Integrating Indigenous Knowledge into Environmental Management in Nova Scotia

Overall Winner, Winner, Science (Upper Undergraduate)

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Abstract

This literature review outlines the integration of Indigenous Knowledge (IK) into environmental management in Nova Scotia. While current Western environmental management practices are steeped in history, Western science, and anthropocentric perspectives toward nature, Indigenous ecological worldviews may provide an alternative method of managing the natural world, while also including First Nations in environmental decision-making. The potential benefits of IK have been recognized by policy-makers and included in large-scale local and global policy, such as the *UN Convention on Biological Diversity*—an international Treaty with 168 signatories (Convention on Biological Diversity, n.d., n.p.; Turner, Ignace, & Ignace, 2000, p. 1275). Even so, there are challenges in merging two modes of thinking about the environment, including stereotypes and communication barriers. However, Nova Scotia has made great strides toward the inclusion of Indigenous perspectives, and Mi'kmaq perspectives specifically, through the creation of First Nations-governed environmental organizations such as the Unamak'ki Institute of Natural Resources and the Atlantic Policy Congress of First Nations Chiefs Secretariat, both of which have strong ties to the federal government (McGregor, 2016, p. 46-48; McMillan & Prosper, 2016, p. 640; UINR, 2016c, para. 3). Nevertheless, Indigenous involvement must continue to increase within the context of environmental problem-solving in Nova Scotia, especially regarding the status of eels, which may be dealt with through proposed amendments to the *Fisheries Act* (Fisheries and Oceans Canada, 2018, para. 4; Giles, Fanning, Denny, & Paul, 2016, 167-183; Species at Risk Public Registry, 2013, n.p.).

Introduction

Across the globe, citizens are becoming more aware of growing environmental concerns, such as climate change, that threaten life as we know it. As a result, academics are attempting to understand how this ecological crisis came into being, and the majority blame Western scientific ideology. Many Western ecological perspectives are anthropocentric in nature and aided in the creation of destructive environmental management techniques that are still in place today (Berkes, 2010, p. 14-18; White, 1967, p. 1205-1207). Consequently, there has been increased awareness regarding more holistic worldviews of nature, such as those held by Indigenous peoples (McGregor, 2016, p. 23-36; Turner et al., 2000, p. 1275). Such traditional knowledge systems have been integrated within significant

international and national environmental frameworks, such as the *UN Convention on Biological Diversity* and Canada's *Species at Risk Act* (Turner *et al.*, 2000, p. 1275; Usher, 2000, p. 1-2). However, integrating Indigenous perspectives into Western-style science and ecosystem management practices is no easy feat; it is controversial, complicated, and presents many ethical issues. Despite the challenges that may arise when attempting to blend Indigenous worldviews and Western science for the sake of environmental policy-creation and decision-making, Nova Scotia is attempting to unify knowledge structures, which is exemplified through the creation and application of First Nations-led environmental initiatives (McGregor, 2016, p. 46-48; McMillan & Prosper, 2016, p. 640).

Western Perspectives on Nature

"Wicked Problems" and Their Religious Origins

Canada is currently being confronted with multiple, complicated environmental problems, called "wicked problems," including deforestation, endangered species, and climate change (Ludwig, 2001, p. 758-759). Wicked problems are characterized by high levels of scientific uncertainty, as well as the need to incorporate multiple perspectives, areas of study, and value systems (Ludwig, 2001, p. 758-759). In the opinion of Ludwig (2001), wicked problems are so complex that "[t]here will likely never be a final resolution of any of them" (p. 759). Presumably, one may ask: how has today's ecological peak, defined by these "wicked problems," come into being? In 1967, Lynn White, Jr. argued that these large-scale environmental issues are due to the dominant Western and anthropocentric attitudes toward nature originating in the Judeo-Christian tradition (p. 1205-1207). According to White (1967), this environmental worldview began with the acceptance of the Creation story described in *Genesis* of the Christian Bible (p. 1205; Harrison, 1999, p. 86). In this Creation narrative, God made man in His image and gave man dominance over all the natural world: consequently, "no item in the physical creation had any purpose save to serve man's purposes" (White, 1967, p. 1205). Throughout history, advancing scientific and technological know-how has merged with widespread Christian principles, allowing humans to wield even greater power over nature (Berkes, 2010, p. 17-18; White, 1967, p. 1205-1206). While a broad generalization of Christianity and those who subscribe to it, White's assertion continues to amass support, from non-Christians and Christians alike (Harrison, 1999, p. 86-87).

