



Integrating Indigenous Traditional Ecological Knowledge of land into land management through Indigenous-academic partnerships

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ABSTRACT

In this article, the authors use an environmental justice lens to review the history of land management practices: first practiced through stewardship by Indigenous Peoples and then taken over by Western science-based land management. There is a long history of environmental injustice in this Great Turtle Island (North America), and we specifically focus on what is happening in the land currently called the United States. The objective of this article is to explain how to integrate Indigenous Traditional Ecological Knowledge (Indigenous TEK) into Western land management practices through Indigenous-academic partnerships. We address this objective through: 1) a review of the literature on environmental injustice in Indigenous communities, the role Indigenous TEK has in providing sound ecological principles for land management, and examples of Indigenous co-management; 2) explaining how to engage in an Indigenous-academic partnerships; 3) through a quasi-case study we utilize qualitative narrative storytelling to tell the story and process through which some of our authors engaged in an Indigenous-academic partnership, the Earth Partnership-Indigenous Arts and Sciences (EP-IAS), with local Indigenous Tribal Nations through relationship building and dialogue to develop Indigenous-driven restoration and land management in the region; and 4) concluding with a discussion on how Indigenous-academic land management partnerships address environmental justice issues and create meaningful opportunities to address historical inequities. The quasi-case study we provide demonstrates the EP-IAS community engagement model, which exemplifies a mutually beneficial and respectful Indigenous-academic partnership through integrating Indigenous TEK and Western science in land management.

1. Introduction

Over millennia, Indigenous communities have amassed a wealth of knowledge about their local environments and developed a deep relationship with the land (Wall Kimmerer, 2000). In this article, we have chosen to use the terms “Indigenous communities” or “Indigenous Peoples” because these terms cover a broad range of Indigenous Nations, Tribal Nations, communities, and peoples left out of land management practices. The Indigenous individuals in our case study are from North America. While each Indigenous community is unique regarding their practices, lifeways, cultures, knowledge, and beliefs, we seek to explore how to apply the largely qualitative, holistic, and sustainable knowledge found in Indigenous Traditional Ecological Knowledge (Indigenous TEK)

to land management practices. Indigenous TEK refers to ecological knowledge that Indigenous Nations, communities, and Peoples specifically have acquired and passed down over generations (Berkes, 1993; Wall Kimmerer, 2000). We want to emphasize that in using the term “traditional,” we are not saying the Knowledge is historic and not in use but is instead based on observations over time and is thus a living body of knowledge. Although Indigenous TEK is based on millennia of interacting with the environment, Indigenous communities and Indigenous TEK are often not included in land management policy and practices in the U.S. and in other colonized countries. The exclusion of Indigenous TEK and perspectives in land management violates environmental justice principles that call for meaningful involvement and input from impacted communities. It also leaves important ecological

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and historical knowledge out of the practitioner knowledge base, policies, and practices.

Land management is primarily designed and implemented by academics, scientists, policy makers, and other professionals in power who approach policies and practices from a Western, scientific, perspective. We use the term “land management” to apply to a broad spectrum of Western environmental practices including conservation, restoration, and preservation. When we refer to how Indigenous Peoples have stewarded the lands for millennia, we will use the term “land stewardship,” recognizing an Indigenous relational and nurturing approach. Integrating Indigenous TEK expands the scope of land management to include important, evidence-based perspectives and observations, and relational care for the land that might be outside of the Western-based perspective and scientific mindset (Huaman and Swentzell, 2021; Wall Kimmerer, 2000). U.S. Secretary of the Interior Deb Haaland (citizen of the Laguna Pueblo in New Mexico and the first Native American U.S. cabinet secretary) explains at the UN Permanent Forum on Indigenous Issues on April 19, 2021, “It is Indigenous resilience and worldview that every government, country and community can learn from, so that we manage our lands, waters and resources not just across budget years, but across generations” (Haaland, 2021). Students studying to become professionals in land management fields can learn to engage with local Indigenous communities and jointly design land management strategies that honor and draw on Indigenous wisdom and TEK, address environmental justice, and build relationships that foster cross-culture knowledge sharing and understanding (Huaman and Swentzell, 2021). This integrative approach to land management can develop sustainable systems to nurture ecological health for future generations.

The Anonymized University (for blind review) Earth Partnership-Indigenous Arts and Sciences (EP-IAS) provides an innovative quasi-case study, sharing their story through narrative storytelling, in an effort to inform others interested in working with Tribal communities (Lewis and Hildebrandt, 2020). Their narrative addresses environmental justice and land management through a collaborative and reciprocal process between Indigenous communities partnering with the Anonymized University (for blind review) academic community. This Indigenous-academic partnership provides a model for creating and engaging in reciprocal partnerships that bring together Indigenous TEK and Western scientific ways of knowing and approaching land management in a co-production model (Yua et al., 2022). We are using the term Indigenous-academic partnership to denote partnerships between academic people and institutions with Indigenous Tribes, Nations, communities, and Peoples. We recognize that not all Indigenous communities are Tribes so we are trying to utilize an inclusive term that demonstrates the many types of partnerships possible. This approach addresses environmental justice issues and acknowledges Indigenous TEK as an integral component of land management training.

Authors on this paper come from both Indigenous and settler backgrounds. Author-1 is Inupiaq and an enrolled citizen of the Nome Eskimo Community with over a decade of experience working with Indigenous populations. Author-2 is of settler background with a background in community engaged environmental justice work. Authors-3 through 6 will be introduced in the EP-IAS section. We also want to recognize the effort taken to come together and write this paper during the COVID-19 pandemic, acknowledging that all of the authors are women, some mothers, and that half of the authors are also Indigenous. In this paper we strive to exemplify an Indigenous-academic partnership through not only our case study but in our work as co-authors, respecting one another’s knowledge, history, family, culture, and way of being. We write in the first person as we speak from our own experiences and knowledge.

