Hawai'i Press.

Tom, E., Adams, M. M., & Goode, R. W. (2023). Solastalgia to Soliphilia: Cultural fire, climate change, and indigenous healing. *Ecopsychology*, *15*, 322–330. https://doi.org/10.1089/eco.2022.0085

Trask, H.-K. (1999). *From a native daughter: Colonialism and sovereignty in Hawai'i* (Rev. ed). University of Hawai'i Press.

Tuck, E., & Yang, K. W. (2012). Decolonization is not a metaphor. *Decolonization: Indigeneity, Education & Society*, *1*(1), 1–40.

Vaughan, M. B. (2018). *Kaiāulu: Gathering tides*. Oregon State University Press.

Vaughan, M. B., Thompson, B., & Ayers, A. L. (2016). Pāwehe Ke Kai a'o Hā'ena: Creating state law based on customary indigenous norms of coastal management. *Society & Natural Resources*, *30*(1), 31–46. https://doi.org/10.1080/08941920.2016.1196406

Wildfires. (2021). Assembly Bill No. 642, California State Legislature 2021-2022 Regular Session. Chaptered by Secretary of State. https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202120220AB642

Wilson, S. (2008). *Research is ceremony: Indigenous research methods*. Fernwood Pub.

Winter, K. B., Rii, Y. M., Reppun, F. A. W. L., Hintzen, K. D., Alegado, R. A., Bowen, B. W., Bremer, L. L., Coffman, M., Deenik, J. L., Donahue, M. J., Falinski, K. A., Frank, K., Franklin, E. C., Kurashima, N., Lincoln, N. K., Madin, E. M. P., McManus, M. A., Nelson, C. E., Okano, R., … Toonen, R. J. (2020). Collaborative research to inform adaptive comanagement: A framework for the He'eia National Estuarine Research Reserve. *Ecology and Society*, *25*(4), art15. https://doi.org/10.5751/ES-11895-250415

Winter, K. B., Vaughan, M. B., Kurashima, N., Giardina, C., Quiocho, K., Chang, K., Akutagawa, M., Beamer, K., & Berkes, F. (2021). Empowering indigenous agency through community-driven collaborative management to achieve effective conservation: Hawai'i as an example. *Pacific Conservation Biology*, *27*(4), 337–344. https://doi.org/10.1071/PC20009

SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

Appendix S1. Examples of concepts from primarily, but not exclusively, Indigenous communities that reflect long and multi-stranded traditions of reciprocity with the rest of nature and more-than-human kin.

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