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Received: 10 July 2024 | Accepted: 12 September 2025

DOI: 10.1002/pan3.70161

People and Nature

REVIEW AND SYNTHESIS

Affirming Indigenous data sovereignty in collaborative wildlife conservation in the era of open data

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Funding information
Natural Sciences and Engineering Research Council of Canada; Environment and Climate Change Canada

Handling Editor: Stefan Partelow

Abstract

1. In the current data-driven landscape of wildlife conservation, data sovereignty (i.e. governance and security) is fundamental to determining how knowledge is created and applied to pressing biodiversity concerns. Western science increasingly champions open data, which uplifts data stewardship and sharing to make data more accessible. At the same time, Indigenous Peoples stress the importance of Indigenous data sovereignty (IDS) to assert Indigenous rights over Indigenous data. These two philosophies offer distinct approaches to data sovereignty, creating possible tensions in collaborations between Western scientists and Indigenous Peoples. Awareness of this issue in wildlife conservation is slowly growing, and practical guidance is needed for balancing IDS and open data in collaborations.
2. Here, we review current literature to identify challenges in bringing IDS and open data together in collaborative wildlife conservation. We include specific commentary for wildlife sensors (camera traps and autonomous recording units) due to the growing use and demonstrated interest in open data practices for these technologies and their appeal in Indigenous-led conservation.
3. We describe three nested themes of data sovereignty: collaborative relationships, data governance and data stewardship. Within these themes, we identify nine recommendations to navigate potential IDS and open data tensions in collaborations, stressing the need to focus on relationship building, support Indigenous data governance agendas and to discuss upfront expectations for data stewardship.
4. Additionally, we suggest reflective questions to consider throughout the data life cycle. This provides a framework for understanding the sociocultural implications of wildlife data and supporting IDS throughout the collaborative process, while identifying opportunities to apply open data stewardship practices.
5. *Synthesis and applications:* Our work demonstrates the need for explicit recognition of IDS principles for wildlife data and proposes general guidance for addressing data sovereignty in collaborative initiatives. We recognize that our

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recommendations are not exhaustive and that each collaborative context brings unique challenges and opportunities. We invite continued discussion on data governance and stewardship to promote shared learning. Our recommendations can be applied more broadly to facilitate a new approach to data sovereignty in collaborations across the natural sciences.

KEYWORDS
collaboration, Indigenous data sovereignty, open data, wildlife conservation, wildlife sensors

1 | INTRODUCTION

Like many Western sciences (see glossary, Table 1), wildlife conservation has become a field of 'big data' that increasingly seeks to capitalize on vast amounts of data to address urgent and complex issues (Buxton et al., 2018; Kays et al., 2020, 2022). Advances in wildlife monitoring technologies increase the volume and diversity of wildlife data generated, as well as the speed at which they are collected, managed and analysed (Farley et al., 2018). In this new landscape, data represent a form of power that influences what and how knowledge is generated (Willoughby, 2019). Data sovereignty (Table 1) is therefore paramount to shaping the future of evidence-based wildlife conservation.

Open data provide the increasingly popular model for sovereignty over big data in Western science (Davies et al., 2019; Farley et al., 2018). As a fundamental element of the broader open science and open scholarship movements, the mission of open data is to dismantle existing barriers to knowledge dissemination and make knowledge more accessible to all sectors of society (Burgelman et al., 2019; Vicente-Saez & Martinez-Fuentes, 2018). Open data policies, which are now common in public institutions (e.g. universities, government), emphasize that data are public resources and should be reasonably available (Burgelman et al., 2019; Davies et al., 2019). Open data encourages fewer restrictions around data sharing to improve data accessibility, transparency and reproducibility (Davies et al., 2019; Hampton et al., 2015). Despite concerns

TABLE 1 Glossary of terms used in this article.

Term	Definition
Autonomous recording units (ARUs)	Remote acoustic recording devices set to record sound on a predetermined schedule for the purpose of detecting wildlife vocalizations and other environmental sounds
Camera traps	Remotely triggered cameras that typically use an infrared sensor to take a photograph when motion and a change in temperature are detected, allowing them to capture wildlife images
Data	The most basic unit of information. Can refer to a variety of record types, including but not limited to numeric measurements, observations, images, audio, video or qualitative descriptions
Data governance	The administration of data through development of data policies and protocols
Data sovereignty	The right to generate and govern data, including determining how data can be used
Data stewardship	Implementation of data governance through set procedures for data collection, organization, usage and sharing
Indigenous data	Data that are generated by or about Indigenous Peoples, their lands and environments; include data collected using both Western science or Indigenous methodologies (Carroll et al., 2020). See Box 2 for more context
Indigenous data sovereignty	The right of Indigenous Peoples to generate and govern Indigenous data according to their own laws and protocols (Kukutai & Taylor, 2016)
Indigenous Knowledge	Knowledge that supports Indigenous Peoples as sovereign and self-governing collectives (TallBear, 2023)
Indigenous worldview	A conception of life based in Indigenous Knowledge and perspectives
Open data	Scientific practices that promote widespread data sharing across academic, industrial, government and non-governmental sectors to foster greater accountability, increase transparency and facilitate innovation and development more broadly (Davies et al., 2019)
Western science	Application of physical evidence, hypothesis-testing and controlled experimentation to support or reject ideas about how systems work. Western science is often ascribed to ancient Greek and Egyptian traditions that were shaped in Europe during the Renaissance and Industrial Revolution, despite drawing from knowledge systems across Europe, Asia and Africa (Aikenhead & Ogawa, 2007; Elshakry, 2010)
Wildlife sensors	Devices such as camera traps and ARUs that can be deployed in a landscape to detect wildlife in a minimally invasive way (i.e. with minimal disturbance to the animal and in the absence of human observers)

Note: Note that some of these definitions are not universal and may vary across the literature.

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regarding proper source recognition and handling sensitive content, open data advocates continue to call for its broader implementation in ecological fields due to its increasing return on research investment and the framework it provides for developing tools, platforms and best practices for data acquisition and management (Gomes et al., 2022; Reichman et al., 2011).

The global rise of open data in ecology also coincides with growing recognition of the rights of Indigenous Peoples. Recent international agreements such as the Kunming-Montreal Global Biodiversity Framework (SCBD, 2022) invoke the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) (United Nations, 2007) to acknowledge that Indigenous Peoples are critical stewards of biodiversity and that affirming Indigenous rights, knowledge and practices is foundational to ongoing conservation initiatives. Increasingly, wildlife conservation is conducted in collaboration with Indigenous Peoples (Collier-Robinson et al., 2019; Popp et al., 2019; Russell et al., 2023). Scholars working within these collaborations advocate for transforming conventional Western science methodologies to practice more respectful and inclusive ecology through co-learning, meaningful engagement and uplifting Indigenous perspectives (McKemey et al., 2022; Reid et al., 2024; Wong et al., 2020).

Inherent to this transformation is the need to affirm Indigenous data sovereignty (IDS) (Jennings et al., 2023; Reyes-García et al., 2022; Williamson et al., 2022). IDS upholds the rights of Indigenous Peoples to develop and govern Indigenous data according to Indigenous laws and protocols (Kukutai & Taylor, 2016). The right to IDS is grounded in UNDRIP as a fundamental mechanism for Indigenous self-determination and self-governance (Davis, 2016; Hudson et al., 2023; Tsosie, 2019). Indigenous data refer to data about or from Indigenous Peoples and data about '…the environment, lands, skies, resources, and non-humans with which they have relations…' (Carroll et al., 2020, 3), a concept that intrinsically includes wildlife data (Box 2). IDS sets guiding principles for asserting the rights of Indigenous Peoples over data related to their people, their territories and their relationships (Hudson et al., 2023; Kukutai & Taylor, 2016; Tsosie, 2019). These principles are succinctly stated as having 'data for governance and governance of data': Indigenous Peoples should have data available to inform decision-making and they should be able to define how Indigenous data are administered (Carroll et al., 2019; Smith, 2016). Carroll et al. (2019) added decolonizing data as a third, interrelated principle that promotes the repatriation of Indigenous worldviews in generating data through uplifting Indigenous epistemologies and methodologies (i.e. ways of knowing and ways of learning (Walter & Suina, 2019)). IDS concepts vary across Indigenous Peoples, as many groups have developed their own guiding frameworks for asserting IDS (FNIGC, 2022; Inuit Tapiriit Kanatami, 2018; Maiam nayri Wingara & Australian Indigenous Governance Institute, 2018; Te Mana Raraunga, 2018). Nevertheless, these frameworks tend to have commonalities distinct from non-Indigenous perspectives on data sovereignty (Carroll et al., 2020). In collaborations between Indigenous Peoples and Western scientists, conflicting understandings of data sovereignty may arise.

In recent years, scholars across disciplines have outlined concerns about affirming IDS in the era of open data (Cannon et al., 2024; Rainie et al., 2019; Walter et al., 2021). Practical guidance on balancing IDS and open data in Indigenous and Western science partnerships is lacking, and perspectives from diverse contexts are needed. Here, we review current literature to understand the compatibilities and tensions between IDS and open data. We then examine the implication of these tensions in the context of wildlife conservation and provide nine generalized recommendations to advance their resolution (Table 2). As an applied example, we consider these recommendations in the use of wildlife sensors (i.e. camera traps and autonomous recording units or ARUs, Table 1 (Burton et al., 2015; Shonfield & Bayne, 2017)) in collaborative conservation (Table 2).

Wildlife sensors facilitate the collection of large amounts of data that can be standardized and shared across projects and a wide range of partners, creating the potential for large-scale collaboration (Darras et al., 2019; Delisle et al., 2021; Steenweg et al., 2017). Wildlife sensors are increasingly used by Indigenous Peoples to implement community-based monitoring programmes (Biodiversity Monitoring, 2023; Jumbo, 2023; Kemp et al., 2022). The sensors provide a minimally invasive tool for monitoring wildlife, offering an alternative data type to those collected by methods considered by some Indigenous Peoples as inappropriate or disrespectful (e.g. GPS collaring, animal handling) (Langwieder et al., 2023; Wong et al., 2020). They are also relatively accessible in terms of cost and set-up, which affirms community control and provides engagement opportunities at every step of collaboration. Furthermore, wildlife sensor deployments result in datasets in the form of images and audio recordings that lend themselves to knowledge sharing and community outreach (Biodiversity Monitoring, 2023; Jumbo, 2023; Kemp et al., 2022). These features make wildlife sensors a promising tool for collaboration and an interesting case through which to consider opportunities and challenges in following both IDS and open data principles.

Regardless of data collection methods, adoption of IDS principles must be an Indigenous-led initiative. No matter how well intentioned, external collaborators cannot impose an IDS agenda on behalf of a partnering community (Cooke et al., 2022; Smith, 2016, 127). Western wildlife scientists can, however, support efforts to assert Indigenous sovereignty by recognizing IDS as a requirement for collaboration and facilitating the process (Buschman, 2022; Carroll et al., 2019; Reyes-García et al., 2022; Box 1). Here, we do not intend to provide prescriptive solutions but instead encourage partners to discuss and agree, upfront, on data governance in collaborative wildlife conservation. In the following sections, we describe the methods of our review of IDS and open data literature (Section 2). We then outline potential tensions between the two approaches and outline recommendations to address them based on three nested themes: collaborative relationships (Section 3), data governance (Section 4) and data stewardship (Section 5).

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TABLE 2 Recommendations for navigating potential tensions between open data and Indigenous data sovereignty in collaborative wildlife conservation between Western scientists and Indigenous Peoples.

Theme	Recommendation	Example considerations for wildlife sensor data
Collaborative relationships	1. *Meaningful engagement*—Develop cultural humility, ethical space, long-term relationships, respect for Indigenous Knowledge, shared decision-making and free, prior and informed consent	What is the nature of collaborator relationships framing the work? Do Western science partners have experiences, guidance or training to facilitate meaningful engagement? Do Indigenous partners have past experiences that could affect their view of wildlife sensors (e.g. conservation surveillance) or collaborative wildlife conservation?
	2. *'Socialize' ecological research*—Adopt practices that formalize the terms of collaboration (e.g. ethics review, research agreements, data sharing protocols)	Do Indigenous partners have existing research protocols for sensor data (e.g. where they can be deployed, who can access certain locations, who can process data, how data should be processed)? Can traditional protocols or relationships with wildlife inform data collection, management and analyses? Have ethics reviews (institutional and/or community) been completed?
	3. *Capacity building*—Support community involvement, reciprocal education opportunities, data literacy and data infrastructure	Do Indigenous partners want to lead sensor deployment, image or sound processing, data summarization, etc.? Do they have the capacity to do so? How can collaborators support capacity building? Do Western science collaborators understand the context of working with wildlife sensor data collected on Indigenous territories?
data governance	4. *Data ownership*—Discuss and agree in advance on ownership or co-ownership expectations for data generated in collaboration, recognizing sociocultural relationships between data and data owner (Box 2)	What is the value of wildlife sensor data to each partner? Are the different types of sensor data understood by all partners, e.g. raw audio recordings or images, derived wildlife data in tabular form, ancillary data? What ongoing responsibilities might each partner have to wildlife (and therefore, the data)?
	5. *Indigenous governance*—Respect Indigenous data governance agenda (Box 2). Consider the advantages of open data standards of accessibility and transferability (e.g. be FAIR (Wilkinson et al., 2016)), respect the relational context in which data are collected and ensure data meet obligations to people influenced by them (e.g. CARE (Carroll et al., 2020, 2021))	How might Indigenous values and protocols inform Indigenous governance of wildlife sensor data? Are these aligned with Western scientific data governance approaches? Are there data sensitivities that need to be considered when analysing images or recordings, or disseminating derived knowledge (e.g. threatened or culturally sensitive species)?
	6. *Partnership agreements*—Develop agreements prior to data collection that outline the terms of the partnership, data ownership and responsibilities. Explicitly address how data are to be stewarded, analysed, published and shared (following recommendations outlined below)	Do all collaborators agree on the value of written agreements to formalize expectations, roles and responsibilities? Are there existing agreements that could be used or adapted? How should images or recordings be stored, shared and analysed? How is each partner acknowledged in research outputs (e.g. co-authorship; land, community or individual acknowledgements) and public engagement (e.g. credits for wildlife images or recordings)?
Data stewardship	7. *Indigenous control of data life cycle*—Ensure needs of Indigenous Peoples are prioritized when planning, collecting, storing, analysing and sharing data	Where in the data life cycle can Indigenous partners take a leadership role? Are specific roles and responsibilities defined for stages of the data life cycle, such as deciding when and what to monitor, deploying and retrieving sensors, how data will be processed and who will guide analyses and interpretations (see Figure 1)?
	8. *Accessibility*—Build data platforms that meet community needs, provide easily interpretable results, include translations	Who makes decisions on sharing images, recordings or other data? Is the data managed in a way that all parties understand? How can derived knowledge be summarized or shared more broadly with community members?
	9. *Data context*—Report sociocultural metadata that provides context about the significance of the data to Indigenous partners (e.g. traditional knowledge/biocultural labels (Local Contexts, 2023))	Can additional information be derived from sensor data that are of importance to Indigenous Peoples? (e.g. health or behaviour of valued species, vegetation or snow phenology)?

Note: Example considerations specific to wildlife sensor data are based on authors' experiences in collaborative monitoring. These recommendations are not exhaustive and are intended to facilitate conversations about data governance and data sovereignty, rather than prescribe specific solutions.

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BOX 1 Positionality statement.

We write as non-Indigenous wildlife researchers residing on unceded Sinixt təmxʷúlaʔxʷ, Syilx and Ktunaxa territories (ET); xʷməθkʷəyəm (Musqueam) (IMS); Atikameksheng Anishnawbek (DAJ); WSÁNEĆ territories (ACB); and as a Métis/Cree researcher from the communities of Lac La Biche and Fort McMurray (and citizen of the Métis Nation of Alberta) and residing on xʷməθkʷəyəm (Musqueam), səlilwətaɬ (Tsleil-Waututh) and Sḵwx̱ wú7mesh (Squamish) territory (WCM). Additionally, all authors are affiliated with the University of British Columbia, located on the traditional, ancestral and unceded territory of the xʷməθkʷəyəm (Musqueam) people. Our inspiration for this work stems from experiences in collaborations with Indigenous partners throughout Canada, through which we identified the need for guidance in respectful stewardship of data collected on Indigenous lands. We recognize that as primarily non-Indigenous authors trained in Western science, we have limited understandings of Indigenous ontologies and epistemologies that inform IDS scholarship. We also acknowledge that a central aspect of decolonizing data practices is centring Indigenous voices in re-imagining data sovereignty in collaborations, as IDS is fundamentally linked to Indigenous sovereignty (Kukutai & Taylor, 2016). Our intention is to highlight these critical components of collaborative work to a wildlife conservation audience and ensure that the burden of change does not solely fall on the shoulders of Indigenous partners. We seek to affirm Indigenous self-determination and uplift Indigenous ways of life through conservation partnerships. In doing so, we are guided by Indigenous partners, elders, land managers, youth and scholars to address our limitations. For example, in writing this article, the lead author invited literature and course recommendations from WCM and invited manuscript review from Indigenous collaborators and others with extensive experience in collaborations with Indigenous partners (see Acknowledgements).

