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EDITORIAL

Special issue: Indigenous research and co-stewardship of wildlife

Indigenous People have occupied the North American continent since time immemorial, and yet, most North Americans are unaware of the sheer number or diversity of Indigenous groups or the scale of the landscape they manage and influence (Thorstenson 2023). To provide some context, the Indigenous groups of just the United States and Canada oversee over 850,000 km^2 of land, an area larger than all but 34 of the world's countries. These vast landscapes hold a plethora of culturally and economically important natural resources. For example, in the United States, Indian Nations manage over 178,000 km^2 of rangelands, 72,000 km^2 of commercial forests, and 16,000 km of streams and rivers, all of which provide important habitat for fish and wildlife populations, including >500 threatened and endangered species (Thorstenson 2023).

The management of these resources varies because of the diversity of values, goals, and perspectives of the unique groups that have resided here for millennia. To exemplify this, we briefly describe the diversity of Indigenous groups that reside in North America within the context of government recognitions. Each of these groups are considered sovereign entities with government-to-government relationships. Thus, differences in Indigenous culture, history, policy, and legal designations all merge to create diversity and complexity across Indigenous Fish and Wildlife Management agencies responsible for the management of these wildlife resources (Stricker et al. 2020, Hoagland and Albert 2023).

In the United States, Indigenous Peoples are generally divided into 3 groups: those that belong to a state or federally recognized tribe, descendants of state or federally recognized tribes without membership or recognition from the tribe, or descendants of a tribe that has no legal recognition. There are 574 federally recognized tribes, which are commonly separated into 2 groups: those within the contiguous states (i.e., Native American, Indian) and Alaskan Native. This delineation is due to the recent timing in which Alaska was settled, and the lack of treaties established between Alaskan tribes and the United States Government. These groups are separate from other non-federally recognized Indigenous groups such as Native Hawaiians, which are of Polynesian descent.

In Canada, Indigenous groups are commonly identified as First Nations, Inuit, or Métis. First Nations refers to the Indian people recognized by the Canadian Constitution, regardless of their status as federally recognized. The governing units that make up First Nations groups, referred to as bands, are the equivalent of Native American tribes in the United States. Inuit are the Indigenous groups that reside across Arctic Canada who did not sign treaties with the Canadian Government but have negotiated modern land claims. Métis are people of mixed First Nation and European ancestry who have no current federal recognition status but have a unique culture different from both Inuit and First Nations.

Indigenous groups in Mexico are also unique. They do not have clear legal recognition at a state or federal level, clarity on their rights to hold title to land, or access to traditional land bases.

It is important to consider this diversity and complexity across Indigenous groups because of the ever-growing interest and awareness of Indigenous Knowledge (IK). Such IK is increasingly being recognized and sought out as part of wildlife management and conservation solutions (Gadgil et al. 2022). The IK held by Indigenous people can enhance our understanding of wildlife and their habitats (Popp et al. 2019) and local IK can fill gaps in scientific understanding that may be difficult to obtain through other means (Stern and Humphries 2022). Indigenous Knowledge provides information that has been collected over lifetimes and the use of IK and Western science (WS) together will yield more comprehensive information about wildlife species than either method alone (Service et al. 2014).

Indigenous Knowledge is also increasingly being incorporated into research and management projects for numerous benefits (Fisk et al. 2024, Moore et al. 2024, Werdel et al. 2024; this issue). It is because of these benefits that non-Indigenous entities are increasingly aware of the contributions that IK can provide in addressing our pressing conservation and stewardship challenges. These benefits have also led to legislative policies related to IK. For example, in the United States the Federal joint Secretarial order 3403 maintains that the United States Department of Interior and Department of Agriculture will benefit by incorporating tribal IK into federal land and resources management. At the same time, professional societies are forming working groups and holding symposia on the role of IK in their respective disciplines. This has led peer-reviewed journals to seek articles using IK, some of which have devoted entire issues to the subject (*Journal of Forestry* [2017], *Climate and Development* [2021], *Journal of Great Lakes Research* [2023], *Molecular Ecology* [2024], *Journal of Wildlife Management* [*JWM*; this issue]).