In this article, our objective is to use an environmental justice lens to explain how to integrate Indigenous TEK into Western land management practices through Indigenous-academic partnerships. We address this objective through: 1) a review of the literature on environmental injustice in Indigenous communities, the role Indigenous TEK has in providing sound ecological principles for land management, and

examples of Indigenous co-management; 2) explaining how to engage in an Indigenous-academic partnerships; 3) utilizing qualitative narrative storytelling we detail the story and method through which some of our authors engaged in an Indigenous-academic partnership, the Earth Partnership-Indigenous Arts and Sciences (EP-IAS), with local Indigenous Tribal Nations through relationship building and dialogue to develop Indigenous-driven restoration and land management in the region; and 4) concluding with a discussion on how Indigenous-academic land management partnerships address environmental justice issues and create meaningful opportunities to address historical inequities. The quasi-case study we provide demonstrates the EP-IAS community engagement model, which exemplifies a mutually beneficial and respectful Indigenous-academic partnership through integrating Indigenous TEK and Western science in land management.

2. Environmental justice

2.1. Background on environmental justice

Environmental justice provides a helpful framing for re-calibrating land management practices and paradigms to include Indigenous communities and Indigenous TEK. Environmental justice encompasses many aspects of justice issues related to environmental policies on people including involvement in decision-making, recognition and process, public participation, and distribution of risk (Scholsberg, 2003). The inclusion of Indigenous communities and Indigenous TEK in environmental education, land management, and restoration practices is an important environmental justice issue.

Environmental justice grew out of the Civil Rights movement in the southern United States (U.S.) in the 1980’s and focuses on the disproportionate impact of environmental burdens and stressors on racially, ethnically, and economically marginalized communities (Bullard, 1990). Both the Civil Rights and Environmental Justice movements share the goal of community empowerment (Roberts, 1998). Indigenous communities have been involved in the Environmental Justice movement for decades and were involved in some of the early planning and framing of the movement (Scholsberg and Carruthers 2010). In 1994, the U.S. government formally recognized Environmental Justice through Executive Order 12898, “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations”, signed by Bill Clinton (United States Environmental Protection Agency, 1994).

The United States Environmental Protection Agency (EPA) defines Environmental Justice as “the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies (United States Environmental Protection Agency (EPA), n.d). The EPA goes on to define “meaningful involvement” as.

“People have an opportunity to participate in decisions about activities that may affect their environment and/or health; The public’s contribution can influence the regulatory agency’s decision; Community concerns will be considered in the decision making process; and Decision makers will seek out and facilitate the involvement of those potentially affected.”

This definition of meaningful involvement is useful for evaluating the historic and contemporary participation of Indigenous communities in the issues that impact them, their communities, and their land. We use the EPA definition for environmental justice in this paper because of the emphasis on the importance of the involvement of impacted communities in all stages of policy and practice.

It is important to remember that mainstream environmentalism focuses on preservation, conservation, recreation, and legislation, with a basis in Western scientific perspectives, whereas environmental justice explicitly includes protection and representation of marginalized

peoples. Bullard (1990) points out that the environmental movement in the U.S. is primarily driven by middle and upper middle class white people. Marginalized groups which are usually experiencing the brunt of pollution are generally excluded from the environmental conversation (Bullard, 1990). In contrast, the focus in environmental justice is on the health and wellbeing of marginalized communities to create a society in which “social needs, welfare, and economic opportunity are integrally related to environmental limits imposed on supporting ecosystems” (Agyeman et al., 2002, p. 78). Environmental justice has therefore reframed the mainstream environmental conversation by explicitly connecting participation of impacted communities into environmental decision-making and policies.

2.2. The effects of colonialism and environmental injustice on indigenous communities

Indigenous communities have experienced environmental injustices since settlers arrived on the shores of what is now called the U.S and began systematically removing Indigenous Peoples from their ancestral homelands and erasing their cultures, traditions, and knowledge systems through treaties and later Federal Indian law (Hooks and Smith, 2004; Wall Kimmerer, 2013). Policies removing children from their families and placing them in boarding schools, sought to explicitly eradicate Indigenous language, culture, and traditions. Treatment by colonizers involved massacres, wars, criminalization of culture, removal policies, and boarding schools which all caused extreme harm with lasting impacts. These experiences have led to historical trauma in Indigenous communities which is the collective psychological and emotional damage that is passed down from generations to generation and is manifested in a variety of ways including mental and physical illnesses (Brave Heart et al., 2011; Evans-Campbell, 2008). The relationship and connection to their lands was broken through forced removal policies and continued colonizing practices. Today, Indigenous communities continue to experience injustices as radioactive contamination, energy projects, and waste sites plague their ancestral lands (Gilio-Whitaker, 2019). Termed the “Treadmill of Destruction,” Indigenous lands have become sacrifice zones for the U.S. (Hooks and Smith, 2004). The complicated relationship between Indigenous communities and the U.S. means that federal policy is often responsible for the disproportionate environmental burden (Walker et al., 2002). The lack of invitation to be historical and contemporary participants in policy development and implementation has diminished Indigenous communities’ abilities to be rights holders in land management decisions and practices (Walker et al., 2002).

This lack of invitation does not mean Indigenous communities are or have ever sat silently as they experience(d) environmental injustices. Indigenous communities have been and continue to take action to protect their land and ways of life. One example includes the efforts by the Standing Rock Sioux and other Indigenous communities who gathered starting in 2016 to serve as water protectors to stop the construction of the Dakota Access Pipeline (Whyte, 2017). The pipeline construction not only posed risks to Tribal land and waters but was being built on land the Tribal Nations had never consented to ceding to the U.S. and was disturbing an ancestral burial site as well. Sadly, the Dakota Access Pipeline issues are nothing new. Since colonization began, Indigenous people have sought and fought to regain control of the land taken from. The “Landback” movement was recently launched as an online campaign to spread awareness of this centuries-long, ongoing issue, by the NDN Collective in 2000 (NDN Collective, n.d).

Ojibwe author David Truer further drew attention to returning land taken from Indigenous people in his article about returning National Parks to Tribes (Truer, 2021) which had also been explored in the book by Mark David Spence (1999) on making National Parks. These efforts shed light on colonization and the resulting Indigenous land loss - an issue not often taught as Indigenous histories have primarily been written by non-Indigenous people, further silencing Indigenous voices

and contributions in public education (Leary, 2013; Loew, 2013). This results in Indigenous TEK, perspectives, and voices being omitted from land management practices. We need new paradigms and models in which Indigenous communities are collaborating with academics and land managers to bring Indigenous TEK into public education and land management practices.