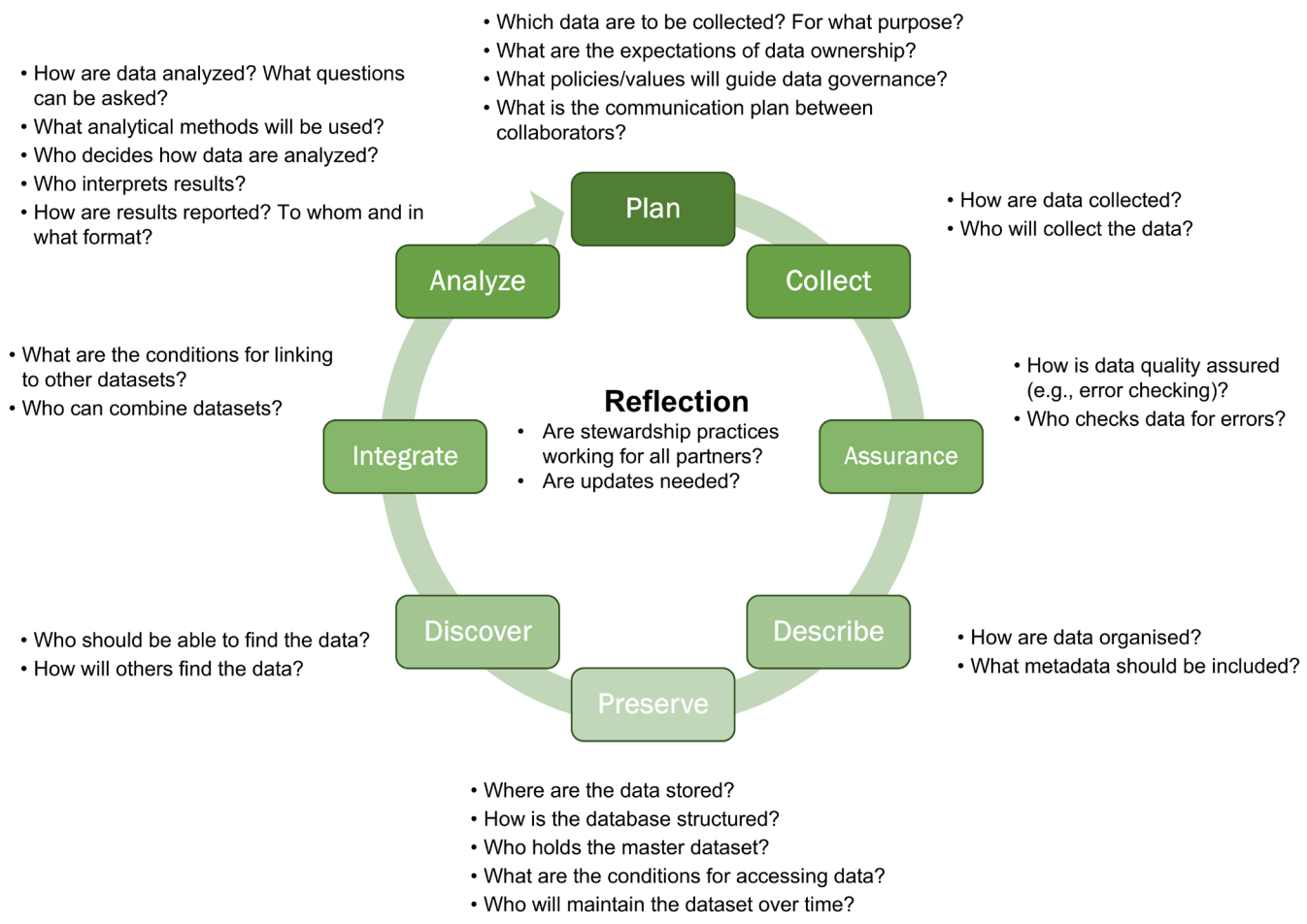


FIGURE 1 Data sovereignty questions for Indigenous and Western science collaborators to discuss at each of the eight stages of the data life cycle (Strasser et al., 2011). Consideration of these questions will invite discussion on how data stewardship aligns with Indigenous governance priorities and encourages collaborators to revise their protocols accordingly.

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We also propose reflective questions to clarify expectations for collaborative data stewardship and link these to a data life cycle (Figure 1).

2 | LITERATURE REVIEW ON THE INTERSECTION OF IDS AND OPEN DATA

Given that Indigenous worldviews are diverse and based in their own local context, IDS perspectives vary widely across Indigenous Peoples (Carroll et al., 2020). Our literature review on IDS used a narrative process that primarily relied on sources from Canada, though we supplemented this with notable scholarship from other countries, including New Zealand, Australia and the United States. We first conducted a scoping search by gathering resources from educational courses (*The Fundamentals of OCAP®* (FNIGC, 2022), *Indigenous Peoples and Technoscience* at the University of Alberta (TallBear & Kolopenuk, 2023)), Canadian academic and government data governance policies, online resources for Indigenous research protocols and data governance and broad Google Scholar searches using the terms 'Indigenous data sovereignty' and 'open data' (Table S1). Additionally, we collected scientific and grey literature pertaining to Indigenous-led and collaborative conservation initiatives (e.g. Indigenous Protected and Conserved Areas and research centring Indigenous Knowledge or combining Indigenous Knowledge and Western science). We then took a snowball sampling approach, gathering relevant citations from the literature identified in the scoping search. We further supplemented our review with additional Google Scholar searches, using key words derived from this sample (Table S1). As we found limited results related to data sovereignty and wildlife specifically, we prioritized literature from fields of ecology and environmental sciences but included all disciplines in our searches. Finally, we identified recommendations by synthesizing our understanding of the literature with our own experiences in wildlife collaborations. We sorted these into nested themes, from high-level considerations (collaborative relationships, Section 3) to more technical details of data handling (data stewardship, Section 5). In total, our recommendations draw from 218 sources across disciplines and sectors (see Data Sources).

3 | THEME: COLLABORATIVE RELATIONSHIPS

Strong relationships between collaborators are foundational to navigating tensions in data sovereignty. The relationship between Western science and Indigenous Peoples has historically been a fraught one, where Western science has a complex legacy of exploitation and embedded structural inequalities that contribute to Indigenous oppression (McCallum, 2017; Reardon & TallBear, 2012). It is this history that frames the need for Indigenous governance in Western science and the central role of IDS in achieving this (Reid et al., 2024; K. Tsosie et al., 2021; Williamson et al., 2022).

There are numerous examples of conflict between Indigenous Peoples and colonial wildlife management. These include the decimation of bison populations across North America during colonization (Daschuk, 2019), controversial hunting restrictions for caribou and polar bears in northern Canada (Dowsley & Wenzel, 2008; Parlee et al., 2018) and predator management that poses health and cultural risks to Indigenous Australians (Goolmeer & Van Leeuwen, 2023). Additionally, although Indigenous Knowledge is increasingly represented in scientific literature (Jessen et al., 2022), Indigenous scientists express frustrations around this expertise being undervalued or considered only through a Western scientific worldview (Hird et al., 2023). Furthermore, wildlife sensors often collect human 'bycatch' data (unintentionally record human images or sounds), which may aggravate existing suspicions of conservation surveillance (Sandbrook et al., 2018). When seeking collaborations with Indigenous Peoples, it is critical that Western scientists understand how previous disputes over wildlife management contribute to lasting tensions in these spaces.

Exclusively adopting open data policies while failing to consider IDS for wildlife data may exacerbate historical conflicts and result in a loss of trust between collaborators (Adams et al., 2014; Spak, 2005). However, before IDS principles can be implemented in collaborations in a meaningful way, Western science partners must adopt engagement practices that build trust and foster relationships with Indigenous partners.

3.1 | Recommendations

3.1.1 | Meaningful engagement

Fostering meaningful engagement in wildlife conservation is a long-term goal that includes developing cultural humility, creating ethical space (where collaborative work reflects the contributions of all partners (Nikolakis & Hotte, 2022)) and introspection (Adams et al., 2014; Buschman, 2022; Wong et al., 2020). Building relationships requires care to ensure mutual understandings of shared goals and values. Western science partners should invest in learning about the relationships between Indigenous Peoples and Western science and their place in this legacy (Reid et al., 2024). Partners also need to fully understand the place-based context of wildlife data they collect, what the work means, and what is needed for it to succeed for all involved. To this end, partners should discuss data sovereignty and the roles of each collaborator throughout the research process, including appropriate acknowledgements for contributions (e.g. co-authorship, community or land acknowledgements). These discussions should begin in the planning phases of collaboration to establish free, prior and informed consent (Ignace et al., 2023). They should also be revisited regularly to revise agreements and ensure that established protocols continue to work for all partners (Figure 1) (Buschman, 2022; Cooke et al., 2022).

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3.1.2 | 'Socialize' ecological research

Wildlife researchers are advised to build and apply sociocultural understandings into their collaborations. This could include (though not limited to) ethics reviews (institutional, community), research agreements or data sharing protocols developed alongside Indigenous partners. Although these steps may be required by funders and permitting agencies, there is often a lack of accountability ensuring they are conducted rigorously unless the data in question pertain specifically to humans. We suggest that incorporating them into collaborative wildlife conservation would compel Western scientists to consider the sociocultural implications of their work, such as the appropriateness of proposed methods and potential impacts on the community. Notably, some Indigenous partners require researchers to adhere to protocols based on their own laws, ethics and customs, which may vary depending on the researchers' positions as 'insiders' or 'outsiders' (Cooke et al., 2022).

3.1.3 | Capacity building

Building strong relationships also involves supporting Indigenous leadership in wildlife conservation (Artelle et al., 2019; Goolmeer et al., 2022). This requires a balance of being cognizant of community capacity while also exploring strategies to enhance capacity for Indigenous research and data management. For example, consider where community-led educational opportunities can be built into the partnership, such as involving community members early in fieldwork planning (including elders and youth), data collection and supporting training opportunities to improve data literacy and project management skills (Adams et al., 2014; Inuit Tapiriit Kanatami, 2018; Itchuaqiyaq, 2023). There may also be space to help develop data infrastructure (e.g. systems for data management, processing, analysing and sharing), which supports Indigenous partners in stewarding their own data in the future (FNIGC, 2022). Making Western science tools available to Indigenous partners then makes the goal of Indigenous data governance more achievable (Schnarch, 2004). Conversely, Western scientists can build their own capacity by investing in education around Indigenous social, cultural and political contexts within which the collaboration is embedded (Ens et al., 2012; Wong et al., 2020).

4 | THEME: DATA GOVERNANCE

In their data governance principles, open data and IDS both seek to dismantle pre-existing dynamics of power inherent in traditional approaches to Western science; open data aim to empower the public as a whole by disaggregating control of knowledge from institutions, while IDS focuses specifically on returning control of Indigenous Knowledge to Indigenous Peoples (Davies et al., 2019; Kukutai & Taylor, 2016). However, as a product of Western science, open data can be oblivious to many of its inherited structural inequities (Bahlai et al., 2019). Although open data aim to empower the public through increased accessibility and redistribution of data, these policies have the potential to undermine the rights of Indigenous Peoples to make their own decisions about the availability and distribution of Indigenous data (Kukutai et al., 2020; Rainie et al., 2019). Implementing open data approaches to data governance in collaborations, therefore, requires careful consideration.

In our experience, open data governance principles are increasingly encouraged in ecology (Gomes et al., 2022), especially in wildlife sensor literature (Buxton et al., 2018; Lima, 2024; Oliver et al., 2023; Steenweg et al., 2017). As a field with previously limited data availability, open data in wildlife ecology provide extensive sharing opportunities that increase the efficiency of hard-won wildlife datasets and improve conservation effectiveness for threatened species (Hampton et al., 2013; Mandeville et al., 2021). For example, widespread data sharing may allow the assessment of ecological patterns at greater spatial extents and inform species status assessments and conservation decision-making (Barker et al., 2015; Peters et al., 2014; Willoughby, 2019). However, the freer approach of open data may neglect vital data sensitivities particular to Indigenous Peoples (Box 2). For example, in a Māori worldview, any genetic data collected from taonga (treasured, culturally valuable) species are also considered taonga, thus invoking cultural stewardship (Collier-Robinson et al., 2019). Many Indigenous cultures recognize wildlife as relations or ancestors (Salmón, 2000), meaning data pertaining to those wildlife, especially images or recordings, may need to be treated with extra sensitivity and respect. These considerations must be addressed upfront since it may be unattainable to impose restrictions after data have been shared. Furthermore, not including Indigenous perspectives in data governance limits the endorsement and usefulness of wildlife data for Indigenous Peoples (Rainie et al., 2019; Walter & Suina, 2019; Williamson et al., 2022). Where resources are co-managed (e.g. protected areas, species at risk), we suggest that data collected should meet the needs of all parties involved and be governed in appropriate ways.

4.1 | Recommendations

4.1.1 | Data ownership

Hummel et al. (2021) advocate that data ownership be understood as the right to control data redistribution and that sociocultural relationships exist between data and data owners. IDS frameworks such as OCAP® (Ownership, Control, Access, Possession; specific to First Nations in Canada (FNIGC, 2022; Schnarch, 2004)), Principles of Māori Data Sovereignty (Te Mana Raraunga, 2018), the IDS Communique (Maiam nayri Wingara & Australian Indigenous Governance Institute, 2018) and CARE Principles (Collective benefit, Authority to control, Responsibility, Ethics (Carroll et al., 2020))

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BOX 2 Complexities of data governance in collaborative wildlife conservation.

Reconciling Indigenous and Western science data governance agendas raises several complex issues to be navigated when engaging in collaborative conservation. While a detailed investigation of these challenges is outside the scope of this article, here we describe three questions that present complex considerations for data governance in collaborations.

1. *What does it mean to support Indigenous data governance?* Adopting IDS frameworks and principles is only the first step of supporting Indigenous data governance. Engaging on a deeper level involves understanding that Indigenous governance is grounded in philosophies distinct from those of Western science, which shape sociocultural relationships between humans and the natural world (e.g. kin-centric systems (Salmón, 2000)) as well as relationships to knowledge and data (Davidson-Hunt & Berkes, 2003; Ens et al., 2012; Mercier et al., 2012). Colonial legacies created power imbalances that favour Western scientific views of data (where data are considered neutral or 'objective'), leaving little room for Indigenous Knowledge systems (Hird et al., 2023; Howitt & Suchet-Pearson, 2006; Walter & Suina, 2019). Supporting Indigenous data governance therefore also includes moving beyond considering Indigenous perspectives on the value of data to adopting an Indigenous lens that reconsiders the complex relationships between people, land and data (Hudson et al., 2023).
2. *What constitutes 'Indigenous data'?* IDS is not a new concept; Indigenous Peoples have been systematically caretaking their knowledge since time immemorial (Rodriguez-Lonebear, 2016, 254). However, the term 'Indigenous data' is relatively recent, with many fields emphasizing the more holistic terms of 'Indigenous Knowledge' or 'Traditional Knowledge' (Duarte et al., 2020). Furthermore, Dogan and Wood (2023) point out that foundational IDS works overlook environmental and ecological Indigenous data, despite these being a key element in many established IDS frameworks (Carroll et al., 2019; Maiam nayri Wingara & Australian Indigenous Governance Institute, 2018; Te Mana Raraunga, 2018). In our experience, the concept of 'Indigenous data' is often unfamiliar to Western scientists and Indigenous partners alike. Questions frequently arise about whether it includes wildlife data collected collaboratively or using Western science methods. Nevertheless, data about culturally significant species reflect relationships between Indigenous Peoples and nature, which often require additional care (Goolmeer et al., 2022; Robbins et al., 2023). We recommend collaborators explicitly discuss the data in question to ensure common understandings.
3. *Who 'owns' data?* IDS frameworks emphasize the concept of *collective* data ownership (Kukutai et al., 2020; Rainie et al., 2019). This means that Indigenous Peoples, as unique cultural groups, can collectively own information and should be afforded collective rights to privacy and dignity (e.g. the right to have community identifiers removed from datasets to prevent possible negative consequences of recognition (Schnarch, 2004)). While open data recognize the privacy of individuals, it does not typically extend to the concept of collective privacy (FNIGC, 2022; Schnarch, 2004). In cases of data collection using public funds, Indigenous data ownership may challenge the open data principle that these data should be 'open by default' (Open Data Charter, 2015). Additionally, under the interpretation of data ownership as recognizing sociocultural relationships to data (Hummel et al., 2021), multiple collaborators (or even groups outside of a research collaboration) may claim a right to own wildlife data based on the responsibilities outlined in their governance structure. For example, Indigenous Peoples may have cultural responsibilities towards wildlife that shape data governance (Hutchins et al., 2023; Robbins et al., 2023) and even apply beyond geographic territories (Pascoe et al., 2024). Additionally, settler governments may claim data ownership through responsibilities to wildlife laid out in legislation (e.g., endangered species or species at risk acts). Discussing any such conditions at the outset of the partnership will help set realistic expectations for data deliverables.

emphasize data ownership as the primary mechanism through which Indigenous Peoples can control and access data. Therefore, one of the main ways Western scientists can support Indigenous data governance is by upholding the rights of Indigenous partners to own data collected on their territories. That is, Western scientists should affirm Indigenous Peoples' relationships to wildlife data and their rights to control its dissemination. In practice, data ownership under an IDS framework may require nuanced applications (Box 2), and overlapping relationships create a complex political landscape on which to navigate data governance. In our experience, partners may choose to negotiate data co-ownership where responsibilities are divided between collaborators. As it is easy to misstep without clear understandings and strong relationships, we suggest using partnership agreements to explicitly outline data ownership and responsibilities (see Recommendation 6).