It is for these reasons, and a desire to respectfully use this knowledge to bring differing perspectives into wildlife ecology and management, that The Wildlife Society (TWS) and the *JWM* have facilitated this special issue on Indigenous research and co-stewardship. This effort originated following discussions between K. L. Nicholson and P. R. Krausman, and later supported by past TWS President G. Batcheller and all subsequent presidents, and TWS Council to highlight the importance and relevance of IK to wildlife management. Following these conversations, we were asked to lead this effort. In attempting to accomplish this goal, we initiated extensive discussions with the membership of TWS's Native Peoples' Wildlife Management Working Group and staff of the Native American Fish and Wildlife Society to develop a vision for what this special issue would include. Part of this vision was to provide perspectives of the Indigenous community on the role of IK in wildlife management and TWS. It was clear from these discussions that a special issue that encompassed IK and much of the previous and ongoing wildlife research occurring in partnership with Indigenous groups was warranted. Thus, we assembled a range of manuscripts that exemplify the type of work currently occurring on tribal lands or in coordination with tribal entities. In doing so, we have been able to assemble a diversity of work that reaches across boundaries to incorporate policy issues, tribally driven research, management activities, and IK.

The phrase tribally driven research has different meanings to different people (Mariella et al. 2009). In the case of this special issue, we included articles that approach tribal research from an Indigenous perspective but also presented examples from a more traditional WS style of research on tribal lands in collaboration with tribal institutions with the research questions originating from the tribes. Additionally, some of these manuscripts may not fit the traditional mold regular readers of *JWM* may expect. For example, some papers may not have a traditional introduction, methods, results, discussion framework commonly seen in other scientific articles. This was intentional as Indigenous Science and IK is in many ways different than the traditional WS approach. Such science is no better or worse than these WS approaches, but such accommodations are necessary if we are to disseminate this information fairly and accurately to the scientific community or incorporate such information into our scientific practices.

From here, we introduce readers of *JWM* to concepts common within Indigenous Science that they may not be familiar with but will likely encounter throughout the subsequent articles. Following this, we have taken this opportunity to highlight challenges within the scientific publishing process that we have encountered while undertaking this endeavor. As this represents the first attempt by TWS and *JWM* to facilitate a special issue on Indigenous Knowledge and research, this provides the ideal time to highlight such concerns so that the members of TWS can better understand IK so it can more easily be incorporated into all aspects of TWS.

KEY CONCEPTS

IK or Traditional Ecological Knowledge

A definition of Traditional Ecological Knowledge (TEK) that has been widely accepted is from Berkes (2012:7): "Traditional Ecological Knowledge is a cumulative body of knowledge, practice, and belief, evolving by adaptive

processes and handed down through generations by cultural transmission, about the relationship of living beings (human and non-human) with one another and with the environment." There is no one name for TEK, as it can also be referred to as terms such as Indigenous Knowledge, Traditional Knowledge, or Native Science. The point is not to be deterred from using the term TEK but rather to reiterate the nature of TEK as adaptable, alive, and always changing.

While this definition of TEK is useful, it is important to note that there is no consensus on a singular definition. The TEK base is added to throughout generations and is experiential in nature. Traditional Ecological Knowledge is something lived and active, and cannot be separated from its people (McGregor 2005). It is a knowledge source and a process and there are no isolated disciplines within it. Traditional Ecological Knowledge is holistic and subjective, and values are embraced as an integral part of understanding the world (Koski et al. 2021). Without confined disciplines within TEK, there is a large focus on collaborative relationship building that links "cross-cultural and cross-situational divides" (Whyte 2013:8). Traditional Ecological Knowledge is expressed orally, through languages, stories, songs, and laws that reflect an intergenerational worldview of interrelationships with the environment.

Traditional Ecological Knowledge's intergenerational worldview comes through experimental relationships with the land that have been developed through generations. This knowledge is based on observations, experiences, and teachings of ancestors and has been adapted over time to the changing conditions of the environment and is experiential in nature.

Western science

Equally important to understanding what TEK or IK is, it is also important that we have a common understanding of what we mean by science. Science is sometimes referred to as WS or scientific ecological knowledge (Kimmerer 2012). Neither of these terms is particularly satisfying from our viewpoint. The direction western is not relevant to North America and scientific ecological knowledge has the feeling of appropriation from TEK about it. When we talk about the use of IK in WS pursuits, it likely occurs in 1 of 2 arenas: research projects and what one would call management projects (although these 2 are not mutually exclusive). In this case, we refer to management projects as those activities that seek to implement some action on a landscape to benefit an aspect of the ecosystem. These are, by definition, place-based projects that many times occur on Indigenous lands. It is entirely appropriate to use IK in those management efforts and the process is somewhat straightforward. In other cases, IK can help direct management efforts or identify opportunities that would not have been obvious without this insight. Because of this, it is possible, although not always easy, to infuse IK into management activities.