3. Integrated land management: indigenous Traditional Ecological Knowledge and western science

3.1. Indigenous land stewardship

For millennia, guided by the belief that all life is sacred, Indigenous Peoples have been practicing a relationship-based approach for sustainable land stewardship, with the inclusion of culture, connection, ceremony, spirituality, and Elder generational knowledge (Kealiikana-kaoleohaililani and Giardina, 2016). Robin Wall Kimmerer (citizen of the Potawatomi Nation) explains, “In Indigenous sciences, it’s not possible to separate the knowledge from the ethics of the responsibility for that knowledge — whereas in Western science, we do that all the time. [ignoring relationships, morals, and values] Indigenous knowledge puts them back in” (Cernansky, 2021). Indigenous Peoples draw on their TEK which is their living ecological knowledge, based on a rich history of observation, practices, and beliefs between humans and their local landscapes and ecological systems (Berkes, 1993; Huntington, 2000; Wall Kimmerer, 2000). This knowledge includes oral traditions passed down that guides future generations in how to manage local resources respectfully and responsibly for generations to come (Berkes et al., 2000). Indigenous peoples draw on this knowledge to manage their own lands and resources through their sovereignty, and their respect and relationship with the natural environment (Cuomo, 2021).

Indigenous land stewardship extends back at least 12,000 years where most of the Earth was inhabited and thusly shaped, by Indigenous people through transformative practices like hunting, species domestication, and cultivation (Ellis et al., 2021). Indigenous stewardship practices are based on generations of knowledge, and a recent report on the decline of species and ecosystem diversity found that land that is being managed by Indigenous Peoples has less rapid species and ecosystems declines than other lands (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, 2021). However, the majority of the lands they managed for millennia, their ancestral traditional lands, have been taken from them through colonization including forced removals and forced treaties and are now managed through Western-based practices.

Currently, Indigenous people make up only 6 % of the world’s population, but they manage 25 % of the land which supports 80% of Earth’s global biodiversity (Inhabit Films, 2021). Through Indigenous approaches to biodiversity and sustainability, they provide clean air and water as well as food for people worldwide (ICCA Consortium, 2021). Indigenous practices such as prescribed fires in California by the Karuk Tribe, Hopi dryland farming in Arizona, sustainable forestry by the Menominee in Wisconsin, buffalo restoration by the Blackfeet in Montana, and Native Hawaiian food forests demonstrate Indigenous holistic perspectives and TEK around land stewardship, emphasizing the relationships between people and the land (Inhabit Films, 2021).

Indigenous relationship-based approaches to the land are in stark contrast to resource-based approaches practiced by the Western world which emphasize using the land for productivity and profit generation such as timber harvesting, farming, damming, and cattle grazing, please see Table 1 (Gilio-Whitaker, 2019; Mauer, 2020). Indigenous stewardship practices traditionally utilized farming, hunting, migration, and even dispersed seeds which contrast with the resource extraction practices of today like single-crop farming and continual grazing which are very taxing on the land (Ellis et al., 2021). This difference in approaches to land use and management instead of stewardship resulted in European and Russian colonial settlers viewing the land as untouched and

Table 1
Indigenous Worldviews and Western Worldview (Barnhardt and Kawagley, 1999, adapted from Knudtson and Suzuki, 1992, p. 13–15).

Indigenous Worldviews	Western Worldview
Spirituality is imbedded in all elements of the cosmos	Spirituality is centered in a single Supreme Being
Humans have responsibility for maintaining harmonious relationship with the natural world	Humans exercise dominion over nature to use it for personal and economic gain
Need for reciprocity between human and natural worlds -resources are viewed as gifts	Natural resources are available for unilateral human exploitation
Nature is honored routinely through daily spiritual practice	Spiritual practices are intermittent and set apart from daily life
Wisdom and ethics are derived from direct experience with the natural world	Human reason transcends the natural world and can produce insights independently
Universe is made up of dynamic, ever-changing natural forces	Universe is made up of an array of static physical objects
Universe is viewed as a holistic, integrative system with a unifying life force	Universe is compartmentalized in dualistic forms and reduced to progressively smaller conceptual parts
Time is circular with natural cycles that sustain all life	Time is a linear chronology of "human progress"
Nature will always possess unfathomable mysteries	Nature is completely decipherable to the rational human mind
Human thought, feelings and words are inextricably bound to all other aspects of the universe	Human thought, feeling and words are formed apart from the surrounding world
Human role is to participate in the orderly designs of nature	Human role is to dissect, analyze and manipulate nature for own ends
Respect for elders is based on their compassion and reconciliation of outer- and inner-directed knowledge	Respect for others is based on material achievement and chronological old age
Sense of empathy and kinship with other forms of life	Sense of separateness from and superiority over other forms of life
View proper human relationship with nature as a continuous two-way, transactional dialogue	View relationship of humans to nature as a one-way, hierarchical imperative

natural upon arrival when in fact the land had been managed by Indigenous Peoples for generations (Gilio-Whitaker, 2019). After colonization, settlers believed that Indigenous Peoples were incapable of managing the land as they were not using it for profit generation and productivity as the settlers would, seeking to exert their control over the physical world (Gilio-Whitaker, 2019; Mauer, 2020).

As settlers advanced and dominated land management practices in the U.S., they perpetrated ecological violence through dispossessing Indigenous Peoples of their lands and disregarding their sovereignty and self-determination (Mauer, 2020). This cycle became the norm as land was taken through colonialism- land management practices were led by Western scientific models and Indigenous TEK practices of stewardship were no longer allowed (Gilio-Whitaker, 2019; Mauer, 2020). The Western-based model ignored Indigenous Peoples' sovereignty, self-determination, TEK, ways of stewardship, and impacted all aspects of their lifeways; ultimately leading to management practices that were not sustainable and prevented Indigenous people from practicing their relationship-based approach to land stewardship.

3.2. Difficulties integrating indigenous TEK into western-based land management

While we are advocating for the meaningful integration of Indigenous TEK and Indigenous participation in land management, we recognize that even though integration provides a wealth of data and valuable contributions to Western-based management practices, there are some difficulties in Indigenous TEK knowledge holders and Western scientists working together. The first difficulty for Western scientists working with Indigenous TEK in land management, is due to Indigenous TEK primarily being an oral resource, drawing on oral histories in which environmental observations, understandings, and practices are passed

down through the generations (Huntington, 2000). Oral histories are a different form of data that many natural and physical Western scientists who work in land management are unfamiliar working with and may require social scientists and/or Indigenous Peoples to team up with physical and natural scientists to first gather the oral histories and write them down so that they can then be drawn on in land management and natural and physical science research (Cruikshank, 2012).