4.1.2 | Indigenous governance

Indigenous governance agenda ensure that Indigenous Peoples have data for decision-making and the resources to develop their own policies and protocols for data stewardship (Carroll et al., 2019; Jennings et al., 2023; Smith, 2016). If Indigenous partners have existing data governance policies, these may be built into the collaborative process (Carroll et al., 2019; Cooke et al., 2022; Smith, 2016), noting that this extends beyond data stewardship to the values

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data represent (Box 2). If not, the broad guidelines of 'Be FAIR and CARE' (Carroll et al., 2021), which refer to the FAIR principles for open data (Findable, Accessible, Interoperable, Reusable) (Wilkinson et al., 2016) and the CARE Principles of IDS (Carroll et al., 2020; Jennings et al., 2023), can be implemented iteratively to achieve the goals of these frameworks.

4.1.3 | Partnership agreements

Partnership agreements for collaborative wildlife conservation could build Indigenous governance directly into data stewardship and create a plan for inevitable differences between partner priorities. Where Indigenous partners do not have existing policies, expectations around data governance can be captured in data sharing and/or research agreements that are co-created and build existing frameworks. For example, the Alberta First Nations Information Governance Centre released a data sharing template that addresses OCAP® concerns and can be used by First Nations in Canada to guide data stewardship negotiations (Yao, 2024). Where Indigenous partners have not yet developed their own agreement templates, we recommend that academic institutions help develop customizable templates for partners to modify, using local IDS frameworks as a guide.

5 | THEME: DATA STEWARDSHIP

Data governance under open data and IDS generates different approaches to data stewardship (Carroll et al., 2021). Open data encourage detailed documentation of how data are managed at every stage of the data life cycle, from the planning of data collection through to analysis and dissemination (Figure 1). These practices prevent the loss of information over time and improve compatibility across datasets (Michener & Jones, 2012; Strasser et al., 2011). Open data also hold data stewards to a high standard of accountability, increase reproducibility and support a greater degree of collaboration among researchers (Vicente-Saez & Martinez-Fuentes, 2018).

In comparison, IDS practices ensure Indigenous control and decision-making power over datasets about Indigenous Peoples, their knowledge or lands. This is important as Indigenous data have been taken out of context and applied inappropriately for the primary benefit of non-Indigenous people. For example, Western scientists have used DNA samples from Indigenous communities without consent and without direct benefit to Indigenous Peoples (Reardon & TallBear, 2012; Tsosie et al., 2021). Cultural burning practices have been applied outside of their intended environmental contexts or without guidance from Indigenous knowledge holders, thus reducing their effectiveness (Hoffman et al., 2022; Williamson et al., 2022). Western science has a long history of misrepresenting Indigenous Knowledge, claiming it without appropriate acknowledgement or generating data that perpetuate a harmful narrative about Indigenous Peoples (Tsosie et al., 2021; Walter & Suina, 2019). It is this legacy that Indigenous data stewardship seeks to counteract.

Furthermore, data stewardship practices determine data accessibility. Data conventionally stored in institutional databases may be difficult to access or may include insufficient context to be easily interpreted by Indigenous partners (FNIGC, 2022; Schnarch, 2004). Indigenous Peoples may have limited technological infrastructure to access open data platforms (e.g. limited high-speed internet), which puts them at a disadvantage when data from their territories are freely available to others around the world (FNIGC, 2022; Hackett et al., 2019). Without explicit consideration of IDS, open data stewardship practices may continue to remove critical context and limit data accessibility, thereby reducing the value of Indigenous data for Indigenous Peoples (Carroll et al., 2019; Rainie et al., 2019; Walter et al., 2021).

Importantly, open data and IDS both provide valuable contributions to stewarding wildlife sensor data collaboratively. Open data platforms provide tools for organizing large volumes of data and streamlining species identification (Kahl et al., 2021; Norouzzadeh et al., 2017; Scotson et al., 2017). IDS perspectives additionally ensure that wildlife data stewardship represents Indigenous partners' needs and values. For example, while wildlife location data are often restricted by Western scientists for various reasons (e.g., endangered species (Sólymos et al., 2013)), Indigenous Peoples may have concerns that necessitate different restrictions (e.g. protection of Indigenous Knowledge, food security, animal welfare). Building both IDS and open data approaches into stewardship would therefore promote better data management while also supporting pluralistic values (Howitt & Suchet-Pearson, 2006).

5.1 | Recommendations

5.1.1 | Indigenous control of the data life cycle

Indigenous partners should have the opportunity to control what happens to data at each stage of the data life cycle (Strasser et al., 2011) to verify that data stewardship meets their needs and priorities (Williamson et al., 2022). It may not be possible or desirable for all partners to engage at every stage. For example, Western scientists might not need to be part of initial discussions about local conservation priorities, evaluation of appropriate Indigenous Knowledge and IDS objectives. Indigenous partners may not want or may lack the capacity to participate in Western scientific data processing and analysis. To this end, we build on Williamson et al. (2022) and provide a series of questions linked to eight stages in the data life cycle (Figure 1). Discussing these questions upfront ensures that data are planned, collected, described and stored in ways that are valuable and accessible to Indigenous partners while also accounting for any data sensitivities particular to the proposed work (Jennings et al., 2023; Wong et al., 2020). It also provides greater certainty in appropriate uses of data and avoids unexpected restrictions at later stages. We suggest that iteratively reflecting on the appropriateness

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of data stewardship protocols demonstrates accountability to the collaboration and nurtures long-term relationships.

5.1.2 | Accessibility

Indigenous Peoples often face additional barriers in generating, accessing and sharing open data (Hackett et al., 2019). Building accessibility into data stewardship should thus include considerations at all stages of the data life cycle (Figure 1). For example, plans to use wildlife sensors can facilitate engagement in data collection and management, even for those with minimal Western scientific training (Kemp et al., 2022; Lasky et al., 2021). For further accessibility, we recommend choosing data platforms that are user-friendly and available offline, if necessary. Additionally, translating results into Indigenous languages may help to ensure greater accessibility and sharing of knowledge (Polfus et al., 2016). Remote Indigenous communities often face challenges that cannot be fixed by external collaborators (e.g. unreliable internet access, limited bandwidth for data transfers) and creative solutions may be required to meet the needs of all parties.

5.1.3 | Data context

Indigenous partner input throughout the data life cycle also allows the addition of local or cultural context (Russell et al., 2023; Williamson et al., 2022). Consistently, wildlife studies combining Western science and Indigenous Knowledge describe the holistic context provided by Indigenous perspectives (Fisher et al., 2021; Goolmeer et al., 2022; Polfus et al., 2016), highlighting the loss of valuable information when this is not considered. One example of including Indigenous context in an open data framework is the use of traditional knowledge (TK) and biocultural (BC) labels (Local Contexts, 2023), a practice applied in fields such as ocean conservation (Ocean Networks Canada, 2023) and molecular ecology (Liggins et al., 2021). Here, TK and BC labels are metadata that can, for example, indicate Indigenous partners' interests in datasets and identify whether specific protocols must be followed or permissions obtained prior to data usage (Montenegro, 2019). These types of data stewardship mechanisms allow for Indigenous Peoples to exert authority over data, while also making data available across platforms.

6 | CONCLUSION

IDS principles are gaining traction in addressing the long history of Western science misusing Indigenous data and as a means to decolonise data practices (Rainie et al., 2019; Walter & Suina, 2019). The movement to reconcile principles of open data with IDS therefore marks a significant paradigm shift in Western science. Open data highlight the potential for knowledge acquisition and technological advancements through freer, standardized data sharing. IDS principles emphasize that Indigenous Peoples have a right to control data generated from Indigenous People and lands. In this article, we explored how these two philosophies affect data in collaborative wildlife conservation, including specific commentary for wildlife sensor data. Indigenous and Western science partners may share overall goals of monitoring and protecting biodiversity but vary in their specific objectives and approaches. The path forward requires clear communication between partners about wildlife data values and usage. Going forward, it will be especially important to highlight successful examples of affirming IDS in varying wildlife conservation contexts to share insights and challenges across collaborations (Cannon et al., 2024). The recommendations and questions proposed here are intended to stimulate conversation and help shift paradigms by ensuring collaborators share an understanding about data sovereignty. In doing so, they facilitate a much-needed shift in approach to data governance and stewardship in collaborative wildlife conservation and beyond.

AUTHOR CONTRIBUTIONS

Erin Tattersall, Warren Cardinal-McTeague and Andrew Cole Burton conceived the original ideas. Erin Tattersall reviewed the literature and led the writing of the manuscript. Warren Cardinal-McTeague, Isla Myers-Smith, Deborah A. Jenkins and Andrew Cole Burton provided critical conceptual and structural feedback on the drafts. All authors gave final approval for publication.

ACKNOWLEDGEMENTS

The authors especially thank S. Haché for supporting this research and providing extensive feedback throughout; it would not have been possible without his guidance. They also thank R. Pearson, A. Menicoche, D. Thompson, C. Francis, M. Fast and A. Norris for their constructive reviews on early drafts of the manuscript. M. McPhee, J. Russell and Sambaa K'e First Nation provided feedback and participated in discussions that shaped our considerations for wildlife sensor data. They also thank Dr. C. Hird, an anonymous reviewer, and the editorial team for their constructive and encouraging feedback.

CONFLICT OF INTEREST STATEMENT

The authors have no conflicts of interest.

DATA AVAILABILITY STATEMENT

No data are associated with this manuscript.

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REFERENCES

Adams, M., Carpenter, J., Housty, J., Neasloss, D., Paquet, P., Service, C., Walkus, J., & Darimont, C. (2014). Toward increased engagement

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between academic and Indigenous community partners in ecological research. *Ecology and Society*, *19*(3), art5. https://doi.org/10.5751/ES-06569-190305

Aikenhead, G. S., & Ogawa, M. (2007). Indigenous knowledge and science revisited. *Cultural Studies of Science Education*, *2*(3), 539–620. https://doi.org/10.1007/s11422-007-9067-8

Artelle, K. A., Zurba, M., Bhattacharyya, J., Chan, D. E., Brown, K., Housty, J., & Moola, F. (2019). Supporting resurgent Indigenous-led governance: A nascent mechanism for just and effective conservation. *Biological Conservation*, *240*, 108284. https://doi.org/10.1016/j.biocon.2019.108284

Bahlai, C. A., Bartlett, L. J., Burgio, K. R., Fournier, A. M. V., Keiser, C. N., Poisot, T., & Whitney, K. S. (2019). Open Science isn't always open to all scientists. *American Scientist*, *107*(2), 78–82.

Barker, N. K. S., Fontaine, P. C., Cumming, S. G., Stralberg, D., Westwood, A., Bayne, E. M., Sólymos, P., Schmiegelow, F. K. A., Song, S. J., & Rugg, D. J. (2015). Ecological monitoring through harmonizing existing data: Lessons from the boreal avian modelling project. *Wildlife Society Bulletin*, *39*(3), 480–487. https://doi.org/10.1002/wsb.567

Biodiversity Monitoring. (2023). *Thaidene Nene land of the ancestors*. https://www.landoftheancestors.ca/biodiversity-monitoring.html

Burgelman, J.-C., Pascu, C., Szkuta, K., Von Schomberg, R., Karalopoulos, A., Repanas, K., & Schouppe, M. (2019). Open science, open data, and open scholarship: European policies to make science fit for the twenty-first century. *Frontiers in Big Data*, *2*, 43. https://doi.org/10.3389/fdata.2019.00043

Burton, A. C., Neilson, E., Moreira, D., Ladle, A., Steenweg, R., Fisher, J. T., Bayne, E., & Boutin, S. (2015). Wildlife camera trapping: A review and recommendations for linking surveys to ecological processes. *Journal of Applied Ecology*, *52*, 675–685. https://doi.org/10.1111/1365-2664.12432

Buschman, V. Q. (2022). Framing co-productive conservation in partnership with Arctic Indigenous peoples. *Conservation Biology*, *36*(6), e13972. https://doi.org/10.1111/cobi.13972

Buxton, R. T., Lendrum, P. E., Crooks, K. R., & Wittemyer, G. (2018). Pairing camera traps and acoustic recorders to monitor the ecological impact of human disturbance. *Global Ecology and Conservation*, *16*, e00493. https://doi.org/10.1016/j.gecco.2018.e00493

Cannon, S. E., Moore, J. W., Adams, M. S., Degai, T., Griggs, E., Griggs, J., Marsden, T., Reid, A. J., Sainsbury, N., Stirling, K. M., Barnes, A. A. Y. S., Benson, R., Burrows, D., Chamberlin, G. R., Charley, B., Dick, D., Duncan, A. T., Liddle, K. K. M., Paul, M., … Indigenous Data Sovereignty Collective. (2024). Taking care of knowledge, taking care of salmon: Towards Indigenous data sovereignty in an era of climate change and cumulative effects. *Facets*, *9*, 1–21. https://doi.org/10.1139/facets-2023-0135

Carroll, S. R., Garba, I., Figueroa-Rodríguez, O. L., Holbrook, J., Lovett, R., Materechera, S., Parsons, M., Raseroka, K., Rodriguez-Lonebear, D., Rowe, R., Sara, R., Walker, J. D., Anderson, J., & Hudson, M. (2020). The CARE principles for Indigenous data governance. *Data Science Journal*, *19*(1), 43. https://doi.org/10.5334/dsj-2020-043

Carroll, S. R., Herczog, E., Hudson, M., Russell, K., & Stall, S. (2021). Operationalizing the CARE and FAIR principles for Indigenous data futures. *Scientific Data*, *8*, 108.

Carroll, S. R., Rodriguez-Lonebear, D., & Martinez, A. (2019). Indigenous data governance: Strategies from United States native nations. *Data Science Journal*, *18*(1), 1. https://doi.org/10.5334/dsj-2019-031

Collier-Robinson, L., Rayne, A., Rupene, M., Thoms, C., & Steeves, T. (2019). Embedding Indigenous principles in genomic research of culturally significant species: A conservation genomics case study. *New Zealand Journal of Ecology*, *43*(3), 3389.

Cooke, P., Fahey, M., Ens, E. J., Raven, M., Clarke, P. A., Rossetto, M., & Turpin, G. (2022). Applying biocultural research protocols in ecology: Insider and outsider experiences from Australia. *Ecological Management & Restoration*, *23*(S1), 64–74. https://doi.org/10.1111/emr.12545

Darras, K., Batáry, P., Furnas, B. J., Grass, I., Mulyani, Y. A., & Tscharntke, T. (2019). Autonomous sound recording outperforms human observation for sampling birds: A systematic map and user guide. *Ecological Applications*, *29*(6), e01954. https://doi.org/10.1002/eap.1954

Daschuk, J. (2019). *Clearing the plains: Disease, politics of starvation, and the loss of Indigenous life*. University of Regina Press.

Davidson-Hunt, I., & Berkes, F. (2003). Learning as you journey: Anishinaabe perception of social-ecological environments and adaptive learning. *Conservation Ecology*, *8*(1), art5. https://www.jstor.org/stable/26271978

Davies, T., Walker, S. B., Rubinstein, M., & Perini, F. (2019). *The state of open data: Histories and horizons*. African Minds and International Development Research Centre. http://stateofopendata.od4d.net

Davis, M. (2016). Data and the United Nations declaration on the rights of Indigenous peoples. In T. Kukutai & J. Taylor (Eds.), *Indigenous data sovereignty: Toward an agenda* (pp. 25–38). Australian National University Press.