Research projects, on the other hand, require specific elements such as developed hypotheses, quantitative data, replication, and statistical analyses, which can lead to challenges in incorporating IK into the rigid structure of WS. This is not to say that it has not happened. For example, IK has been used in the past to guide and develop hypotheses to test within a WS paradigm (Duncan et al. 2023). In other cases, IK can serve an important role in discussing similarities or future directions within research-focused manuscript discussions (Polfus et al. 2014, Stirling et al. 2023). Although an appropriate use of IK and a beneficial contribution of IK to the scientific community, this is in many ways still requiring that IK fit into the WS paradigm. Which brings about an important question: should we try to integrate IK into WS? Is this a desirable outcome?

Two-eyed seeing

The questions regarding the appropriate integration of IK and WS have served as the foundation for the two-eye seeing (i.e., Etuaptmunk Mi'knaw) movement. Two-eyed has been described as "…learning to see from one eye with the strengths of Indigenous knowledges and ways of knowing, and from the other eye with the strengths of

mainstream knowledges and ways of knowing, and to use both these eyes together, for the benefit of all" (Bartlett et al. 2012:335). For example, the use of two-eyed seeing in fisheries research contends that a growing body of research reports that bridging IK with WS is important for understanding locally relevant conservation and management (Almack et al. 2023).

Seeing with 2 eyes enables the viewer to see with depth of field and with greater perspective. Seeing with 1 eye is flat with no or little perspective. This physiological effect of perspective with 2 eyes is the perfect analogy for the use of 2-eyed seeing in science (broadly defined). Seeing with both the WS eye and the IK eye, as described by Almack et al. (2023), allows for this perspective. But both eyes are different, both see different things, both complement each other. It is the brain that organizes the vision into a single view with depth of field. In the same way we need to respect and promote both the Indigenous knowledge way of knowing and the WS way of knowing.

CHALLENGES IN PUBLISHING INDIGENOUS KNOWLEGE

Indigenous data sovereignty

Tribes have been exploited by settler and colonizer use of science for generations and are sometime skeptical of researchers. Much of this skepticism stems from the rights of the tribes to control information collected either by Indigenous People or about Indigenous People. This is not an unfounded concern as immeasurable examples exist, both historically and present-day, in which ecological data were stolen from Indigenous groups (e.g., traditional knowledge of medicinal plants used to develop commercial products such as prescription drugs, misuse of Indigenous names, sacred symbols, or images; Brewer and Warner 2015). The result is a great reluctance to share IK (i.e., data) with non-Indigenous groups.

Additionally, there are some forms of IK that are not appropriate to share with the larger society and should be kept private or among Indigenous People. When Indigenous People gather in ceremonial Lodges, there are often stories and lessons that are shared among the Lodge members and these stories represent IK. Lodge members are told not to share these lessons outside of the Lodge. This need for privacy of stories and lessons (a form of IK) conflicts with the current open-science movement in which many peer-reviewed publications now require the open sharing of data used within a study. This is inconsistent with the use and traditions of IK, which is passed down among generations within a single community. Data sharing agreements may also ask Indigenous communities to ignore and forgive the history of settler and colonizer use of research within Indigenous groups. Because of these conflicts, it is an important discussion that needs to be addressed by researchers involved in IK-based work. Importantly, such discussions have led to a model increasingly used in IK research in which a data sovereignty agreement is established between Indigenous People and other entities involved in the research efforts (Matson et al. 2021). In this way, prior to any research activities, the tribe (or whichever Indigenous group) and the research community discuss and reach an agreement on which data collected during the research are sharable and which are not. This of course leads to questions about the open science movement and how this movement may accommodate such Indigenous data sovereignty agreements.

Establishing Indigenous Science collaborations

One of the most common questions we receive from graduate students, and other parties interested in working with Indigenous groups, is how they can establish relationships with tribes. Our first guidance is that you must first become acutely aware of the rightful distrust of Indigenous groups of WS researchers due the data sovereignty issues already mentioned. In knowing and accepting this fact, you must then work to build bridges and trust amongst the research community and the Indigenous People. This is not a simple or quick action, but given the

potential benefits to our shared wildlife and fisheries resources, we strongly believe that commitment is warranted. There are 6 essential elements in working with Indigenous People, elements that will help to establish good relationships (J. Gilbert, Great Lakes Indian Fish and Wildlife Commission, unpublished data): 1) communication, early and often, 2) respect for the culture and mores of the people you are working with, 3) empathy in understanding different perspectives, 4) flexibility in the approaches to research and management to reflect the respect and empathy developed for the Indigenous People, 5) time (it takes time to build relationships), and 6) humor, which is an important aspect of Indigenous life. Many (but not all) Indigenous groups have committees or processes in place that must be followed when working within Indigenous fish and wildlife agencies or on Indigenous lands. It is important to understand this tribal structure and permission process prior to working with any tribe.