The second difficulty in engaging with and integrating Indigenous TEK into Western-based land management practices is that it requires scientists to be flexible and think about data in a different way, including oral traditions and observations as forms of data and not just instrumental measurements (Huntington, 2000). Third, integrating Indigenous TEK requires cross-cultural interaction which is difficult for some Western trained scientists. Finally, with the history of Western researchers extracting information from Indigenous sources without acknowledging them or recognizing and respecting Indigenous data sovereignty and intellectual property rights, many Indigenous communities do not trust and are unwilling to work with Western scientists (Hodge, 2012). These problems can be addressed through Western scientists taking the time to sit down with Indigenous people, talking to them as equals and knowledge holders, and building partnerships with them in research from the beginning of the process, as will be explained the next section on Indigenous-Academic Partnerships: The Ethics of the Process (Huntington, 2000).

3.3. Benefits of including indigenous TEK in land management

The benefits of including Indigenous TEK far outweigh the difficulties. The main benefit of engaging with Indigenous TEK is the generations of data communities have collected which provides baseline data from centuries ago through a long history of observations that Indigenous Peoples are trained in and use daily to make hunting and land management decisions (Huntington, 2000; Moller et al., 2004). Indigenous TEK expands scientific understanding by broadening the data from what was collected at the field site by visiting scientists, to a much larger spatial area utilized by Indigenous TEK users in their day-to-day life as they hunt, fish, and gather, collecting daily observations of the environment (Gagnon and Berteaux, 2009). Western science alone often misses important events because the data collection period is so short while Indigenous TEK provides daily observations over centuries (Moller et al., 2004). Indigenous TEK can inform ecological systems, impact assessments, land management practices, and scientific research (Huntington, 2000). Indigenous TEK has been used for species counts, to locate field sites for study, to obtain specimens, and to interpret data collected as well as to monitor resources, protect species and habitats, and manage the land and resources (Berkes et al., 2000; Huntington, 2000). Indigenous TEK is invaluable to land management practices, and provides a comprehensive understanding of species, place, and resources.

3.4. Co-management for inclusion of indigenous TEK in western-based land management

Co-management is one alternative to Western-based land management practices that seeks the management power to be shared between government agencies (e.g., states and U.S. federal government) and local people (e.g., Indigenous Nations and communities), which brings Indigenous TEK into management practices (Diver, 2016). Co-management practices have sought to create a space for Indigenous Peoples to provide their perspectives in international, state, and federal land management practices on lands that were their traditional ancestral lands that have been taken from them through colonialism. The actual practice of co-management is often problematic as Indigenous cultural interests conflict with economic goals the state or federal government may have for the land (Gilio-Whitaker, 2019). When Indigenous Peoples are consulted in co-management, there is often a lack of meaningful

engagement due to power differences of the different actors involved (Caulfield, 1997). Instead, there tends to be different degrees of co-management ranging from a consultative participation from the local knowledge holders (such as Indigenous Peoples) all the way to a community-driven management strategy (Diver, 2016). A relevant example of a more equal co-management partnership is in California where the Karuk Tribe in partnership with the USDA (U.S. Department of Agriculture) Forest Service and other California state and community organizations to help manage the lands and reduce wildfires through utilizing cultural burn treatments that will reduce fuel the wildfires feed on (Marks-Block, 2020; Senos et al., 2012; Sommer, 2020). This partnership between the USDA Forest Service and the Karuk Tribe demonstrates how integrating Indigenous TEK and Western science provides useful tools for understanding and managing land.

We look to the current U.S. administration for the possibility of changes to federal land management policy and practices. On President Biden's first day of office, January 20, 2021, he signed an executive order to advance "equity for all, including people of color and others who have been historically underserved, marginalized, and adversely affected by persistent poverty and inequality" (Exec. Order, 2021). President Biden also appointed Deb Haaland, an Indigenous person, as Secretary of the Interior. Secretary Haaland has since issued two secretary's orders in 2021 which established a Climate Task Force, advanced environmental justice and work with Indigenous Tribal Nations, and sought to reduce the complexity of Indigenous Nations being able to put land into trust so they can manage their own lands (Sec. Order, 2021). On November 15, 2021 the White House released a memorandum titled Indigenous Traditional Ecological Knowledge and Federal Decision Making, and they are holding Tribal consultations on how to do this in the spring of 2022 (Executive Office of the President, 2021). In March 2022, the Director of the National Park Service stated in a congressional hearing that they are committed to increasing the role Tribal Nations play in the management of public lands (Tribal Co-management, 2022). These are promising federal practices that we hope further include Indigenous TEK in land management.

Integrating Indigenous TEK into land management through partnerships addresses environmental justice issues, respects Indigenous sovereignty and self-determination, involves Indigenous Peoples in meaningful ways, and engages with Indigenous perspectives and knowledge based on a history of observation, experiences, and a relationship with the natural world (Mauer, 2020). Indigenous TEK provides centuries of information and perspectives to Western-based scientific management and restoration practices through holistic understandings of the environment (Wall Kimmerer, 2000). Integrating TEK with western land management practices provides a way for effective, holistic sustainable land management.

4. Indigenous-academic partnerships

4.1. *The ethics of the process*

One promising avenue for incorporating Indigenous TEK with Western science in land management is in Indigenous-academic partnerships, which could provide training for emerging land management practitioners while incorporating Indigenous perspectives. However, as with other partnerships, there is a traumatic history between academic institutions and Indigenous Peoples which needs to be addressed. Non-Indigenous academic researchers have a history of viewing Indigenous Peoples as research subjects, taking sacred items from their communities, and discrediting their TEK which has hurt relationships between the two groups (Kovach, 2010; McKeown, 2020). Other unethical research practices that have hurt Indigenous Peoples include: conducting "helicopter research" where research come in to gather data and then leave with that data, not returning anything useful to the community (Wallerstein and Duran, 2008); collecting data without consent such as the radioactive thyroid study on Alaska Natives; using data

outside of the initial agreed upon research parameters such as the Havasupai blood samples being used for non-diabetes research; and releasing project results to the media before the community which had lasting damaging effects on the community such as the Barrow Alcohol Study (Hodge, 2012). Deficit-based studies like the Barrow Alcohol Study can lead to stigmatization and marginalization of Indigenous communities as well (Chase, 2019; Hyett et al., 2019). This history of research abuses has created a mistrust between Indigenous Peoples and researchers that serves as a barrier to partnerships.