Delisle, Z. J., Flaherty, E. A., Nobbe, M. R., Wzientek, C. M., & Swihart, R. K. (2021). Next-generation camera trapping: Systematic review of historic trends suggests keys to expanded research applications in ecology and conservation. *Frontiers in Ecology and Evolution*, *9*, 617996. https://doi.org/10.3389/fevo.2021.617996

Dogan, A. L., & Wood, D. (2023). "Do you collect data to give to the university or do you do the work to benefit people?": Indigenous data sovereignty in environmental contexts. In *Proceedings of the 6th ACM SIGCAS/SIGCHI conference on computing and sustainable societies* (pp. 107–116). ACM. https://doi.org/10.1145/3588001.3609368

Dowsley, M., & Wenzel, G. W. (2008). "The time of the most polar bears": A co-management conflict in Nunavut. *Arctic*, *61*(2), 177–189.

Duarte, M. E., Vigil-Hayes, M., Littletree, S., & Belarde-Lewis, M. (2020). Of course, data can never fully represent reality. *Human Biology*, *91*(3), 163–178. https://doi.org/10.13110/humanbiology.91.3.03

Elshakry, M. (2010). When science became western: Historiographical reflections. *Isis*, *101*, 98–109.

Ens, E. J., Finlayson, M., Preuss, K., Jackson, S., & Holcombe, S. (2012). Australian approaches for managing 'country' using Indigenous and non-Indigenous knowledge. *Ecological Management & Restoration*, *13*(1), 100–107. https://doi.org/10.1111/j.1442-8903.2011.00634.x

Farley, S. S., Dawson, A., Goring, S. J., & Williams, J. W. (2018). Situating ecology as a big-data science: Current advances, challenges, and solutions. *Bioscience*, *68*(8), 563–576. https://doi.org/10.1093/biosci/biy068

Fisher, J. T., Grey, F., Anderson, N., Sawan, J., Anderson, N., Chai, S.-L., Nolan, L., Underwood, A., Amerongen Maddison, J., Fuller, H. W., & Frey, S. (2021). Indigenous-led camera-trap research on traditional territories informs conservation decisions for resource extraction. *Facets*, *6*, 1266–1284. https://doi.org/10.1139/facets-2020-0087

FNIGC. (2022). *The fundamentals of OCAP®* [Presentation slides]. https://fnigc.ca/ocap-training/

Gomes, D. G. E., Pottier, P., Crystal-Ornelas, R., Hudgins, E. J., Foroughirad, V., Sánchez-Reyes, L. L., Turba, R., Martinez, P. A., Moreau, D., Bertram, M. G., Smout, C. A., & Gaynor, K. M. (2022). Why don't we share data and code? Perceived barriers and benefits to public archiving practices. *Proceedings of the Royal Society B: Biological Sciences*, *289*, 20221113.

Goolmeer, T., Skroblin, A., Grant, C., van Leeuwen, S., Archer, R., Gore-Birch, C., & Wintle, B. A. (2022). Recognizing culturally significant species and Indigenous-led management is key to meeting international biodiversity obligations. *Conservation Letters*, *15*(6), e12899. https://doi.org/10.1111/conl.12899

Goolmeer, T., & Van Leeuwen, S. (2023). Indigenous knowledge is saving our iconic species. *Trends in Ecology & Evolution*, *38*(7), 591–594. https://doi.org/10.1016/j.tree.2023.03.010

25758314, 0, Downloaded from https://besjournals.onlinelibrary.wiley.com/doi/10.1002/pan3.70161 by Erin Tattersall , Wiley Online Library on [04/10/2025]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

Hackett, J., The Firelight Group, & Olson, R. (2019). *Dissemination of open geospatial data under the Open Government Licence-Canada through OCAP principles* (No. 57e; p. 57e). https://doi.org/10.4095/314977

Hampton, S. E., Anderson, S. S., Bagby, S. C., Gries, C., Han, X., Hart, E. M., Jones, M. B., Lenhardt, W. C., MacDonald, A., Michener, W. K., Mudge, J., Pourmokhtarian, A., Schildhauer, M. P., Woo, K. H., & Zimmerman, N. (2015). The Tao of open science for ecology. *Ecosphere*, *6*(7), 1–13. https://doi.org/10.1890/ES14-00402.1

Hampton, S. E., Strasser, C. A., Tewksbury, J. J., Gram, W. K., Budden, A. E., Batcheller, A. L., Duke, C. S., & Porter, J. H. (2013). Big data and the future of ecology. *Frontiers in Ecology and the Environment*, *11*(3), 156–162. https://doi.org/10.1890/120103

Hird, C., David-Chavez, D. M., Gion, S. S., & Van Uitregt, V. (2023). Moving beyond ontological (worldview) supremacy: Indigenous insights and a recovery guide for settler-colonial scientists. *Journal of Experimental Biology*, *226*(12), jeb245302. https://doi.org/10.1242/jeb.245302

Hoffman, K. M., Christianson, A. C., Dickson-Hoyle, S., Copes-Gerbitz, K., Nikolakis, W., Diabo, D. A., McLeod, R., Michell, H. J., Mamun, A. A., Zahara, A., Mauro, N., Gilchrist, J., Ross, R. M., & Daniels, L. D. (2022). The right to burn: Barriers and opportunities for Indigenous-led fire stewardship in Canada. *Facets*, *7*, 464–481. https://doi.org/10.1139/facets-2021-0062

Howitt, R., & Suchet-Pearson, S. (2006). Rethinking the building blocks: Ontological pluralism and the idea of 'management'. *Geografiska Annaler: Series B, Human Geography*, *88*(3), 323–335. https://doi.org/10.1111/j.1468-0459.2006.00225.x

Hudson, M., Carroll, S. R., Anderson, J., Blackwater, D., Cordova-Marks, F. M., Cummins, J., David-Chavez, D., Fernandez, A., Garba, I., Hiraldo, D., Jäger, M. B., Jennings, L. L., Martinez, A., Sterling, R., Walker, J. D., & Rowe, R. K. (2023). Indigenous peoples' rights in data: A contribution toward Indigenous research sovereignty. *Frontiers in Research Metrics and Analytics*, *8*, 1173805. https://doi.org/10.3389/frma.2023.1173805

Hummel, P., Braun, M., & Dabrock, P. (2021). Own data? Ethical reflections on data ownership. *Philosophy and Technology*, *34*(3), 545–572. https://doi.org/10.1007/s13347-020-00404-9

Hutchins, L., Mc Cartney, A., Graham, N., Gillespie, R., & Guzman, A. (2023). Arthropods are kin: Operationalizing Indigenous data sovereignty to respectfully utilize genomic data from Indigenous lands. *Molecular Ecology Resources*, *25*, 1–16. https://doi.org/10.1111/1755-0998.13822

Ignace, L., Burton, L., Mynott, S., Meehan, M., Olson, E., Steel, J., Ojeda, J., Harper, S., Ramirez, L., Baker, D., Sleigh, L., Frenkel, C., Rhodes, C., & Ban, N. C. (2023). Researchers' responsibility to uphold Indigenous rights. *Science*, *381*(6654), 129–131. https://doi.org/10.1126/science.adh4470

Inuit Tapiriit Kanatami. (2018). *National Inuit strategy on research*. Inuit Tapiriit Kanatami. https://www.itk.ca/projects/national-inuit-strategy-on-research/

Itchuaqiyaq, C. U. (2023). *Equitable Arctic research: A guide for innovation*. https://www.itchuaqiyaq.com/

Jennings, L., Anderson, T., Martinez, A., Sterling, R., Chavez, D. D., Garba, I., Hudson, M., Garrison, N. A., & Carroll, S. R. (2023). Applying the 'CARE principles for Indigenous data governance' to ecology and biodiversity research. *Nature Ecology & Evolution*, *7*, 1547–1551. https://doi.org/10.1038/s41559-023-02161-2

Jessen, T. D., Ban, N. C., Claxton, N. X., & Darimont, C. T. (2022). Contributions of Indigenous knowledge to ecological and evolutionary understanding. *Frontiers in Ecology and the Environment*, *20*(2), 93–101. https://doi.org/10.1002/fee.2435

Jumbo, J. (2023). *Wildlife camera and ARU webinar* [Webinar]. https://nwtresearch.com/outreach/speaker-series

Kahl, S., Wood, C. M., Eibl, M., & Klinck, H. (2021). BirdNET: A deep learning solution for avian diversity monitoring. *Ecological Informatics*, *61*, 101236. https://doi.org/10.1016/j.ecoinf.2021.101236

Kays, R., Davidson, S. C., Berger, M., Bohrer, G., Fiedler, W., Flack, A., Hirt, J., Hahn, C., Gauggel, D., Russell, B., Kölzsch, A., Lohr, A., Partecke, J., Quetting, M., Safi, K., Scharf, A., Schneider, G., Lang, I., Schaeuffelhut, F., & Wikelski, M. (2022). The Movebank system for studying global animal movement and demography. *Methods in Ecology and Evolution*, *13*(2), 419–431. https://doi.org/10.1111/2041-210X.13767

Kays, R., McShea, W. J., & Wikelski, M. (2020). Born-digital biodiversity data: Millions and billions. *Diversity and Distributions*, *26*(5), 644–648. https://doi.org/10.1111/ddi.12993

Kemp, C., Yarchuk, K., Menzies, A. K., & Popp, J. N. (2022). *A guide to using wildlife cameras for ecological monitoring in a community-based context* (p. 41). University of Guelph.

Kukutai, T., Carroll, S. R., & Walter, M. (2020). Indigenous data sovereignty. In D. Mamo (Ed.), *The Indigenous world 2020* (34th ed., pp. 654–662). IWGIA. https://figshare.utas.edu.au/articles/chapter/Indigenous_data_sovereignty/23063915/1/files/40804226.pdf

Kukutai, T., & Taylor, J. (2016). *Indigenous data sovereignty: Toward an agenda*. Australian National University Press.

Langwieder, A., Coxon, A., Louttit, N., Varty, S., Boulanger, F., Diamond, S., Lameboy, J., Jolly, A., Natawapineskum, G., Okimaw, D., & Humphries, M. M. (2023). Community-led non-invasive polar bear monitoring in the Eeyou Marine Region of James Bay, Canada: Insights on distribution and body condition during the ice-free season. *Facets*, *8*, 1–12. https://doi.org/10.1139/facets-2022-0226

Lasky, M., Parsons, A., Schuttler, S., Mash, A., Larson, L., Norton, B., Pease, B., Boone, H., Gatens, L., & Kays, R. (2021). Candid critters: Challenges and solutions in a large-scale citizen science camera trap project. *Citizen Science: Theory and Practice*, *6*(1), 4. https://doi.org/10.5334/cstp.343

Liggins, L., Hudson, M., & Anderson, J. (2021). Creating space for Indigenous perspectives on access and benefit-sharing: Encouraging researcher use of the local contexts notices. *Molecular Ecology*, *30*(11), 2477–2482. https://doi.org/10.1111/mec.15918

Lima, R. D. (2024). The need for proper archiving and referencing of sound recordings in taxonomic studies of birds. *Ornithology*, *141*(2), ukae004. https://doi.org/10.1093/ornithology/ukae004

Local Contexts. (2023). *Grounding Indigenous rights*. https://localcontexts.org/

Maiam nayri Wingara, & Australian Indigenous Governance Institute. (2018). *Indigenous data sovereignty: Communique (Indigenous data sovereignty summit)*. Maiam nayri Wingara & Australian Indigenous Governance Institute. https://www.aigi.org.au/wp-content/uploads/2022/01/Communique-Indigenous-Data-Sovereignty-Summit-1.pdf

Mandeville, C. P., Koch, W., Nilsen, E. B., & Finstad, A. G. (2021). Open data practices among users of primary biodiversity data. *Bioscience*, *71*(11), 1128–1147. https://doi.org/10.1093/biosci/biab072

McCallum, M. J. L. (2017). Starvation, experimentation, segregation, and trauma: Words for reading Indigenous health history. *The Canadian Historical Review*, *98*(1), 96–113.

McKemey, M. B., Rangers, B., Rangers, Y. M., Costello, O., Hunter, J. T., & Ens, E. J. (2022). 'Right-way' science: Reflections on co-developing Indigenous and western cross-cultural knowledge to support Indigenous cultural fire management. *Ecological Management & Restoration*, *23*(S1), 75–82. https://doi.org/10.1111/emr.12532

Mercier, O. R., Stevens, N., & Toia, A. (2012). Matauranga Maori and the data-information-knowledge-wisdom hierarchy. *MAI Journal*, *1*(2), 103–116.

Michener, W. K., & Jones, M. B. (2012). Ecoinformatics: Supporting ecology as a data-intensive science. *Trends in Ecology & Evolution*, *27*(2), 85–93. https://doi.org/10.1016/j.tree.2011.11.016

Montenegro, M. (2019). Subverting the universality of metadata standards: The TK labels as a tool to promote Indigenous data sovereignty. *Journal of Documentation*, *75*(4), 731–749. https://doi.org/10.1108/JD-08-2018-0124

25758314, 0, Downloaded from https://besjournals.onlinelibrary.wiley.com/doi/10.1002/pan3.70161 by Erin Tattersall , Wiley Online Library on [04/10/2025]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

Nikolakis, W., & Hotte, N. (2022). Implementing "ethical space": An exploratory study of Indigenous-conservation partnerships. *Conservation Science and Practice*, *4*(1), e580.

Norouzzadeh, M. S., Nguyen, A., Kosmala, M., Swanson, A., Palmer, M., Packer, C., & Clune, J. (2017). Automatically identifying, counting, and describing wild animals in camera-trap images with deep learning. *Proceedings of the National Academy of Sciences of the United States of America*, *1*, 1–10. https://doi.org/10.1073/pnas.1719367115

Ocean Networks Canada. (2023). *Decolonizing data: Supporting Indigenous sovereignty in ocean data*. https://www.oceannetworks.ca/news-and-stories/stories/decolonizing-data/

Oliver, R. Y., Iannarilli, F., Ahumada, J., Fegraus, E., Flores, N., Kays, R., Birch, T., Ranipeta, A., Rogan, M. S., Sica, Y. V., & Jetz, W. (2023). Camera trapping expands the view into global biodiversity and its change. *Philosophical Transactions of the Royal Society, B: Biological Sciences*, *378*, 20220232. https://doi.org/10.1098/rstb.2022.0232

Open Data Charter. (2015). *International open data charter*. https://opendatacharter.net/wp-content/uploads/2015/10/opendatacharter-charter_F.pdf

Parlee, B. L., Sandlos, J., & Natcher, D. C. (2018). Undermining subsistence: Barren-ground caribou in a "tragedy of open access". *Science Advances*, *4*(2), e1701611. https://doi.org/10.1126/sciadv.1701611

Pascoe, J. H., Goolmeer, T., McKnight, A., & Couzens, V. (2024). Whale are our kin, our memory and our responsibility. *Wildlife Research*, *51*(8), WR23157. https://doi.org/10.1071/WR23157

Peters, D. P. C., Loescher, H. W., SanClements, M. D., & Havstad, K. M. (2014). Taking the pulse of a continent: Expanding site-based research infrastructure for regional- to continental-scale ecology. *Ecosphere*, *5*(3), art29. https://doi.org/10.1890/ES13-00295.1

Polfus, J., Manseau, M., Simmons, D., Neyelle, M., Bayha, W., Andrew, F., Andrew, L., Klütsch, C. F. C., Rice, K., & Wilson, P. (2016). Łeghágotsłeghágots'enetę (learning together): The importance of Indigenous perspectives in the identification of biological variation. *Ecology and Society*, *21*(2), 18. https://doi.org/10.5751/ES-08284-210218

Popp, J. N., Priadka, P., & Kozmik, C. (2019). The rise of moose co-management and integration of Indigenous knowledge. *Human Dimensions of Wildlife*, *24*(2), 159–167. https://doi.org/10.1080/10871209.2019.1545953

Rainie, S. C., Kukutai, T., Walter, M., Figueroa-Rodríguez, O. L., Walker, J., & Axelsson, P. (2019). Issues in open data: Indigenous data sovereignty. In *The state of open data: Histories and horizons* (pp. 300–319). African Minds and International Development Research Centre. http://stateofopendata.od4d.net

Reardon, J., & TallBear, K. (2012). "Your DNA is our history": Genomics, anthropology, and the construction of whiteness as property. *Current Anthropology*, *53*(S5), S233–S245. https://doi.org/10.1086/662629

Reichman, O. J., Jones, M. B., & Schildhauer, M. P. (2011). Challenges and opportunities of open data in ecology. *Science*, *331*, 703–705. https://doi.org/10.1126/science.1197962

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), 1–598. https://doi.org/10.1038/s41559-023-02309-0

Reyes-García, V., Tofighi-Niaki, A., Austin, B. J., Benyei, P., Danielsen, F., Fernández-Llamazares, Á., Sharma, A., Soleymani-Fard, R., & Tengö, M. (2022). Data sovereignty in community-based environmental monitoring: Toward equitable environmental data governance. *Bioscience*, *72*(8), 714–717. https://doi.org/10.1093/biosci/biac048

Robbins, P., Hunt, H. H., Pelegri, F., & Gilbert, J. (2023). Sovereign genes, wildlife conservation, genetic preservation, and Indigenous data sovereignty. *Frontiers in Conservation Science*, *4*, 1099562. https://doi.org/10.3389/fcosc.2023.1099562

Rodriguez-Lonebear, D. (2016). Building a data revolution in Indian country. In *Indigenous data sovereignty: Toward an agenda* (pp. 253–272). Australian National University Press.