Role in Environmental Management

Just as the Christian Creation story constructed a framework for the way Western societies conceive of the environment (White, 1967, p. 1205-1206), Berkes (2010) contends that monotheistic religions have also shaped Western scientific discourse and environmental management practices (p. 18). For much of its history, Western environmental management has been characterized by certain key features that have enabled the exploitation of nature, including the separation of humans from the environment, the acceptance of the authority of "impartial" scientists, the instrumental valuation of nature due to its ability to provide commodities, reductionism, or the study of ecosystem components separately, as well as positivism, or the notion that nature is "…predictable and controllable" (Berkes, 2010, p. 15 & 18). Since the 1990s, there have been shifts away from these modes of regarding the environment, but it is

difficult to discern the type and magnitude of change that has occurred or is currently taking place (Berkes, 2010, p. 14-15).

Indigenous Perspectives on Nature

Spirituality, Ecology, and Canadian Indigenous Perspectives on Nature

The idea of "man as master of nature" was not always the perspective that governed the human-nature relationship (White, 1967, p. 1205). Before the rise of the Judeo-Christian tradition, early Western societies held that every natural creature or object had a guardian spirit which had to be appeased before the resource was used, and that not doing so would have consequences within the environment (White, 1967, p. 1205). Across the globe, numerous similar worldviews still exist, emphasizing a bond between human and nature (McGregor, 2016, p. 22).

In fact, the attitude that all human actions have ramifications within the environment closely resembles Canadian Indigenous spirituality and perspectives on nature. While Canadian Indigenous spirituality is heterogeneous, there are common threads among Nations, such as the heavy emphasis on the interconnectedness and interdependence between people and the natural world (McGregor, 2016, p. 22-36). For instance, in the Haudenosaunee Creation story, the human and nature relationship creates a "complex Web of Life" (McGregor, 2004, p. 387), a network of existence that dictates how one must interact with all beings (McGregor, 2004, p. 387). Likewise, the Anishinaabe Creation narrative, while outlining how all life came to be, also establishes Indigenous environmental "codes of conduct" (McGregor, 2016, p. 25). Furthermore, the concept of "All My Relations" is quite universal within Indigenous environmental worldviews:

> Native American teachings describe the relations all around—animals, fish, trees, and rocks—as our brothers, sisters, uncles and grandpas. Our relations to each other, our prayers whispered across generations to our relatives, are what bind our cultures together…. These are our older relatives—the ones who came before and taught us how to live" (McGregor, 2016, p. 35).

Accordingly, it is through "All My Relations" that Indigenous people view themselves as kin to nature, as it is their relatives that keep them alive (McGregor, 2016, p. 35; McMillan & Prosper, 2016, p. 642-645). Taken together, these spiritual elements provide the basis for Indigenous environmental principles and ethics (McGregor, 2016, p. 23-36).

Indigenous Knowledge (IK)

Indigenous perspectives on the natural world, which revolve around the connection between humans and the environment, are often referred to as Indigenous Knowledge (IK). While no overarching definition exists (McGregor, 2004, p. 390), IK can be described as knowledge that has been acquired through an intricate life-long process involving "an integration of person, place, product, and process" (McGregor, 2004, p. 391), and is provided by "older beings who have the wisdom of the world within

their grasp" (McGregor, 2004, p. 391). More specifically, IK is a way of life that entails the collective observations of all beings within a certain location, and acknowledges that everything, even the supernatural, is part of the universe (Alessa, Kliskey, Gamble, Fidel, Beaujean, & Gosz, 2016, p. 92; McGregor, 2004, p. 389-392; Turner et al., 2000, p. 1279). For instance, Indigenous Elders recall being disciplined for playing with plants or animals meant for food, which their parents asserted could lead to consequences in nature—such as poor weather conditions like rain and fog—imposed by the spiritual realm because those plants and animals were viewed as having laid down their lives for the sake of humans (Turner *et al.*, 2000, p. 1279-1280). Moreover, such behavior could lead to, not only spiritual repercussions, but resource depletion that had the potential to threaten the wellbeing of current and future generations (McGregor, 2016, p. 28-35; Turner *et al.*, 2000, p. 1279-1280). Consequently, methods of environmental management associated with IK rely heavily on governance and sustainability through values like respect (Turner *et al.*, 2000, p. 1279).