Publishing IK

In closing, we highlight some primary challenges we experienced or were made aware of when leading this effort. We hope this information stimulates discussion around the role of TWS in general, and more specifically the publishing committees of *JWM* and sister journals in how they incorporate and promote IK in the future. How can we as TWS approach this difficult endeavor? This editorial provides a starting point for such discussions as we work to build fair and accommodating structures within TWS journals that allow for the publication of IK articles that are not confined to the rigid strictures of WS.

The first question we must answer as a professional society is should Indigenous research be published, and if so, by whom? This is an important question to answer. Does only published research deserve attention? Not all Indigenous people feel or even think their knowledge needs to be or should be published. It is, after all, not their style. They pass on their research and knowledge verbally through stories, songs, prayers, and other means, not through journal articles.

On the other hand, some Indigenous research should be published. Given the known benefits to our natural resources, it is important that the publication process is accessible to Indigenous People. If publication is the chosen avenue for disseminating Indigenous Knowledge, it brings about the first question of many, and one of the primary concerns raised in our conversations with potential authors of this special issue: "How can we address publication charges (i.e., page charges) associated with peer-reviewed journals?" Many tribal wildlife agencies are underfunded relative to state or federal wildlife agencies; thus, they have limited financial resources available for page charges. Fortunately, *JWM* and the publisher (i.e., Wiley) have programs in place that can minimize the financial barrier in some cases. The Editor-in-Chief of *JWM* can waive page charges for a limited number of manuscripts and Wiley and TWS are constantly considering programs so no acceptable paper is rejected because of limited funds.

The next challenge associated with peer-reviewed publications pertains to how IK papers are to be evaluated and by what or whose standards. As you will see in some of the following articles, IK-based research many times does not fit within the WS paradigm in which there are clear hypotheses, detailed methodology, and clear results supplemented with specifically formatted tables and figures. Because of this, how then can we create flexible guidelines that allow for IK knowledge to be shared but do not discredit or force IK into a structure that is not fitting or appropriate?

One such example that became obvious throughout this special issue publication process was concerns regarding how to cite IK. How does one do this in a way that recognizes the authority of that citation? This has been a topic of interest in the Indigenous communities of late. MacLeod (2021) advocates for the citation of IK to be more than a personal communication citation. She proposes a citation form, similar to personal communication but that contains more culturally appropriate information (MLA format; last name, first name, nation or community, treaty territory if applicable, city or community they live in, topic or subject of communication, date). More broadly, it is commonly understood that IK papers must be reviewed if they are to be included within the peer-reviewed

literature. One can question who the appropriate peers are to review such work. Can only people with Indigenous backgrounds evaluate IK papers, or can journal editors select from a larger, more general list, as is done now with subject-area expertise?

Additional issues that arose during our discussions included the appropriateness of authorship. Should all papers based around IK include ≥1 Indigenous author. As highlighted above, how would editors evaluate if one is Indigenous? Are only members of a federally recognized tribe considered Indigenous? What about others that are not members of tribal groups? Can non-Indigenous people write about IK? What about a non-Indian who has >40 years of experience working with and for the tribes? Does this count as representing Indigenous communities? These are important and valid questions as we confront issues related to data sovereignty and the potential for the intellectual theft of IK.

We hope that in highlighting some of these concerns and challenges, we have demonstrated the need for increased flexibility by journals like *JWM* if they want to continue incorporating IK into their journals. There are no simple answers to these challenges. Solutions will likely require outside-of-the-box thinking from TWS's membership that includes concessions in our normal publication process to make this happen. Most importantly, TWS must realize that such publication flexibility must not come only in the form of a special issue but rather must be part of a permanent shift so that stand-alone publications incorporating IK can become a regular part of *JWM*. Such discussions should not happen without insight from other groups such as the Native Peoples' Wildlife Management Working Group of TWS or the Native American Fish and Wildlife Society. Through such collaboration, TWS will be well prepared to disseminate the relevant science occurring across Indian Country to the broader wildlife profession. Although this may represent a shift from our publication tradition, we firmly believe that the benefits to our profession and to our natural resources will be profound.

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