Russell, S. R., Sultana, R., Rangers, N. Y., & Ens, E. J. (2023). Mepimbat tedul proujek: Indigenous knowledge of culturally significant freshwater turtles addresses species knowledge gaps in northern Australia. *Austral Ecology*, *48*(7), 1306–1327. https://doi.org/10.1111/aec.13353

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

Sandbrook, C., Luque-Lora, R., & Adams, W. M. (2018). Human bycatch: Conservation surveillance and the social implications of camera traps. *Conservation and Society*, *16*(4), 493. https://doi.org/10.4103/cs.cs_17_165

SCBD. (2022). *COP-15 Decision 15/4. Conference of the parties to the convention on biological diversity fifteenth meeting - Part II*. https://doi.org/10.5281/ZENODO.3831673

Schnarch, B. (2004). Ownership, control, access, and possession (OCAP) or self-determination applied to research: A critical analysis of contemporary first nations research and some options for first nations communities. *International Journal of Indigenous Health*, *1*(1), 1.

Scotson, L., Johnston, L. R., Iannarilli, F., Wearn, O. R., Mohd-Azlan, J., Wong, W. M., Gray, T. N. E., Dinata, Y., Suzuki, A., Willard, C. E., Frechette, J., Loken, B., Steinmetz, R., Moßbrucker, A. M., Clements, G. R., & Fieberg, J. (2017). Best practices and software for the management and sharing of camera trap data for small and large scales studies. *Remote Sensing in Ecology and Conservation*, *3*, 1–15. https://doi.org/10.1002/rse2.54

Shonfield, J., & Bayne, E. M. (2017). Autonomous recording units in avian ecological research: Current use and future applications. *Avian Conservation and Ecology*, *12*(1), art14. https://doi.org/10.5751/ace-00974-120114

Smith, D. E. (2016). Governing data and data for governance: The everyday practice of Indigenous sovereignty. In T. Kukutai & J. Taylor (Eds.), *Indigenous data sovereignty: Toward an agenda* (pp. 117–135). Australian National University Press.

Sólymos, P., Burton, C., Herbers, J., Boutin, S., & Schieck, J. (2013). Is accurate location information necessary for repeatability in field-based ecology? *Frontiers in Ecology and the Environment*, *11*(4), 178–179. https://doi.org/10.1890/13.WB.010

Spak, S. (2005). The position of Indigenous knowledge in Canadian co-management organizations. *Anthropologica*, *47*(2), 233–246.

Steenweg, R., Hebblewhite, M., Kays, R., Ahumada, J., Fisher, J. T., Burton, C., Townsend, S. E., Carbone, C., Rowcliffe, J. M., Whittington, J., Brodie, J., Royle, J. A., Switalski, A., Clevenger, A. P., Heim, N., & Rich, L. N. (2017). Scaling up camera traps: Monitoring the planet's biodiversity with networks of remote sensors. *Frontiers in Ecology and the Environment*, *15*, 26–34. https://doi.org/10.1002/FEE.1448

Strasser, C., Cook, R., Michener, W., Budden, A., & Koskela, R. (2011). DataONE promoting data stewardship through best practices. *Proceedings of the environmental information management conference 2011 (EIM 2011)* (pp. 126–131).

TallBear, K. (2023). *Indigenous peoples as collaborators: Indigenous research guidelines and data sovereignty* [Powerpoint slides]. https://docs.google.com/presentation/d/1d8umD_w6uLE-mvziyTKW9r1r-CnavLEH/edit#slide=id.p1

TallBear, K., & Kolopenuk, J. (2023). *Indigenous peoples and technoscience* [Presentation slides]. https://www.ualberta.ca/en/native-studies/programs/continuing-education/indigenous-technoscience-microcredential/index.html

Te Mana Raraunga. (2018). *Principles of Māori data sovereignty*. https://www.temanararaunga.maori.nz/nga-rauemi

Tsosie, K., Yracheta, J., Kolopenuk, J., & Geary, J. (2021). We have "gifted" enough: Indigenous genomic data sovereignty in precision

25758314, 0, Downloaded from https://besjournals.onlinelibrary.wiley.com/doi/10.1002/pan3.70161 by Erin Tattersall , Wiley Online Library on [04/10/2025]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

medicine. *The American Journal of Bioethics*, *21*(4), 72–75. https://doi.org/10.1080/15265161.2021.1891347

Tsosie, R. (2019). Tribal data governance and informational privacy: Constructing "Indigenous data sovereignty". *Montana Law Review*, *80*, 229.

United Nations. (2007). *United Nations Declaration on the Rights of Indigenous Peoples*. https://www.ohchr.org/en/indigenous-peoples/un-declaration-rights-indigenous-peoples

Vicente-Saez, R., & Martinez-Fuentes, C. (2018). Open science now: A systematic literature review for an integrated definition. *Journal of Business Research*, *88*, 428–436. https://doi.org/10.1016/j.jbusres.2017.12.043

Walter, M., Lovett, R., Maher, B., Williamson, B., Prehn, J., Bodkin-Andrews, G., & Lee, V. (2021). Indigenous data sovereignty in the era of big data and open data. *Australian Journal of Social Issues*, *56*(2), 143–156. https://doi.org/10.1002/ajs4.141

Walter, M., & Suina, M. (2019). Indigenous data, Indigenous methodologies and Indigenous data sovereignty. *International Journal of Social Research Methodology*, *22*(3), 233–243. https://doi.org/10.1080/13645579.2018.1531228

Wilkinson, M. D., Dumontier, M., Aalbersberg, I. J., Appleton, G., Axton, M., Baak, A., Blomberg, N., Boiten, J.-W., da Silva Santos, L. B., Bourne, P. E., Bouwman, J., Brookes, A. J., Clark, T., Crosas, M., Dillo, I., Dumon, O., Edmunds, S., Evelo, C. T., Finkers, R., … Mons, B. (2016). The FAIR guiding principles for scientific data management and stewardship. *Scientific Data*, *3*(1), 1. https://doi.org/10.1038/sdata.2016.18

Williamson, B., Provost, S., & Price, C. (2022). Operationalising Indigenous data sovereignty in environmental research and governance. *EPF: Philosophy, Theory, Models, Methods, and Practice*, *2*, 1–24. https://doi.org/10.1177/26349825221125496

Willoughby, S. (2019). Environment. In T. Davies, S. B. Walker, M. Rubinstein, & F. Perini (Eds.), *The state of open data: Histories and horizons* (pp. 102–118). African Minds and International Development Research Centre.

Wong, C., Ballegooyen, K., Ignace, L., Johnson, M. J., & Swanson, H. (2020). Towards reconciliation: 10 calls to action to natural scientists working in Canada. *Facets*, *5*(1), 769–783. https://doi.org/10.1139/facets-2020-0005

Yao, K. (2024). *Framework for a data sharing agreement* (p. 13). Alberta First Nations Information Governance Centre. https://afnigc.ca/wp-content/uploads/2024/06/Data-Sharing-Agreement-Full-2024.pdf

DATA SOURCES

Adams, M., Carpenter, J., Housty, J., Neasloss, D., Paquet, P., Service, C., Walkus, J., & Darimont, C. (2014). Toward increased engagement between academic and Indigenous community partners in ecological research. *Ecology and Society*, *19*(3), art5. https://doi.org/10.5751/ES-06569-190305

Adams, M., Tulloch, V. J. D., Hemphill, J., Penn, B., Anderson, L. T., Davis, K., Avery-Gomm, S., Harris, A., & Martin, T. G. (2023). Inclusive approaches for cumulative effects assessments. *People and Nature*, *5*(2), 431–445. https://doi.org/10.1002/pan3.10447

Agrawal, A. (1995). Dismantling the divide between Indigenous and scientific knowledge. *Development and Change*, *26*(3), 413–439. https://doi.org/10.1111/j.1467-7660.1995.tb00560.x

Agrawal, A. (2002). Indigenous knowledge and the politics of classification. *International Social Science Journal*, *54*(173), 287–297. https://doi.org/10.1111/1468-2451.00382

Aikenhead, G. S., & Ogawa, M. (2007). Indigenous knowledge and science revisited. *Cultural Studies of Science Education*, *2*(3), 539–620. https://doi.org/10.1007/s11422-007-9067-8

Ambler, J., Diallo, A. A., Deardon, P. K., Wilcox, P., Hudson, M. L., & Tiffin, N. (2021). Including digital sequence data in the Nagoya protocol can promote data sharing. *Trends in Biotechnology*, *39*(2). https://www.clinicalkey.com/#!/content/playContent/1-s2.0-S0167779920301736

Arbour, L., & Cook, D. (2006). DNA on loan: Issues to consider when carrying out genetic research with aboriginal families and communities. *Community Genetics*, *9*(3), 153–160. https://doi.org/10.1159/000092651

Arcand, M. M., Bradford, L., Worme, D. F., Strickert, G. E. H., Bear, K., Johnston, A. B. D., Wuttunee, S. M., Gamble, A., & Shewfelt, D. (2020). Sowing a way towards revitalizing Indigenous agriculture: Creating meaning from a forum discussion in Saskatchewan, Canada. *Facets*, *5*(1), 619–641. https://doi.org/10.1139/facets-2020-0004

Arhami, M., Desiani, A., Munawar, & Hayati, R. (2018). Eco-informatics: The encouragement of ecological data management. In *Proceedings of MICoMS 2017* (Vol. *1*, pp. 555–561). Emerald Publishing Limited. https://doi.org/10.1108/978-1-78756-793-1-00007

Artelle, K. A., Zurba, M., Bhattacharyya, J., Chan, D. E., Brown, K., Housty, J., & Moola, F. (2019). Supporting resurgent Indigenous-led governance: A nascent mechanism for just and effective conservation. *Biological Conservation*, *240*, 108284. https://doi.org/10.1016/j.biocon.2019.108284

Asswad, J., & Marx Gómez, J. (2021). Data ownership: A survey. *Information (Basel)*, *12*(11), 11. https://doi.org/10.3390/info12110465

Bahlai, C. A., Bartlett, L. J., Burgio, K. R., Fournier, A. M. V., Keiser, C. N., Poisot, T., & Whitney, K. S. (2019). Open Science isn't always open to all scientists. *American Scientist*, *107*(2), 78–82.

Barker, N. K. S., Fontaine, P. C., Cumming, S. G., Stralberg, D., Westwood, A., Bayne, E. M., Sólymos, P., Schmiegelow, F. K. A., Song, S. J., & Rugg, D. J. (2015). Ecological monitoring through harmonizing existing data: Lessons from the boreal avian modelling project. *Wildlife Society Bulletin*, *39*(3), 480–487. https://doi.org/10.1002/wsb.567

Bharadwaj, L. (2014). A framework for building research partnerships with first nations communities. *Environmental Health Insights*, *8*, 15–25. https://doi.org/10.4137/EHI.S10869

Brewer, J. P., Black, J., Stevens, C., & Ancestors, G. (2023). Toward Alaska native research and data sovereignty: Observations and experiences from the Yukon flats. *Environment and Planning F*, *2*(1–2), 247–263. https://doi.org/10.1177/26349825231163146

Burgelman, J.-C., Pascu, C., Szkuta, K., Von Schomberg, R., Karalopoulos, A., Repanas, K., & Schouppe, M. (2019). Open Science, open data, and open scholarship: European policies to make science fit for the twenty-first century. *Frontiers in Big Data*, *2*, 43. https://doi.org/10.3389/fdata.2019.00043

Burton, A. C., Neilson, E., Moreira, D., Ladle, A., Steenweg, R., Fisher, J. T., Bayne, E., & Boutin, S. (2015). REVIEW: Wildlife camera trapping: A review and recommendations for linking surveys to ecological processes. *Journal of Applied Ecology*, *52*(3), 675–685. https://doi.org/10.1111/1365-2664.12432

Buschman, V. Q. (2022). Framing co-productive conservation in partnership with Arctic Indigenous peoples. *Conservation Biology*, *36*(6), e13972. https://doi.org/10.1111/cobi.13972

Cannon, S. E., Moore, J. W., Adams, M. S., Degai, T., Griggs, E., Griggs, J., Marsden, T., Reid, A. J., Sainsbury, N., Stirling, K. M., Barnes, A. A. Y. S., Benson, R., Burrows, D., Chamberlin, G. R., Charley, B., Dick, D., Duncan, A. T., Liddle, K. K. M., Paul, M., … Indigenous Data Sovereignty Collective. 2024. Taking care of knowledge, taking care of salmon: Towards Indigenous data sovereignty in an era of climate change and cumulative effects. *Facets*, *9*, 1–21. https://doi.org/10.1139/facets-2023-0135

Carroll, S. R., Bengoetxea, J., Rodriguez-Lonebear, D., & Chair, E. C. (2019). *Oñati Indigenous Data Sovereignty (ID-SOV) Communique*.

Carroll, S. R., Duarte, M., & Liboiron, M. (2024). Indigenous data sovereignty. In *Keywords of the datafied state* (pp. 206–223). Data & Society Research Institute. https://datasociety.net/wp-content/uploads/2024/04/Keywords_Indigenous_Data_Sovereignty_Carroll_Duarte_Liboiron_04242024.pdf

Carroll, S. R., Garba, I., Figueroa-Rodríguez, O. L., Holbrook, J., Lovett, R., Materechera, S., Parsons, M., Raseroka, K., Rodriguez-Lonebear, D., Rowe, R., Sara, R., Walker, J. D., Anderson, J., & Hudson, M. (2020). The CARE principles for Indigenous data governance. *Data Science Journal*, *19*(1), 1. https://doi.org/10.5334/dsj-2020-043

Carroll, S. R., Herczog, E., Hudson, M., Russell, K., & Stall, S. (2021). Operationalizing the CARE and FAIR principles for Indigenous data futures. *Scientific Data*, *8*, 108.

Carroll, S. R., Plevel, R., Jennings, L. L., Garba, I., Sterling, R., Cordova-Marks, F. M., Hiratsuka, V., Hudson, M., & Garrison, N. A. (2022). Extending the CARE principles from tribal research policies to benefit sharing in genomic research. *Frontiers in Genetics*, *13*, 1052620. https://doi.org/10.3389/fgene.2022.1052620

Carroll, S. R., Rodriguez-Lonebear, D., & Martinez, A. (2019). Indigenous data governance: Strategies from United States native nations. *Data Science Journal*, *18*(1), 1. https://doi.org/10.5334/dsj-2019-031

25783314, 0, Downloaded from https://besjournals.onlinelibrary.wiley.com/doi/10.1002/pan3.70161 by Erin Tattersall , Wiley Online Library on [04/10/2025]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

Castleden, H., Morgan, V. S., & Neimanis, A. (2010). Researchers' perspectives on collective/community co-authorship in community-based participatory Indigenous research. *Journal of Empirical Research on Human Research Ethics*, *5*(4), 23–32. https://doi.org/10.1525/jer.2010.5.4.23

Chapin, F. S., Cochran, P., Huntington, O., Knapp, C. N., Brinkman, T. J., & Gadamus, L. R. (2014). Traditional knowledge and wisdom: A guide for understanding and shaping Alaskan social-ecological change. In *Linking ecology and ethics for a changing world: Values, philosophy, and action* (p. 18). Springer Science+Business Media.

Christen, K. A. (2012). Does information really want to be free? Indigenous knowledge systems and the question of openness. *International Journal of Communication*, *6*, 24.