It is vital that academic partners become aware of the rights of Indigenous Peoples and recognize their sovereignty, self-determination, data sovereignty, rights to free, prior, and informed consent (FPIC), and Indigenous governance when seeking to work with them in environmental management (UN General Assembly, 2007). When these rights are ignored, legal and ethical issues arise, settler colonial ecological violence continues, cultural values and practices are not valued, and Indigenous Peoples are harmed from the research (Moodie, 2010; Smith, 2012; Dhillon, 2020; Mauer, 2020). Indigenous Peoples need to be treated as equal partners in Indigenous-academic collaborations as they are not passive subjects, and their data sovereignty needs to be respected (Global Indigenous Data Alliance, 2018). Harding et al. (2012) developed a list of some of the many ethical codes for people doing work with Indigenous communities.

There are still challenges today with mutually beneficial, equitable partnerships in Indigenous-academic collaborations. Repatriation from museums, private collections, and universities is still underway, as Indigenous Peoples seek to take back what has been taken from their communities and graves over the centuries (McKeown, 2020). Additionally, in a study of papers written on climate research from 1996 to 2015, 87% of the studies reviewed practiced an extractive model of research, where Indigenous TEK was utilized but Indigenous communities were not equal partners in the research process (David-Chavez and Gavin, 2018). This problem often arises when researchers are not truly committed to the partnership and instead just want access to Indigenous TEK without engaging with the Indigenous community in the research process, but the consequences can be far reaching because it can reinforce Indigenous communities' mistrust of academic partnerships. Another problem comes from researchers going into Indigenous communities already having their research questions formalized rather than considering the interests and concerns of the community through co-production (Kawerak Social Science Program et al., 2020). Yet another issue is researchers failing to disseminate the data in a way or form that is useful to the community they worked with (Brunet et al., 2016). As academics are recognizing the value Indigenous TEK can bring to research and are increasingly seeking to partner and collaborate with Indigenous Peoples through community-engaged research it is important they do so in ethical and appropriate ways (Adams et al., 2014; Strand et al., 2003). Instead of following the typical research scenarios that "tell" Indigenous communities what the research agenda is an attempt to "fit" the community with the developed study design and purpose, best practices to engage in Indigenous and academic partnerships are described below.

4.2. *Best practices in indigenous-academic partnerships for land management*

Best practices in Indigenous-academic partnerships demonstrate that both parties need to be fully invested in the partnership for ethical and equitable partnerships to take place. Engaging in co-production and an asset-based approach emphasizes Indigenous TEK, wellbeing, sovereignty, self-determination, and resilience (Chase, 2019; Hyett et al., 2019; Kawerak Social Science Program et al., 2020). The goal is to conduct mutually beneficial research, where both the researchers and Indigenous communities benefit from the project in the way that they want to (Gordon, 2017). Gordon, 2017 provides an eight-step model on how to build mutually beneficial research relationships anchored in

trust between Indigenous communities and researchers which includes, “Knowing extensive community history, developing strong local contacts, communicating openly about the project, treating the community members as equals, displaying [culturally appropriate] manners and etiquette through honesty and reciprocity, acting ethically in [I]ndigenous cultures...exchanging knowledge to build...capital, and giving project results to the community so they can be put to practical use” (Gordon, 2017, p. 237). Actions researchers take while following the model lead to trust building, and can ultimately lead to authentic friendship and understanding due to all the hours spent together, sharing meals, research time, personal time, which truly strengthens the relationships so necessary for co-production and mutually beneficial research (Gordon, 2017; Fox et al., Kawerak Social Science Program et al., 2020). Fig. 1.

It is also important to utilize free prior and informed consent to involve Indigenous communities in all phases of the research that they would like to be involved in, which could include the conception, design, implementation, data analysis, and knowledge dissemination (Adams et al., 2014; Brydon-Miller, 2009; David-Chavez and Gavin, 2018; UN General Assembly, 2007). Additionally, as Indigenous people are experts in Indigenous TEK and other areas they need to be compensated for their roles as research participants with honoraria or stipends (Brunet et al., 2016). Finally, dissemination of the research results must be more than just an academic publication but something useful to the community (Brunet et al., 2016; Gordon, 2017, 2021). Taking a mutually beneficial approach to research partnerships that emphasize participatory methods and an asset-based approach leads to improved relationships between academics and Indigenous Peoples, trust, and an exchange of knowledge.

As these practices are considered, researchers engage in decolonizing the research process (Gordon, 2022). This includes taking an approach that is: 1) asset-based to prevent further stigmatization and marginalization (Hyett et al., 2019; Tuck, 2009), 2) participatory to privilege Indigenous Knowledge and the co-production of knowledge (Gordon, 2021; Yua et al., 2022), 3) centered on engaging in free, prior, and informed consent (UN General Assembly, 2007), and 4) creating space for trust building (Gordon, 2017). This is done through engaging in mutually beneficial research and utilizing Indigenous methodologies or methodologies that have been adapted to be in alliance with Indigenous methodologies through utilizing an Indigenous relational theoretical framework (Datta, 2015; Gordon, 2021; Smith, 2012). These adaptations value and prioritize Indigenous TEK, Indigenous sovereignty, and Indigenous self-determination and involve traditional Indigenous practices like story-telling and talking circles (Kovach, 2010; Bowman, 2020). Tribally-driven Participatory Research (T DPR) is another adaptation that came about from community-based participatory research to be in alignment with Indigenous methodologies, and T DPR moves from the research being Tribally based to Tribally driven (Letendre and Caine, 2004). Researchers engaged in T DPR or other Indigenous methodologies co-create research designs, conduct asset-based work, build community capacity to conduct their own studies, and conduct research that is of most importance to the local community, including honoring internal

community processes and requesting Tribal Council or Tribal IRB (Institutional Review Board) approval (Mariella et al., 2009).