Claw, K. G., Anderson, M. Z., Begay, R. L., Tsosie, K. S., Fox, K., & Garrison, N. A. (2018). A framework for enhancing ethical genomic research with Indigenous communities. *Nature Communications*, *9*(1), 2957. https://doi.org/10.1038/s41467-018-05188-3

Collier-Robinson, L., Rayne, A., Rupene, M., Thoms, C., & Steeves, T. (2019). Embedding Indigenous principles in genomic research of culturally significant species: A conservation genomics case study. *New Zealand Journal of Ecology*, *43*(3), 3389.

Collings, P. (1997). Subsistence hunting and wildlife management in the Central Canadian Arctic. *Arctic Anthropology*, *34*(1), 41–56.

Cooke, P., Fahey, M., Ens, E. J., Raven, M., Clarke, P. A., Rossetto, M., & Turpin, G. (2022). Applying biocultural research protocols in ecology: Insider and outsider experiences from Australia. *Ecological Management & Restoration*, *23*(S1), 64–74. https://doi.org/10.1111/emr.12545

Council of Canadian Academies. (2023). *Northern research leadership and equity: Expert panel on the future of Arctic and northern research in Canada* (p. 188). Council of Canadian Academies. https://cca-reports.ca/wp-content/uploads/2023/12/Arctic-EN_final-digital.pdf

Culina, A., Bagilioni, M., Crowther, T. W., Visser, M. E., Woutersen-Windhouwer, S., & Manghi, P. (2018). Navigating the unfolding open data landscape in ecology and evolution. *Nature Ecology & Evolution*, *2*, 420–426. https://doi.org/10.1038/s41559-017-0458-2

Daschuk, J. (2019). *Clearing the plains: Disease, politics of starvation, and the loss of Indigenous life*. University of Regina Press.

David-Chavez, D. M., & Gavin, M. C. (2018). A global assessment of Indigenous community engagement in climate research. *Environmental Research Letters*, *13*(12), 123005. https://doi.org/10.1088/1748-9326/aaf300

Davidson-Hunt, I., & Berkes, F. (2003). Learning as you journey: Anishinaabe perception of social-ecological environments and adaptive learning. *Conservation Ecology*, *8*(1). https://www.jstor.org/stable/26271978, art5.

Davies, T., Walker, S. B., Rubinstein, M., & Perini, F. (2019). *The state of open data: Histories and horizons*. African Minds and International Development Research Centre. http://stateofopendata.od4d.net

Davis, L., Denis, J. S., Hiller, C., & Lavell-Harvard, D. (2022). Learning and unlearning: Settler engagements in long-term Indigenous–settler alliances in Canada. *Ethnicities*, *22*(5), 619–641. https://doi.org/10.1177/14687968211063911

Davis, M. (2016). Data and the United Nations declaration on the rights of Indigenous peoples. In T. Kukutai & J. Taylor (Eds.), *Indigenous data sovereignty: Toward an agenda* (pp. 25–38). Australian National University Press.

de Beer, J. (2016). *Ownership of open data: Governance options for agriculture and nutrition*.

Dogan, A. L., & Wood, D. (2023). "Do you collect data to give to the university or do you do the work to benefit people?": Indigenous data sovereignty in environmental contexts. In *Proceedings of the 6th ACM SIGCAS/SIGCHI conference on computing and sustainable societies* (pp. 107–116). https://doi.org/10.1145/3588001.3609368

Dowsley, M., & Wenzel, G. W. (2008). "The time of the most polar bears": A co-management conflict in Nunavut. *Arctic*, *61*(2), 177–189.

Duarte, M. E., Vigil-Hayes, M., Littletree, S., & Belarde-Lewis, M. (2020). Of course, data can never fully represent reality. *Human Biology*, *91*(3), 163–178. https://doi.org/10.13110/humanbiology.91.3.03

Edmunds, D. S., Shelby, R., James, A., Steele, L., Baker, M., Perez, Y. V., & TallBear, K. (2013). Tribal housing, codesign, and cultural sovereignty. *Science, Technology & Human Values*, *38*(6), 801–828. https://doi.org/10.1177/0162243913490812

Elshakry, M. (2010). When science became western: Historiographical reflections. *Isis*, *101*, 98–109.

Ens, E. J., Finlayson, M., Preuss, K., Jackson, S., & Holcombe, S. (2012). Australian approaches for managing 'country' using Indigenous and non-Indigenous knowledge. *Ecological Management & Restoration*, *13*(1), 100–107. https://doi.org/10.1111/j.1442-8903.2011.00634.x

Farley, S. S., Dawson, A., Goring, S. J., & Williams, J. W. (2018). Situating ecology as a big-data science: Current advances, challenges, and solutions. *Bioscience*, *68*(8), 563–576. https://doi.org/10.1093/biosci/biy068

Fernández-Llamazares, Á., Lepofsky, D., Lertzman, K., Armstrong, C. G., Brondizio, E. S., Gavin, M. C., Lyver, P. O., Nicholas, G. P., Pascua, P., Reo, N. J., Reyes-García, V., Turner, N. J., Yletyinen, J., Anderson, E. N., Balée, W., Cariño, J., David-Chavez, D. M., Dunn, C. P., Garnett, S. C., … Vaughan, M. B. (2021). Scientists' warning to humanity on threats to Indigenous and local knowledge systems. *Journal of Ethnobiology*, *41*(2), 144–169. https://doi.org/10.2993/0278-0771-41.2.144

Figshare. (2022). *The state of open data 2022 (digital science report)*. knowledge.figshare.com/state-of-open-data

First Nations Centre. (2007). *Considerations and templates for ethical research practices*. National Aboriginal Health Organization. https://ethicshub.ca/wp-content/uploads/2020/05/45-Template-for-a-Data-Sharing-Protocol.pdf

First Nations Information Governance Centre. (2014). Barriers and levers for the implementation of OCAP. *The International Indigenous Policy Journal*, *5*(2). https://fnigc.ca/wp-content/uploads/2021/08/Barriers-and-Levers-for-the-Implementation-of-OCAP.pdf

First Nations Information Governance Centre. (2020). *A first nations data governance strategy* (p. 102). First Nations Information Governance Centre. https://fnigc.ca/wp-content/uploads/2020/09/FNIGC_FNDGS_report_EN_FINAL.pdf

First Nations Information Governance Centre. (2022). *The fundamentals of OCAP®* [Presentation slides]. https://fnigc.ca/ocap-training/

Fisher, J. T., Grey, F., Anderson, N., Sawan, J., Anderson, N., Chai, S.-L., Nolan, L., Underwood, A., Amerongen Maddison, J., Fuller, H. W., & Frey, S. (2021). Indigenous-led camera-trap research on traditional territories informs conservation decisions for resource extraction. *Facets*, *6*, 1266–1284. https://doi.org/10.1139/facets-2020-0087

Gargan, S. (2004). *Deh Cho first nation traditional knowledge research protocol*. Dehcho First Nations.

Garrison, N. A., Hudson, M., Ballantyne, L. L., Garba, I., Martinez, A., Taualii, M., Arbour, L., Caron, N. R., & Rainie, S. C. (2019). Genomic research through an Indigenous lens: Understanding the expectations. *Annual Review of Genomics and Human Genetics*, *20*(1), 495–517. https://doi.org/10.1146/annurev-genom-083118-015434

Gaudry, A., & Lorenz, D. (2018). Indigenization as inclusion, reconciliation, and decolonization: Navigating the different visions for indigenizing the Canadian Academy. *AlterNative: An International Journal of Indigenous Peoples*, *14*(3), 218–227. https://doi.org/10.1177/1177180118785382

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

Gomes, D. G. E., Pottier, P., Crystal-Ornelas, R., Hudgins, E. J., Foroughirad, V., Sánchez-Reyes, L. L., Turba, R., Martinez, P. A., Moreau, D., Bertram, M. G., Smout, C. A., & Gaynor, K. M. (2022). Why don't we share data and code? Perceived barriers and benefits to public archiving practices. *Proceedings of the Royal Society B: Biological Sciences*, *289*, 20221113.

Goolmeer, T., Skroblin, A., Grant, C., van Leeuwen, S., Archer, R., Gore-Birch, C., & Wintle, B. A. (2022). Recognizing culturally significant species and Indigenous-led management is key to meeting international biodiversity obligations. *Conservation Letters*, *15*(6), e12899. https://doi.org/10.1111/conl.12899

Goolmeer, T., & Van Leeuwen, S. (2023). Indigenous knowledge is saving our iconic species. *Trends in Ecology & Evolution*, *38*(7), 591–594. https://doi.org/10.1016/j.tree.2023.03.010

Government of Canada. (2022). *Canada's national action plan on open government 2022-24*. Government of Canada. https://open.canada.ca/en/content/national-action-plan-open-government

Government of Canada. (2023). *United Nations declaration on the rights of Indigenous peoples act action plan*. https://www.justice.gc.ca/eng/declaration/ap-pa/ah/pdf/2023-06-20_UNDA_Action_Plan_EN.pdf

Guiliano, J., & Heitman, C. (2019). Difficult heritage and the complexities of Indigenous data. *Journal of Cultural Analytics*. https://doi.org/10.22148/16.044

Hackett, J., The Firelight Group, & Olson, R. (2019). *Dissemination of open geospatial data under the Open Government Licence-Canada through OCAP principles* (No. 57e; p. 57e). https://doi.org/10.4095/314977

Hampton, S. E., Anderson, S. S., Bagby, S. C., Gries, C., Han, X., Hart, E. M., Jones, M. B., Lenhardt, W. C., MacDonald, A., Michener, W. K., Mudge, J., Pourmokhtarian, A., Schildhauer, M. P., Woo, K. H., & Zimmerman, N. (2015). The Tao of open science for ecology. *Ecosphere*, *6*(7), art120. https://doi.org/10.1890/ES14-00402.1

25758314, 0, Downloaded from https://besjournals.onlinelibrary.wiley.com/doi/10.1002/pan3.70161 by Erin Tattersall , Wiley Online Library on [04/10/2025]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

Hampton, S. E., Strasser, C. A., Tewksbury, J. J., Gram, W. K., Budden, A. E., Batcheller, A. L., Duke, C. S., & Porter, J. H. (2013). Big data and the future of ecology. *Frontiers in Ecology and the Environment*, *11*(3), 156–162. https://doi.org/10.1890/120103

Harding, A., Harper, B., Stone, D., O'Neill, C., Berger, P., Harris, S., & Donatuto, J. (2012). Conducting research with tribal communities: Sovereignty, ethics, and data-sharing issues. *Environmental Health Perspectives*, *120*(1), 6–10. https://doi.org/10.1289/ehp.1103904

Hartter, J., Ryan, S. J., MacKenzie, C. A., Parker, J. N., & Strasser, C. A. (2013). Spatially explicit data: Stewardship and ethical challenges in science. *PLoS Biology*, *11*(9), e1001634. https://doi.org/10.1371/journal.pbio.1001634

Henri, D. A., Provencher, J. F., Bowles, E., Taylor, J. J., Steel, J., Chelick, C., Popp, J. N., Cooke, S. J., Rytwinski, T., McGregor, D., Ford, A. T., & Alexander, S. M. (2021). Weaving Indigenous knowledge systems and Western sciences in terrestrial research, monitoring and management in Canada: A protocol for a systematic map. *Ecological Solutions and Evidence*, *2*(2), e12057. https://doi.org/10.1002/2688-8319.12057

Hill, R., Grant, C., George, M., Robinson, C., Jackson, S., & Abel, N. (2012). A typology of Indigenous engagement in Australian environmental management: Implications for knowledge integration and social-ecological system sustainability. *Ecology and Society*, *17*(1), art23. https://doi.org/10.5751/ES-04587-170123

Hird, C., David-Chavez, D. M., Gion, S. S., & Van Uitregt, V. (2023). Moving beyond ontological (worldview) supremacy: Indigenous insights and a recovery guide for settler-colonial scientists. *Journal of Experimental Biology*, *226*(12), jeb245302. https://doi.org/10.1242/jeb.245302

Hoffman, K. M., Davis, E. L., Wickham, S. B., Schang, K., Johnson, A., Larking, T., Lauriault, P. N., Quynh Le, N., Swerdfager, E., & Trant, A. J. (2021). Conservation of Earth's biodiversity is embedded in Indigenous fire stewardship. *Proceedings of the National Academy of Sciences of the United States of America*, *118*(32), e2105073118. https://doi.org/10.1073/pnas.2105073118

Howitt, R., & Suchet-Pearson, S. (2006). Rethinking the building blocks: Ontological pluralism and the idea of 'management'. *Geografiska Annaler: Series B, Human Geography*, *88*(3), 323–335. https://doi.org/10.1111/j.1468-0459.2006.00225.x

United Nations Declaration on the Rights of Indigenous Peoples Act. (2021). *United Nations Declaration on the Rights of Indigenous Peoples Act*. https://laws-lois.justice.gc.ca/PDF/U-2.2.pdf

2023–2026 Data Strategy for the Federal Public Service. (2023). *2023–2026 data strategy for the federal public service*. https://www.canada.ca/en/treasury-board-secretariat/corporate/reports/2023-2026-data-strategy.html

Hudson, M., Carroll, S. R., Anderson, J., Blackwater, D., Cordova-Marks, F. M., Cummins, J., David-Chavez, D., Fernandez, A., Garba, I., Hiraldo, D., Jäger, M. B., Jennings, L. L., Martinez, A., Sterling, R., Walker, J. D., & Rowe, R. K. (2023). Indigenous peoples' rights in data: A contribution toward Indigenous research sovereignty. *Frontiers in Research Metrics and Analytics*, *8*, 1173805. https://doi.org/10.3389/frma.2023.1173805

Hudson, M., Garrison, N. A., Sterling, R., Caron, N. R., Fox, K., Yracheta, J., Anderson, J., Wilcox, P., Arbour, L., Brown, A., Taualii, M., Kukutai, T., Haring, R., Te Aika, B., Baynam, G. S., Dearden, P. K., Chagné, D., Malhi, R. S., Garba, I., & Carroll, S. R. (2020). Rights, interests and expectations: Indigenous perspectives on unrestricted access to genomic data. *Nature Reviews Genetics*, *21*(6), 6. https://doi.org/10.1038/s41576-020-0228-x

Hummel, P., Braun, M., & Dabrock, P. (2021). Own data? Ethical reflections on data ownership. *Philosophy and Technology*, *34*(3), 545–572. https://doi.org/10.1007/s13347-020-00404-9

Hummel, P., Braun, M., Tretter, M., & Dabrock, P. (2021). Data sovereignty: A review. *Big Data & Society*, *8*(1), 2053951720982012. https://doi.org/10.1177/2053951720982012

Hutchins, L., Mc Cartney, A., Graham, N., Gillespie, R., & Guzman, A. (2023). Arthropods are kin: Operationalizing Indigenous data sovereignty to respectfully utilize genomic data from Indigenous lands. *Molecular Ecology Resources*, *25*, 1–16. https://doi.org/10.1111/1755-0998.13822

Iaccarino, M. (2003). Science and culture. *EMBO Reports*, *4*(3), 220–223. https://doi.org/10.1038/sj.embor.embor781

Idaa Strategies. (2021). *Community approaches to wildlife monitoring* (p. 15). MakeWay Foundation.

Ignace, L., Burton, L., Mynott, S., Meehan, M., Olson, E., Steel, J., Ojeda, J., Harper, S., Ramirez, L., Baker, D., Sleigh, L., Frenkel, C., Rhodes, C., & Ban, N. C. (2023). Researchers' responsibility to uphold Indigenous rights. *Science*, *381*(6654), 129–131. https://doi.org/10.1126/science.adh4470

Indigenous Circle of Experts. (2018). *We rise together: Achieving pathway to Canada Target 1 throught the creation of Indigenous protected and conserved areas in the spirit and practice of reconciliation* (p. 112). https://www.icce-caec.ca/knowledge-centre/we-rise-together-the-indigenous-circle-of-experts-report-and-recommendations/

Indigenous Knowledge Circle of the National Boreal Caribou Knowledge Consortium. (2022). *Guiding principles for cross-cultural collaboration*.

Indigenous Research Support Initiative. (2019a). *Principles for indigenous data governance*. University of British Columbia. https://irsi.ubc.ca/sites/default/files/inline-files/Principles%20for%20Indigenous%20Data%20Governance.pdf

Indigenous Research Support Initiative. (2019b). *Principles of engagement for indigenous community-based research*.

Inuit Circumpolar Council. (2022). *Circumpolar Inuit protocols for equitable and ethical engagement*. Inuit Circumpolar Council. https://hh30e7.p3cdn1.secureserver.net/wp-content/uploads/EEE-Protocols-LR-WEB.pdf

Inuit Tapiriit Kanatami. (2018). *National Inuit strategy on research*. Inuit Tapiriit Kanatami. https://www.itk.ca/projects/national-inuit-strategy-on-research/

Itchuaqiyaq, C. U. (2023). *Equitable Arctic research: A guide for innovation*. https://www.itchuaqiyaq.com/

Janssen, M., Charalabidis, Y., & Zuiderwijk, A. (2012). Benefits, adoption barriers and myths of open data and open government. *Information Systems Management*, *29*(4), 258–268. https://doi.org/10.1080/10580530.2012.716740

Jenkins, G. B., Beckerman, A. P., Bellard, C., Benítez-López, A., Ellison, A. M., Foote, C. G., Hufton, A. L., Lashley, M. A., Lortie, C. J., Ma, Z., Moore, A. J., Narum, S. R., Nilsson, J., O'Boyle, B., Provete, D. B., Razgour, O., Rieseberg, L., Riginos, C., Santini, L., … Peres-Neto, P. R. (2023). Reproducibility in ecology and evolution: Minimum standards for data and code. *Ecology and Evolution*, *13*(5), e9961. https://doi.org/10.1002/ece3.9961

Jennings, L., Anderson, T., Martinez, A., Sterling, R., Chavez, D. D., Garba, I., Hudson, M., Garrison, N. A., & Carroll, S. R. (2023). Applying the 'CARE principles for Indigenous data governance' to ecology and biodiversity research. *Nature Ecology & Evolution*, *7*, 1547–1551. https://doi.org/10.1038/s41559-023-02161-2

Jessen, T. D., Ban, N. C., Claxton, N. X., & Darimont, C. T. (2022). Contributions of Indigenous knowledge to ecological and evolutionary understanding. *Frontiers in Ecology and the Environment*, *20*(2), 93–101. https://doi.org/10.1002/fee.2435

Jumbo, J. (2023). *Wildlife camera and ARU webinar* [Webinar]. https://nwtresearch.com/outreach/speaker-series

Kaechele, N., Beveridge, R., Adams, M., Boyce, P., & Artelle, K. (2024). A primer for the practice of reflexivity in conservation science. *Conservation Letters*, *17*(5), e13047. https://doi.org/10.1111/conl.13047

Kahl, S., Wood, C. M., Eibl, M., & Klinck, H. (2021). BirdNET: A deep learning solution for avian diversity monitoring. *Ecological Informatics*, *61*, 101236. https://doi.org/10.1016/j.ecoinf.2021.101236

Kays, R., Davidson, S. C., Berger, M., Bohrer, G., Fiedler, W., Flack, A., Hirt, J., Hahn, C., Gauggel, D., Russell, B., Kölzsch, A., Lohr, A., Partecke, J., Quetting, M., Safi, K., Scharf, A., Schneider, G., Lang, I., Schaeuffelhut, F., … Wikelski, M. (2022). The Movebank system for studying global animal movement and demography. *Methods in Ecology and Evolution*, *13*(2), 419–431. https://doi.org/10.1111/2041-210X.13767

Kays, R., McShea, W. J., & Wikelski, M. (2020). Born-digital biodiversity data: millions and billions. *Diversity and Distributions*, *26*(5), 644–648. https://doi.org/10.1111/ddi.12993

Keats, B., & Evans, P. (2020). Traditional knowledge and resource management in the northwest territories, Canada_definitions, disciplinary divides, and reasons for decisions. *The Extractive Industries and Society*, *7*, 1309–1318. https://doi.org/10.1016/j.exis.2020.08.009

Kemp, C. (2023). *Optimizing community-based wildlife monitoring: Prioritizing Indigenous knowledge and values* [M.Sc. dissertation]. University of Guelph.

Kemp, C., Yarchuk, K., Menzies, A. K., & Popp, J. N. (2022). *A guide to using wildlife cameras for ecological monitoring in a community-based context* (p. 41). University of Guelph.

Kendrick, A., & Manseau, M. (2008). Representing traditional knowledge: Resource management and Inuit knowledge of barren-ground Caribou. *Society & Natural Resources*, *21*(5), 404–418. https://doi.org/10.1080/08941920801898341

Kiatsoo/Xais'xais Stewardship Authority. (2021). *Informing first nations stewardship with applied research: Key questions to inform an equitably beneficial and engaged research process*. Kitasoo/Xais'xais First Nation.

Kovach, M. (2021). *Indigenous methodologies: Characteristics, conversations, and contexts*. University of Toronto Press.

25758314, 0, Downloaded from https://besjournals.onlinelibrary.wiley.com/doi/10.1002/pan3.70161 by Erin Tattersall , Wiley Online Library on [04/10/2025]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

Kukutai, T., Carroll, S. R., & Walter, M. (2020). Indigenous data sovereignty. In I. D. Mamo (Ed.), *The Indigenous world 2020* (34th ed., pp. 654–662). IWGIA. https://figshare.utas.edu.au/articles/chapter/Indigenous_data_sovereignty/23063915/1/files/40804226.pdf

Kukutai, T., & Taylor, J. (2016). *Indigenous data sovereignty: Toward an agenda*. Australian National University Press.

Lamb, C. T., Willson, R., Menzies, A. K., Owens-Beek, N., Price, M., McNay, S., Otto, S. P., Hessami, M., Popp, J. N., Hebblewhite, M., & Ford, A. T. (2023). Braiding Indigenous rights and endangered species law. *Science*, *380*(6646), 694–696. https://doi.org/10.1126/science.adg9830

Langwieder, A., Coxon, A., Louttit, N., Varty, S., Boulanger, F., Diamond, S., Lameboy, J., Jolly, A., Natawapineskum, G., Okimaw, D., & Humphries, M. M. (2023). Community-led non-invasive polar bear monitoring in the Eeyou Marine Region of James Bay, Canada: Insights on distribution and body condition during the ice-free season. *Facets*, *8*, 1–12. https://doi.org/10.1139/facets-2022-0226

Lasky, M., Parsons, A., Schuttler, S., Mash, A., Larson, L., Norton, B., Pease, B., Boone, H., Gatens, L., & Kays, R. (2021). Candid critters: Challenges and solutions in a large-scale citizen science camera trap project (No. 1). *Citizen Science: Theory and Practice*, *6*(1), 1. https://doi.org/10.5334/cstp.343

Latulippe, N., & Klenk, N. (2020). Making room and moving over: Knowledge co-production, Indigenous knowledge sovereignty and the politics of global environmental change decision-making. *Current Opinion in Environmental Sustainability*, *42*, 7–14. https://doi.org/10.1016/j.cosust.2019.10.010

Liggins, L., Hudson, M., & Anderson, J. (2021). Creating space for Indigenous perspectives on access and benefit-sharing: Encouraging researcher use of the local contexts notices. *Molecular Ecology*, *30*(11), 2477–2482. https://doi.org/10.1111/mec.15918

Lima, R. D. (2024). The need for proper archiving and referencing of sound recordings in taxonomic studies of birds. *Ornithology*, *141*(2), ukae004. https://doi.org/10.1093/ornithology/ukae004

Ljubicic, G., Okpakok, S., Robertson, S., & Mearns, R. (2018). *Uqsuqtuurmiut inuita tuktumi qaujimaningit* (Inuit knowledge of caribou from Gjoa haven, Nunavut): Collaborative research contributions to co-management efforts. *Polar Record*, *54*(3), 213–233. https://doi.org/10.1017/S0032247418000372

Local Contexts. (2023). *Grounding Indigenous rights*. https://localcontexts.org/

Loring, P. A., & Moola, F. (2021). Erasure of Indigenous peoples risks perpetuating conservation's colonial harms and undermining its future effectiveness. *Conservation Letters*, *14*(2), e12782. https://doi.org/10.1111/conl.12782

Lovett, R., Lee, V., Kukutai, T., Cormack, D., Rainie, S. C., & Walker, J. (2019). 2: Good data practices for Indigenous data sovereignty and governance. In *Good data* (pp. 26–36).

Maiam nayri Wingara, & Australian Indigenous Governance Institute. (2018). *Indigenous data sovereignty: Communique (Indigenous data sovereignty summit)*. Maiam nayri Wingara & Australian Indigenous Governance Institute. https://www.aigi.org.au/wp-content/uploads/2022/01/Communique-Indigenous-Data-Sovereignty-Summit-1.pdf

Mamun, A. A., & Natcher, D. C. (2023). The promise and pitfalls of community-based monitoring with a focus on Canadian examples. *Environmental Monitoring and Assessment*, *195*(4), 445. https://doi.org/10.1007/s10661-022-10841-y

Mandeville, C. P., Koch, W., Nilsen, E. B., & Finstad, A. G. (2021). Open data practices among users of primary biodiversity data. *Bioscience*, *71*(11), 1128–1147. https://doi.org/10.1093/biosci/biab072

Martinez, D. J., Cannon, C. E. B., McInturff, A., Alagona, P. S., & Pellow, D. N. (2023). Back to the future: Indigenous relationality, kincentricity and the north American model of wildlife management. *Environmental Science & Policy*, *140*, 202–207. https://doi.org/10.1016/j.envsci.2022.12.010

Mazzochi, F. (2018). Why "integrating" Western science and Indigenous knowledge is not an easy task: What lessons could be learned for the future of knowledge. *Journal of Future Studies*, *22*(3), 19–34. https://doi.org/10.6531/JFS.2018.22(3).00A19

Mc Cartney, A. M., Anderson, J., Liggins, L., Hudson, M. L., Anderson, M. Z., TeAika, B., Geary, J., Cook-Deegan, R., Patel, H. R., & Phillippy, A. M. (2022). Balancing openness with Indigenous data sovereignty: An opportunity to leave no one behind in the journey to sequence all of life. *Proceedings of the National Academy of Sciences*, *119*(4), e2115860119. https://doi.org/10.1073/pnas.2115860119

Mc Cartney, A. M., Head, M. A., Tsosie, K. S., Sterner, B., Glass, J. R., Paez, S., Geary, J., & Hudson, M. (2023). Indigenous peoples and local communities as partners in the sequencing of global eukaryotic biodiversity. *npj Biodiversity*, *2*(1), 1. https://doi.org/10.1038/s44185-023-00013-7

McAlvay, A. C., Armstrong, C. G., Baker, J., Elk, L. B., Bosco, S., Hanazaki, N., Joseph, L., Martínez-Cruz, T. E., Nesbitt, M., Palmer, M. A., Almeida, W. C. P., Anderson, J., Asfaw, Z., Borokini, I. T., Cano-Contreras, E. J., Hoyte, S., Hudson, M., Ladio, A. H., Odonne, G., … Vandebroek, I. (2021). Ethnobiology phase VI: Decolonizing institutions, projects, and scholarship. *Journal of Ethnobiology*, *41*(2), 170–191. https://doi.org/10.2993/0278-0771-41.2.170

McCallum, M. J. L. (2017). Starvation, experimentation, segregation, and trauma: Words for Reading Indigenous health history. *The Canadian Historical Review*, *98*(1), 96–113.

McKemey, M. B., Rangers, B., Rangers, Y. M., Costello, O., Hunter, J. T., & Ens, E. J. (2022). 'Right-way' science: Reflections on co-developing Indigenous and western cross-cultural knowledge to support Indigenous cultural fire management. *Ecological Management & Restoration*, *23*(S1), 75–82. https://doi.org/10.1111/emr.12532

Mecredy, G., Sutherland, R., & Jones, C. (2018). First nations data governance, privacy, and the importance of the OCAP® principles. *International Journal of Population Data Science*, *3*(4), 4. https://doi.org/10.23889/ijpds.v3i4.911

Mercier, O. R., Stevens, N., & Toia, A. (2012). Matauranga Maori and the data-information-knowledge-wisdom hierarchy. *MAI Journal*, *1*(2), 103–116.

Michener, W. K. (2015). Ecological data sharing. *Ecological Informatics*, *29*, 33–44. https://doi.org/10.1016/j.ecoinf.2015.06.010

Michener, W. K., Beach, J. H., Jones, M. B., Ludäscher, B., Pennington, D. D., Pereira, R. S., Rajasekar, A., & Schildhauer, M. (2007). A knowledge environment for the biodiversity and ecological sciences. *Journal of Intelligent Information Systems*, *29*(1), 111–126. https://doi.org/10.1007/s10844-006-0034-8

Michener, W. K., & Jones, M. B. (2012). Ecoinformatics: Supporting ecology as a data-intensive science. *Trends in Ecology & Evolution*, *27*(2), 85–93. https://doi.org/10.1016/j.tree.2011.11.016

Molloy, J. C. (2011). The open knowledge foundation: Open data means better science. *PLoS Biology*, *9*(12), e1001195. https://doi.org/10.1371/journal.pbio.1001195

Montenegro, M. (2019). Subverting the universality of metadata standards: The TK labels as a tool to promote Indigenous data sovereignty. *Journal of Documentation*, *75*(4), 731–749. https://doi.org/10.1108/JD-08-2018-0124

Nickerson, M. (2017). *First nations' data governance: Measuring the nation-to-nation relationship*. British Columbia First Nations' Data Governance Initiative. https://static1.squarespace.com/static/558c624de4b0574c94d62a61/t/618c60f2abd843215add85cf/1636589811532/NATION-TO-NATION_FN_DATA_GOVERNANCE_-_FINAL_-_EN.pdf

Nikolakis, W., & Hotte, N. (2022). Implementing "ethical space": An exploratory study of Indigenous-conservation partnerships. *Conservation Science and Practice*, *4*(1), e580.

Nissenbaum, H. (2004). Privacy as contextual integrity. *Washington Law Review*, *79*.

Norouzzadeh, M. S., Nguyen, A., Kosmala, M., Swanson, A., Palmer, M. S., Packer, C., & Clune, J. (2018). Automatically identifying, counting, and describing wild animals in camera-trap images with deep learning. *Proceedings of the National Academy of Sciences*, *115*(25), E5716–E5725. https://doi.org/10.1073/pnas.1719367115

Ocean Networks Canada. (2023). *Decolonizing data: Supporting Indigenous sovereignty in ocean data*. https://www.oceannetworks.ca/news-and-stories/stories/decolonizing-data/

Office of the Vice-President (Research). (2020). *Indigenous research agreement*. Memorial University of Newfoundland. https://www.mun.ca/research/media/production/memorial/administrative/research/media-library/indigenous/Indigenous%20Research%20Agreement%20Feb%202024.pdf

Oguamanam, C. (2019). *Indigenous data sovereignty: Retooling Indigenous resurgence for development* (SSRN Scholarly Paper No. 3997388). https://doi.org/10.2139/ssrn.3997388

Open Data Charter. (2015). *International open data charter*. https://opendatacharter.net/wp-content/uploads/2015/10/opendatacharter-charter_F.pdf

Open Government Partnership. (2019). *Open government partnership global report*. https://www.opengovpartnership.org/wp-content/uploads/2019/05/Global-Report_Executive-Summary_EN.pdf

Open North. (2017). *Decolonizing data: Indigenous data sovereignty primer*. https://static1.squarespace.com/static/558c624de4b0574c94d62a61/t/618c6154be1c714d40e4b32e/1636589908913/Decolonizing%2BData%2BFN_DATA_SOVEREIGNTY_PAPER.pdf

Palmer, C. L., Belarde-Lewis, M., Hohn, T., & Teuton, C. B. (2022). Indigenous research data case study: Toward contextual integrity for Indigenous data. https://digital.lib.washington.edu:443/researchworks/handle/1773/49173

Parlee, B. L., & Caine, K. J. (2018). *When the caribou do not come: Indigenous knowledge and adaptive management in the Western Arctic*. UBC Press.

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Parlee, B. L., Sandlos, J., & Natcher, D. C. (2018). Undermining subsistence: Barren-ground caribou in a "tragedy of open access". *Science Advances*, *4*(2), e1701611. https://doi.org/10.1126/sciadv.1701611

Pascoe, J. H., Goolmeer, T., McKnight, A., & Couzens, V. (2024). Whale are our kin, our memory and our responsibility. *Wildlife Research*, *51*(8). https://doi.org/10.1071/WR23157

Paul, M. (2023). Looking to the future: Indigenous data sovereignty and policy in Canada. *Pathfinder: A Canadian Journal for Information Science Students and Early Career Professionals*, *4*(1), 54–67. https://doi.org/10.29173/pathfinder71

Peters, D. P. C., Loescher, H. W., SanClements, M. D., & Havstad, K. M. (2014). Taking the pulse of a continent: Expanding site-based research infrastructure for regional- to continental-scale ecology. *Ecosphere*, *5*(3), 1–23. https://doi.org/10.1890/ES13-00295.1

Pfeifer, P. (2018). *From the credibility gap to capacity building: An Inuit critique of Canadian Arctic research*. Northern Public Affairs.

Phillips, G. (n.d.). *Applications of Indigenous data sovereignty. Community development and nation rebuilding*.