Approaching partnerships with Indigenous communities with these best practices explicitly at the forefront is one way that we have found to create successful and mutually beneficial partnerships, which include Indigenous voices and Indigenous driven and centered research designs, while also including Indigenous contributors as authors if they would like to be. When academic partners begin collaborations with Indigenous communities and individuals, they need to be mindful of the problematic history between Indigenous Peoples and academic institutions. Academic organizations can create strong partnerships based on the principles of good communication, power sharing, incorporating partners’ voices into all aspects of the design and planning they want to be involved in, and creating long-term commitments. A commitment to relationship building with a desire to work together from planning to implementation, mutual learning, cultural understanding, and commitment to knowledge generation and perpetuation effectively benefits efforts to address landscape scale issues (Bussey et al., 2016). Academic and Indigenous partners are currently creating new partnerships that provide exciting models for how to improve these relationships and incorporate more Indigenous TEK into land management practices, education, and research as we explain in the case study below.

5. The earth partnership indigenous arts and sciences program (EP-IAS)

The following is not a formal case study but rather we are sharing our story through narrative storytelling in an effort to inform others interested in working with Tribal communities (Lewis and Hildebrandt, 2020). In our experiences developing collaborations (authors 3 through 6), we have learned that forming equitable relationships begins with honoring community interests and values, supporting the health and well-being of the community, and respecting the decisions made by the community. Author-3 is the Director of EP-IAS and co-developed the idea for IAS with Tribal community partners; Author-4 works for EP-IAS and has ten years of experience working with Native Nations in Wisconsin; Author-5 works for EP-IAS and is a citizen of the Choctaw Nation of Oklahoma working to help Native youth thrive; and Author-6 is a traditional Lunaape Kwe (woman) and community member of the Stockbridge-Munsee Band of Mohican Nation working as an external evaluator for EP-IAS. As authors we want to emphasize through this quasi-case study/narrative storytelling that building mutually beneficial collaborations with Tribal communities, which includes developing personal relationships, is key to addressing issues raised in this paper.

Before sharing about Earth Partnership Indigenous Arts and Sciences (EP-IAS), we acknowledge that our program originated at Anonymized University (for blind review). The land Anonymized University (for blind review) currently occupies is Ho-Chunk Land, and Anonymized University (for blind review) sits on a place the Ho-Chunk Nation has called Teejop (Day-JOPE) since time immemorial. In an 1832 treaty, the Ho-Chunk were forced to cede the territory Anonymized University (for blind review) now occupies. This was followed by decades of ethnic cleansing when both the federal and state governments repeatedly, but unsuccessfully, sought to forcibly remove the Ho-Chunk from Wisconsin. This history of colonization informs EP-IAS’s shared future of collaboration and innovation. Today, Anonymized University (for blind review) is working towards culturally and legally respecting the inherent sovereignty of the Ho-Chunk Nation, along with the eleven other Indigenous Nations of Wisconsin. This is done primarily through pockets of partnerships and projects, and it is an ongoing process to bring about systemic change at an institutional level.

5.1. Background/Moving from EP to EP-IAS

The development of the EP-IAS program provides a model of an Indigenous-academic partnership that recognizes, respects and includes sovereignty of Tribal Nations through collaborative design and planning



Fig. 1. Eight-step Model on Mutually Beneficial Research Relationship Building (Gordon, 2017).

while creating new possibilities for integrating Indigenous TEK with Western science-based land stewardship practices. The Earth Partnership (EP) restoration education program began at the Anonymized University (for blind review) Arboretum in 1991 as a way for teachers to actively engage students in living the community-focused “land ethic” described by Arboretum co-founder Aldo Leopold (1949). The program frames restoration as a learning process, a hands-on way to deeply connect to place and enact ecological values. EP focused on an experiential process using ecological restoration as a context for science, technology, engineering, and mathematics (STEM) learning across discipline, age, learning style, culture, and place. Ecological restoration transforms people’s relationship with the land where they begin to see themselves as “plain members and citizens” of the ecological community. As they transform themselves and their role, they learn to care for nature and become stewards in their own communities providing them competency and purpose to make a difference in the world.

Prior to the formation of IAS, EP met with a small group of Indigenous leaders to introduce the EP program that works with schools and teachers to connect students to the land through ecological restoration and asked if there may be interest in working together. Once there was an agreement, it was decided to hold community listening sessions with Indigenous and non-Indigenous leaders, community members, students, educators and natural resources staff. EP held multiple dialogues posing the following question:

“Imagine we are in the future, perhaps 10 years from now, and young people are meaningfully engaged at their schools. They are developing good stewardship practices that influence choices for their careers and themselves. Their choices contribute to the health of the land and well-being of the community. What do young people need to learn and experience to make this happen?”

Responses from the dialogue ranged from 1) more widespread understanding of ecological and human interconnectedness; 2) acknowledge the value of Indigenous TEK as a powerful resource; 2) the importance of developing cooperative community – family – school relationships (centering community as the foundational element of learning); 3) developing and utilizing authentic culturally-driven learning resources, and knowledge sharing, and 4) understanding that stewardship means you are sharing with the past, present and the future. A critical goal voiced by all Indigenous communities was that these strategies would engage Native youth in education and career pathways. As a result, they would be prepared to manage their own lands and participate in natural resource management decision-making. The testimony offered by one Elder participating in the dialogues speaks succinctly to the effectiveness of active listening through community dialogue: “For the first time in my life, I think the university has heard me.”

5.2. Participants

In 2011, to reimagine an Indigenous-academic partnership based on mutual respect and shared interests, the EP-IAS initiative at Anonymized University (for blind review) began in response to Indigenous community-identified needs for water stewardship, protection of subsistence harvest, resilience in the face of climate change on cultural practices, and Indigenous youth access to higher education and natural resource careers. When first approaching Indigenous potential partners, the EP program staff acknowledged that their program philosophy is also based on a respect for the land community - a transcendent and uniting concept – while also affirming important differences in orientations that stem from unique cosmologies, languages, and philosophies.

EP-IAS was co-developed by the Anonymized University (for blind review) Earth Partnership (EP) and Indigenous partners in Wisconsin, including the Mashkiziibii (Bad River Band of Lake Superior Chippewa), Ho-Chunk Nation, Lac Courte Oreilles Band of Lake Superior Chippewa Indians, Waswaagoning (Lac du Flambeau Band of Lake

Superior Chippewa Indians), and the Miskwaabekong (Red Cliff Band of the Lake Superior Chippewa). EP-IAS strives to uphold the widely held Indigenous values of respect, relationship, reciprocity, and responsibility, which guides the program model for active listening (Brayboy et al., 2012; YoungBear-Tibbetts, 2013). EP-IAS continues to focus on ecological restoration, environmental stewardship, and equitable education. Holly Young-Bear Tibbits, the first EP-IAS advisor, author and Indigenous scholar, credited EP-IAS as the first Anonymized University (for blind review) university Indigenous initiative to explicitly employ and develop a model for multicultural engagement (YoungBear-Tibbetts, 2013).

5.3. Methods engaged in

The EP-IAS quasi-case study/narrative storytelling provides a framework and insights into employing an Indigenous-academic approach to land stewardship and education working with Indigenous communities in an equitable manner. In this process of relationship building, EP- IAS sought to: respectfully and authentically engage Indigenous TEK in the process of ecological restoration education as a way to make science learning more equitable; to engage Indigenous youth as the next generation of environmental scientists and stewards; and to develop educational and environmental collaboration among Native and non-Native people, respectfully integrating Indigenous TEK and Western science to work towards greater land and water health through Indigenous-academic land management practices. A multicultural design, learning from Indigenous partners, and Indigenous scholarship helped to refine EP-IAS programming to an Indigenous centered way of working together. [Photo 1](#).

Through listening and practicing humility, EP-IAS has learned the following key strategies and processes for successful partnerships between Indigenous communities and academic institutions:

- Bring Indigenous and University expertise together to work towards durable local outcomes.
- Begin with dialogues to understand the perspectives and goals of each community.
- Engage partners in the co-design process from the beginning of the project.
- Develop research methods and instruments cooperatively.
- Follow Indigenous community’s protocols for grant and research approvals.
- Adhere to data sovereignty and employ flexible timelines and feedback loops.
- When applying for funding, establish Co-Principal Investigators from the community.
- Establish a local coordinator in each community to build relationships and trust.
- Form an advisory group of Indigenous scholars.



Photo 1. Participants planting native species to replace a lawn area near a lake.

- Co-host annual meetings and visits to the communities.
- Maintain regular communications including virtual and face-to-face meetings.
- Co-author journals and co-present at conferences for dissemination.

5.4. Results: specific to Indigenous-academic land management

EP-IAS restoration experiences build capacity for land stewardship by preparing young Indigenous people to manage their own lands and non-Indigenous people to manage land through an Indigenous TEK lens. These opportunities engage learners based on the values, traditions, and educational priorities essential to their communities while also facilitating pathways to environmental science careers, working towards a larger community goal of Indigenous-led land management that affirms Indigenous sovereignty (Bauer-Armstrong, 2019). This is nation building (Cornell and Kalt, 1998; University of Arizona, n.d; Bowman, 2020) partnership engagement which contributes to the protection and strengthening of culture, community, sovereignty, and decision making through this project with our Indigenous Tribal Nation partners and their community members.

EP-IAS implements community-based restoration and land management on Indigenous lands to address water quality, environmental health, biodiversity, and to support traditional subsistence practices. For example, EP-IAS, through its community engagement model, addresses water quality issues by planting shoreline buffers, removing invasive species in wetlands and reseeding with wild rice, and building rain gardens. For example, interpretive signs to inform guests how to improve water quality by utilizing sustainable landscape practices to protect water, increase diversity, and provide habitat for pollinators was developed at the Legendary Waters Resort and Casino, through the Red Cliff Band of Lake Superior Chippewa Indians Department of Natural Resource. Other land management practices utilizing Indigenous TEK and Western science include woodland and prairie restorations and planting native species at community parks, schools and public spaces. EP-IAS also provides institutes to build capacity for non-Indigenous practitioners and educators to integrate Indigenous TEK and Western science into their curriculum. This integration of TEK and Western science brings together the best of both sciences to better prepare students for land management careers.

IAS is a collaboration with Native Nations in Wisconsin which works with youth, families, teachers, and communities around culturally relevant learning experiences and the exploration of careers in environmental education with a goal of “Indigenizing” science education. IAS efforts go beyond restoration to include reciprocal restoration as articulated by Robin Wall Kimmerer, IAS Advisor, which includes re-establishing cultural practices along with revitalizing the use of Native language. The power of reciprocal restoration heals relationships among humans and the natural world. An example of reciprocal restoration is the following story in which Indigenous youth work alongside Elders mapping wild foods and medicine on Reservation lands. The Indigenous TEK component includes learning from Elders, learning to identify plants, learning the traditional names, and oral storytelling about the cultural connections associated with the plants. The integration of Western science is the use of applied digital technology for environmental monitoring, baseline data collection, developing maps for community members to locate plants for harvesting, and decision making for managing plant populations. For EP-IAS, centering authentic partnership is the basis for both equitable education and healthy land and water. This means acknowledging historical and contemporary injustice, while also providing hope that we can collectively become good neighbors as we envision a new shared future, one of literal and figurative common ground in our joint tenancy of this Great Turtle Island (North America) (YoungBear-Tibbetts, 2013). Fig. 2.



Fig. 2. EP-IAS process.

5.5. Reflecting on relationship challenges

We acknowledge that academic institutions are a product of colonization, and therefore need to actively work toward to reverse the practice of hierarchical relationships between universities and Indigenous Nation. This process is challenging and requires deep reflection, a willingness to continue to learn, humility and commitment to the 4 R’s: respect, relationship, responsibility and reciprocity. As with any relationship, expect challenges. The historical reality is Indigenous Nations, have been harmed by educational institutions, including boarding schools that served as tools for assimilation (Newland, 2022). Given this fact, we encounter various levels of mistrust in our work from Indigenous Nations or individual Indigenous Tribal members. The EP response is to listen, honor the words spoken, and accept their decisions. However, there may be an opportunity to build partnerships later, for example when one time we were contacted three years after an initial ask.