Polfus, J. L., Manseau, M., Simmons, D., Neyelle, M., Bayha, W., Andrew, F., Andrew, L., Klütsch, C. F. C., Rice, K., & Wilson, P. (2016). Łeghágots'enete (learning together): The importance of Indigenous perspectives in the identification of biological variation. *Ecology and Society*, *21*(2), art18. https://doi.org/10.5751/ES-08284-210218

Popp, J. N., Priadka, P., & Kozmik, C. (2019). The rise of moose co-management and integration of Indigenous knowledge. *Human Dimensions of Wildlife*, *24*(2), 159–167. https://doi.org/10.1080/10871209.2019.1545953

Rainie, S. C., Kukutai, T., Walter, M., Figueroa-Rodríguez, O. L., Walker, J., & Axelsson, P. (2019). Issues in open data: Indigenous data sovereignty. In *The state of open data: Histories and horizons* (pp. 300–319). African Minds and International Development Research Centre. http://stateofopendata.od4d.net

Reardon, J., & TallBear, K. (2012). "Your DNA is our history": Genomics, anthropology, and the construction of whiteness as property. *Current Anthropology*, *53*(S5), S233–S245. https://doi.org/10.1086/662629

Reichman, O. J., Jones, M. B., & Schildhauer, M. P. (2011). Challenges and opportunities of open data in ecology. *Science*, *331*, 703–705. https://doi.org/10.1126/science.1197962

Reid, A. J., Eckert, L. E., Lane, J.-F., 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), 1–598. https://doi.org/10.1038/s41559-023-02309-0

Reid, A. J., Young, N., Hinch, S. G., & Cooke, S. J. (2022). Learning from Indigenous knowledge holders on the state and future of wild Pacific salmon. *Facets*, *7*, 718–740. https://doi.org/10.1139/facets-2021-0089

Research Data Alliance International Indigenous Data Sovereignty Interest Group. (2019). *CARE principles for Indigenous data governance*. The Global Indigenous Data Alliance. GIDA-global.org

Reyes-García, V., Tofighi-Niaki, A., Austin, B. J., Benyei, P., Danielsen, F., Fernández-Llamazares, Á., Sharma, A., Soleymani-Fard, R., & Tengö, M. (2022). Data sovereignty in community-based environmental monitoring: Toward equitable environmental data governance. *Bioscience*, *72*(8), 714–717. https://doi.org/10.1093/biosci/biac048

Robbins, P., Hunt, H. H., Pelegri, F., & Gilbert, J. (2023). Sovereign genes, wildlife conservation, genetic preservation, and Indigenous data sovereignty. *Frontiers in Conservation Science*, *4*, 1099562. https://doi.org/10.3389/fcosc.2023.1099562

Robinson, C. J., Kong, T., Coates, R., Watson, I., Stokes, C., Pert, P., McConnell, A., & Chen, C. (2021). Caring for Indigenous data to evaluate the benefits of Indigenous environmental programs. *Environmental Management*, *68*(2), 160–169. https://doi.org/10.1007/s00267-021-01485-8

Robinson, J. M., Gellie, N., MacCarthy, D., Mills, J. G., O'Donnell, K., & Redvers, N. (2021). Traditional ecological knowledge in restoration ecology: A call to listen deeply, to engage with, and respect Indigenous voices. *Restoration Ecology*, *29*(4), e13381. https://doi.org/10.1111/rec.13381

Rodriguez-Lonebear, D. (2016). Building a data revolution in Indian country. In *Indigenous data sovereignty: Toward an agenda* (pp. 253–272). Australian National University Press.

Russell, S. R., Sultana, R., Rangers, N. Y., & Ens, E. J. (2023). Mepimbat tedul proujek: Indigenous knowledge of culturally significant freshwater turtles addresses species knowledge gaps in northern Australia. *Austral Ecology*, *48*(7), 1306–1327. https://doi.org/10.1111/aec.13353

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

Sambaa K'e Dene Band. (2003). *Sambaa K'e Dene band policy regarding the gathering, use and distribution of Yúndíit'ǒh (traditional knowledge)*. https://nwtresearch.com/sites/default/files/sambaa-k-e-dene-band.pdf

Sandbrook, C., Clark, D., Toivonen, T., Simlai, T., O'Donnell, S., Cobbe, J., & Adams, W. (2021). Principles for the socially responsible use of conservation monitoring technology and data. *Conservation Science and Practice*, *3*(5), e374. https://doi.org/10.1111/csp2.374

Sandbrook, C., Luque-Lora, R., & Adams, W. M. (2018). Human bycatch: Conservation surveillance and the social implications of camera traps. *Conservation and Society*, *16*(4), 493. https://doi.org/10.4103/cs.cs_17_165

Sandlos, J. (2007). *Hunters at the margin: Native people and wildlife conservation in the Northwest Territories*. UBC Press.

Sandlos, J. (2018). The past facing forward: History and caribou management in Northern Canada. In B. L. Parlee & K. J. Caine (Eds.), *When the caribou do not come: Indigenous knowledge and adaptive management in the Western Arctic* (pp. 36–57). UBC Press.

Schnarch, B. (2004). Ownership, control, access, and possession (OCAP) or self-determination applied to research: A critical analysis of contemporary first nations research and some options for first nations communities. *International Journal of Indigenous Health*, *1*(1), 1.

Scotson, L., Johnston, L. R., Iannarilli, F., Wearn, O. R., Mohd-Azlan, J., Wong, W. M., Gray, T. N. E., Dinata, Y., Suzuki, A., Willard, C. E., Frechette, J., Loken, B., Steinmetz, R., Moßbrucker, A. M., Clements, G. R., & Fieberg, J. (2017). Best practices and software for the management and sharing of camera trap data for small and large scales studies. *Remote Sensing in Ecology and Conservation*, *3*(3), 158–172. https://doi.org/10.1002/rse2.54

Service, C. N., Adams, M. S., Artelle, K. A., Paquet, P., Grant, L. V., & Darimont, C. T. (2014). Indigenous knowledge and science unite to reveal spatial and temporal dimensions of distributional shift in wildlife of conservation concern. *PLoS One*, *9*(7), e101595. https://doi.org/10.1371/journal.pone.0101595

Shonfield, J., & Bayne, E. M. (2017). Autonomous recording units in avian ecological research: Current use and future applications. *Avian Conservation and Ecology*, *12*(1), art14. https://doi.org/10.5751/ACE-00974-120114

Singer, C. L. (2023). Equal use of Indigenous and scientific knowledge in species assessments: A case study from the Northwest Territories, Canada. *Biological Conservation*, *281*, 109995.

Smith, D. E. (2016). Governing data and data for governance: The everyday practice of Indigenous sovereignty. In T. Kukutai & J. Taylor (Eds.), *Indigenous data sovereignty: Toward an agenda* (pp. 117–135). Australian National University Press.

Snipp, M. C. (2016). What does data sovereignty imply: What does it look like? In T. Kukutai & J. Taylor (Eds.), *Indigenous data sovereignty: Toward an agenda* (pp. 39–55). Australian National University Press.

Sólymos, P., Burton, C., Herbers, J., Boutin, S., & Schieck, J. (2013). Is accurate location information necessary for repeatability in field-based ecology? *Frontiers in Ecology and the Environment*, *11*(4), 178–179. https://doi.org/10.1890/13.WB.010

Spak, S. (2005). The position of Indigenous knowledge in Canadian co-management organizations. *Anthropologica*, *47*(2), 233–246.

Steenweg, R., Hebblewhite, M., Kays, R., Ahumada, J., Fisher, J. T., Burton, C., Townsend, S. E., Carbone, C., Rowcliffe, J. M., Whittington, J., Brodie, J., Royle, J. A., Switalski, A., Clevenger, A. P., Heim, N., & Rich, L. N. (2017). Scaling-up camera traps: Monitoring the planet's biodiversity with networks of remote sensors. *Frontiers in Ecology and the Environment*, *15*(1), 26–34. https://doi.org/10.1002/fee.1448

Stern, E. R., & Humphries, M. M. (2022). Interweaving local, expert, and Indigenous knowledge into quantitative wildlife analyses: A systematic review. *Biological Conservation*, *266*, 109444. https://doi.org/10.1016/j.biocon.2021.109444

Strasser, C. (2012). *Primer on data management: What you always wanted to know*. https://doi.org/10.5060/D2251G48

Strasser, C., Cook, R., Michener, W., Budden, A., & Koskela, R. (2011). DataONE promoting data stewardship through best practices. In *Proceedings of the environmental information management conference 2011 (EIM 2011)* (pp. 126–131).

Sullivan, B. L., Wood, C. L., Iliff, M. J., Bonney, R. E., Fink, D., & Kelling, S. (2009). eBird: A citizen-based bird observation network in the biological sciences. *Biological Conservation*, *142*(10), 2282–2292. https://doi.org/10.1016/j.biocon.2009.05.006

25758314, 0, Downloaded from https://besjournals.onlinelibrary.wiley.com/doi/10.1002/pan3.70161 by Erin Tattersall , Wiley Online Library on [04/10/2025]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

TallBear, K. (2014). Indigenous bioscientists constitute knowledge across cultures of expertise and tradition. In *Re:Mindings: Co-constituting Indigenous, academic, artistic knowledges* (pp. 173–191).

TallBear, K. (2017). *Future imaginary dialogues* [Interview transcript]. Concordia University. https://indigenousfutures.net/wp-content/uploads/2017/02/Future-Imaginary-Dialogues-Kim-TallBear.pdf

TallBear, K. (2023). *Indigenous peoples as collaborators: Indigenous research guidelines and data sovereignty* [Powerpoint slides]. https://docs.google.com/presentation/d/1d8umD_w6uLE-mvziyTKW9r1r-CnavLEH/edit#slide=id.p1

TCPS 2, I. A. P. on R. E. (2018). *Tri-council policy statement: Ethical conduct for research involving humans – TCPS 2 (2018) – Chapter 9: Research involving the First Nations, Inuit and Métis Peoples of Canada*. https://ethics.gc.ca/eng/tcps2-eptc2_2018_chapter9-chapitre9.html

Te Aika, B., Liggins, L., Rye, C., Perkins, E. O., Huh, J., Brauning, R., Godfery, T., & Black, M. A. (2023). Aotearoa genomic data repository: An āhuru mōwai for taonga species sequencing data. *Molecular Ecology Resources*, 1–14. https://doi.org/10.1111/1755-0998.13866

Te Mana Raraunga. (2018). *Principles of Māori data sovereignty*. https://www.temanararaunga.maori.nz/nga-rauemi

Tondu, J. M. E., Balasubramaniam, A. M., Chavarie, L., Gantner, N., Knopp, J. A., Provencher, J. F., Wong, P. B. Y., & Simmons, D. (2014). Working with northern communities to build collaborative research partnerships: Perspectives from early career researchers. *Arctic*, *67*(3). https://doi.org/10.14430/arctic4416

Trisos, C. H., Auerbach, J., & Katti, M. (2021). Decoloniality and anti-oppressive practices for a more ethical ecology. *Nature Ecology & Evolution*, *5*(9), 9. https://doi.org/10.1038/s41559-021-01460-w

Tsosie, K., Yracheta, J., Kolopenuk, J., & Geary, J. (2021). We have "gifted" enough: Indigenous genomic data sovereignty in precision medicine. *The American Journal of Bioethics*, *21*(4), 72–75. https://doi.org/10.1080/15265161.2021.1891347

Tsosie, R. (2019). Tribal data governance and informational privacy: Constructing "Indigenous data sovereignty". *Montana Law Review*, *80*.

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

Tuhiwai Smith, L. (1999). *Decolonizing methodologies: Research and Indigenous peoples*. https://nycstandswithstandingrock.files.wordpress.com/2016/10/linda-tuhiwai-smith-decolonizing-methodologies-research-and-indigenous-peoples.pdf

Turpel-Lafond, M. E., & Chondoma, L. (2019). *Building Indigenous-led engagement frameworks: Report on the dialogue on Indigenous data, information and records (Summary)*. University of British Columbia.

United Nations. (2007). *United Nations Declaration on the Rights of Indigenous Peoples*. https://www.ohchr.org/en/indigenous-peoples/un-declaration-rights-indigenous-peoples

Varghese, J., & Crawford, S. S. (2021). A cultural framework for Indigenous, local, and science knowledge systems in ecology and natural resource management. *Ecological Monographs*, *91*(1), e01431. https://doi.org/10.1002/ecm.1431

Vicente-Saez, R., & Martinez-Fuentes, C. (2018). Open science now: A systematic literature review for an integrated definition. *Journal of Business Research*, *88*, 428–436. https://doi.org/10.1016/j.jbusres.2017.12.043

Walter, M. (2016). Data politics and Indigenous representation in Australian statistics. In T. Kukutai & J. Taylor (Eds.), *Indigenous data sovereignty: Toward an agenda* (pp. 79–97). Australian National University Press.

Walter, M., Kukutai, T., Carroll, S. R., & Rodriguez-Lonebear, D. (2021). *Indigenous data sovereignty and policy*. Taylor & Francis. https://doi.org/10.4324/9780429273957

Walter, M., Lovett, R., Maher, B., Williamson, B., Prehn, J., Bodkin-Andrews, G., & Lee, V. (2021). Indigenous data sovereignty in the era of big data and open data. *Australian Journal of Social Issues*, *56*(2), 143–156. https://doi.org/10.1002/ajs4.141

Walter, M., & Suina, M. (2019). Indigenous data, Indigenous methodologies and Indigenous data sovereignty. *International Journal of Social Research Methodology*, *22*(3), 233–243. https://doi.org/10.1080/13645579.2018.1531228

Wilkinson, M. D., Dumontier, M., Aalbersberg, I. J., Appleton, G., Axton, M., Baak, A., Blomberg, N., Boiten, J.-W., da Silva Santos, L. B., Bourne, P. E., Bouwman, J., Brookes, A. J., Clark, T., Crosas, M., Dillo, I., Dumon, O., Edmunds, S., Evelo, C. T., Finkers, R., … Mons, B. (2016). The FAIR guiding principles for scientific data management and stewardship. *Scientific Data*, *3*, 1. https://doi.org/10.1038/sdata.2016.18

Wilks, J., Kennedy, G., Drew, N., & Wilson, K. (2018). Indigenous data sovereignty in higher education, *60*(2).

Williamson, B., Provost, S., & Price, C. (2022). Operationalising Indigenous data sovereignty in environmental research and governance. *EPF: Philosophy, Theory, Models, Methods, and Practice*, 1–24. https://doi.org/10.1177/26349825221125496

Willoughby, S. (2019). Environment. In T. Davies, S. B. Walker, M. Rubinstein, & F. Perini (Eds.), *The state of open data: Histories and horizons* (pp. 102–118). African Minds and International Development Research Centre.

Wilson, G. R., Edwards, M. J., Smits, J. K., Wilson, G. R., Edwards, M. J., & Smits, J. K. (2010). Support for Indigenous wildlife management in Australia to enable sustainable use. *Wildlife Research*, *37*(3), 255–263. https://doi.org/10.1071/WR09130

Wilson, N. J., Worden, E., & O'Hanlon, G. (2024). Connecting community-based monitoring to Arctic environmental decision-making and governance: A systematic scoping review of the literature. *Arctic Science*, (2), 261–280. https://doi.org/10.1139/as-2023-0034

Wong, C., Ballegooyen, K., Ignace, L., Johnson, M. J., & Swanson, H. (2020). Towards reconciliation: 10 calls to action to natural scientists working in Canada. *Facets*, *5*(1), 769–783. https://doi.org/10.1139/facets-2020-0005

Wray, K., & Parlee, B. (2013). Ways we respect Caribou: Teetł'it Gwich'in rules. *Arctic*, *66*(1), 68–78.

Yao, K. (2024). *Framework for a data sharing agreement* (p. 13). Alberta First Nations Information Governance Centre. https://afnigc.ca/wp-content/uploads/2024/06/Data-Sharing-Agreement-Full-2024.pdf

York, J., Dowsley, M., Cornwell, A., Kuc, M., & Taylor, M. (2016). Demographic and traditional knowledge perspectives on the current status of Canadian polar bear subpopulations. *Ecology and Evolution*, *6*(9), 2897–2924. https://doi.org/10.1002/ece3.2030

SUPPORTING INFORMATION

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

Table S1. Key words included in Google Scholar searches as part of a literature review on Indigenous data sovereignty and open data in ecology and environmental sciences.

How to cite this article: Tattersall, E., Cardinal-McTeague, W., Myers-Smith, I., Jenkins, D. A., & Burton, A. C. (2025). Affirming Indigenous data sovereignty in collaborative wildlife conservation in the era of open data. *People and Nature*, *00*, 1–19. https://doi.org/10.1002/pan3.70161

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