Another issue that affects relationship building is how research is typically done on Indigenous Nations rather than with them. Researchers come in and do their research then leave (Wallerstein and Duran, 2008). It is often short-term and extractive. Additionally, educational programs are designed and implemented with little to no consultation with Indigenous Nations and then disappear when funding is gone. Knowing the typical Indigenous-academic interactions, an Elder asked in an almost accusing tone, “How long are you going to be here?” Our reply is “We are committed to working with you as long as we are wanted.” As a soft-funded program, we are challenged by the need to constantly search and apply for grants.

A factor that has helped with relationship building and earning trust is having an Indigenous Tribal Principle Investigator in each partner community. This person co-designs and co-manages the project, and shares in the responsibility and decision making, which ensures programming aligns with Tribal priorities in caring for the land and education outreach. Until recently it was nearly impossible to add external study team members not affiliated with the university in conducting research through the University’s Institutional Review Board (IRB) process due to restrictive IRB processes built for institutions instead of community partners. In 2020, EP hosted a “Culturally Responsive Research Relationships: Building the Awareness and Skills of Academic Partners to Work in Good Relations with Native Nations and Indigenous Communities” led by (author-6). This session introduced implementation methods for culturally responsive research practices with Indigenous Communities. After participating in a series of webinars, the University made appropriate changes which now allows for adding Indigenous Tribal study team members and creating space for their voice in the research process.

The next phase for EP-IAS is implementing TDPR (Mariella et al., 2009) to provide insights on sustainable or scale-up strategies, as well as gaps (Indigenous pedagogy, culturally responsive partnership development, strengthening outreach strategies, etc.). EP-IAS, through funding from the Spencer Foundation, is using Indigenous and critical theories and methods to authentically engage Indigenous Peoples, coalitions, and non-Indigenous university faculty, staff, and community participants as true partners in research studies around land stewardship and education. EP-IAS works “with,” as opposed to “on,” Indigenous participants (Bowman et al., 2018). Together the best of inter-relational scientific, Indigenous, and Earth justice theories and methods can be braided together to co-design, co-implement, and celebrate important work

together (Huaman and Swentzell, 2021). Truly these scientific, cultural, and spiritual roots represent the heart of our work. **Photo 2.**

6. Conclusion

Integrating Indigenous TEK and Western science into land management has the potential to alter the way people collectively care for the land and also to address long-standing environmental justice issues that have burdened Indigenous communities. Indigenous Peoples in the U.S. have faced historical environmental injustices from first contact with settlers arriving and these have continued through the present, resulting in Indigenous communities not being meaningfully involved in the decisions that impact them, their communities, and their ancestral homelands. The authors of this paper recognize that current land management policies and practices are rooted in histories of colonialism and governing practices and seek to provide a framework for healing and collaboration.

Indigenous Peoples have amassed a wealth of knowledge over generations about the local environment. This Indigenous TEK includes observations, oral traditions, and an understanding of interconnectedness. Integrating Indigenous TEK into land management practices benefits practitioners by providing rich ecological data while combining it with a long-term social cultural context. This integration can lead to more sustainable land management practices and provides a pathway to meaningfully involve Indigenous communities. Referring back to the EPA definition that places an emphasis on “meaningful involvement” of impacted communities and states that impacted “people have an opportunity to participate in decisions about activities that may affect their environment/or health”, the EP-IAS case study provides a roadmap for how Indigenous communities and Western stewardship programs can have authentic dialogue that fosters equal collaboration (United States Environmental Protection Agency, 1994).

One avenue for integrating Indigenous TEK with land management training is through Indigenous-academic partnerships. These collaborations have the potential to foster relationships and provide important benefits for Indigenous and academic partners that include multicultural education and integrated land management practices. The EP-IAS partnership addresses environmental justice by creating a foundational relationship where Indigenous partners feel listened to and whose concerns and goals are incorporated into the partnership design. EP-IAS sees Indigenous TEK as an asset and beneficial tool for local ecological stewardship initiatives and actively works to integrate this type of knowledge into management practices.

Practicing environmental justice through meaningful involvement can be done in a mutually respectful and beneficial way through integrating Indigenous TEK into widespread land stewardship practices as we learned with the stages of listening, dialogue, and co-planning. Integrating Indigenous TEK ensures that it is valued and respected which increases Indigenous Peoples’ ability to influence policy decisions. Through educating land managers and young people, EP-IAS is actively working to incorporate more Indigenous TEK in Western ecological stewardship strategies while explicitly working to address long-standing justice and power tensions. The integration of these practices can ultimately change the policy by highlighting the benefits of Indigenous TEK and providing a roadmap of working through historically difficult issues.

EP-IAS has shown that a thoughtful and reciprocal-minded approach to Indigenous-academic collaborations can be an effective method for working with Indigenous Tribal Nations and communities. The EP-IAS partnership characteristics of meeting with Indigenous communities to identify needs, co-designing and planning the program, and incorporating Indigenous TEK and Western scientific ways of a comprehensive and holistic understanding of land management, provides a roadmap for other entities looking to enhance partnership opportunities between academic or scientific groups and Indigenous communities. EP-IAS is actively working to create positive and reciprocal relationships between



Photo 2. Students assessing the change in biodiversity of plants and wildlife in a young prairie.

academic programs and Indigenous communities, through environmental science that reframes and reclaims education in Indigenous communities and affirms Indigenous self-determination and sovereignty. Inquiry through the EP-IAS program is helping to build and refine a model of collaborative Indigenized science education that engages Indigenous and university partners, acknowledging important differences in perspectives and experiences while emphasizing overarching shared commitments to more equitable education and environmental health. Best practices from the literature and the EP-IAS can be applied to numerous other situations within Indigenous-academic partnerships and other marginalized groups of people.

No matter what kind of work or who the partner is, building trust and engaging in reciprocal mutually beneficial relationships are the bedrock of a strong partnership. These relationships are predicated on sharing power, good communication, and collaborative design, planning, and implementation. It is critical to understand different perspectives and to be open to forming shared values that address environmental issues and concerns through ecological restoration and other land management actions. To succeed, environmental justice requires us to listen, respect and incorporate the wisdom inherent in Indigenous relationships to land, recognize the strength of integrating both practices of Indigenous TEK and Western science, and create authentic and equitable partnerships. All society, Indigenous, non-Indigenous, young, and old can benefit by understanding the contributions of Indigenous TEK and ways of knowing—such as: reciprocal relationships with the land and each other, responsibility for stewardship of the Earth, and respectful reverence for the land.

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No data was used for the research described in the article.

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