Traditional Ecological Knowledge (TEK)

When IK is paired with Western scientific knowledge it is often referred to as Traditional Ecological Knowledge (TEK; McGregor, 2004, p. 393). TEK is an oral tradition and can be described as the "intimate knowledge of a particular environment possessed and passed along by those who have inhabited an area for many generations" (Withgott, Brennan, & Murck, 2013, p. 660). However, TEK is considered a branch of IK that has beginnings in Westernized systems and is generally only used in Western environmental management regimes (McGregor, 2004, p. 393; McGregor, 2008, p. 144). According to McGregor (2008), the term TEK is problematic because it may lack a sufficient appreciation of the diversity of knowledge within or among First Nations communities, and frequently exclusively focuses on information pertaining to the environment (p. 144). Still, TEK can resemble IK if the holistic view of existence central to both is appreciated and included within Western frameworks (McGregor, 2008, p. 145-146). Due to the limitations of TEK, however, the more inclusive term, IK, will be used throughout the remainder of this literature review.

Integration of Indigenous Knowledge and Western Science

Introduction to Western Scientific Discourse and IK

Before proceeding, it is important to provide background on the production of Western science, its limitations, and how IK can challenge the dominance of Western science in environmental decision-making. Within the sphere of Western environmental management, decisions are made by governmental bodies, which are influenced by scientists using the scientific method (Giles *et al.*, 2016, p. 177). Through this process, scientists make observations, develop a hypothesis and predicted explanations as to why the phenomenon of interest takes place, and subsequently carry out testing (Giles *et al.*, 2016, p. 169; Withgott *et al.*, 2013, p. 14-15). The scientific method values empirical evidence that can be experimentally replicated, and requires that results of experiments be collated into a scientific document like a peer-reviewed journal article (Giles *et al.*, 2016, p. 169). Oftentimes,

Western science is deemed "…the yardstick against which other forms of inquiry are judged and to which they are supposed to aspire" (Failing, Gregory, & Harstone, 2007, p. 47).

According to academics such as McGregor (2004) and Shackeroff & Campbell (2007), IK is generally considered less evidence-based than Western science, and therefore substandard in comparison (p. 397; p. 346). However, IK is as rigorous as Western science, as it is collected through observation, subject to analysis, always changing, and must undergo a peer-review process via life-long community members (Alessa *et al.*, 2016, p. 93; Shackeroff & Campbell, 2007, p. 351). If the exactness of IK is still in question, it should be noted that the consequences of acting upon faulty information are dire, especially in the most Northern regions of Canada (Alessa *et al.*, 2016, p. 93-94), and can include "sickness, suffering, and death" (Alessa *et al.*, 2016, p. 94).

Western science has also been considered superior due to its perceived objectivity; however, the impact of value systems underlying Western science is slowly becoming more recognized (Giles *et al.*, 2016, p. 169; Ludwig, 2001, p. 758). Likewise, the values that influence Western science may not be aligned with society's values, an issue that can be discerned in the public's growing concern over the safety of genetically modified foods (Failing *et al.*, 2007, p. 47; Ludwig, 2001, p. 762). According to Ludwig (2001), a study in Britain revealed that 30% of scientists, either in the private sector or within the government, have adjusted experimental results for various reasons, including to suit the needs of powerful people or industries (p. 760 & 762). As a result, scientists must recognize the role of values in the production of knowledge, especially for those, including First Nations, that may be affected by science-based decision-making, necessitating the incorporation of Indigenous perspectives, which may aid in addressing issues like equity and justice (Berkes, 2010, p. 24; Ludwig, 2001, p. 758 & 763).

Policy, the Benefits of IK, and Environmental Justice

The powerful environmental insight, wisdom, and values-based approach toward ecology that is possessed and practiced by Indigenous people has caught the attention of environmentalists, scientists, and policy-makers in recent years (Turner *et al.*, 2000, p. 1275). IK has been internationally recognized and implemented within major environmental policies such as the *Brundtland Report* and the *UN Convention on Biological Diversity* (Turner *et al.*, 2000, p. 1275). In Canada specifically, Indigenous participation and consultation is required when environmental decisions are made, in compliance with legislation such as the *Canadian Environmental Assessment Act* (CEAA), the *Committee on the Status of Endangered Wildlife in Canada* (COSEWIC), the *Species at Risk Act* (SARA), as well as the *Canada-United States Migratory Birds Convention Act* (MBCA) (Usher, 2000, p. 1-2).

The goal of IK inclusion in policy-making is to challenge the hegemony of Western scientific thought, allowing for a restructuring of present-day environmental management practices as well as the creation of new methods of addressing "wicked problems" (Berkes, 2010, p. 24 & 34). Indeed, the aim is to utilize IK to shift away from the traditional Western and anthropocentric attitudes that still underlie most

Western science-based decision making, and toward a more holistic approach in which the human-and-environment duality is minimized (Berkes, 2010, p. 24 & 34). With the aid of Indigenous people, those within the Western environmental sector can deepen their ecological understanding, develop enhanced relationships with the natural world, and formulate lasting environmental sustainability objectives (Johnson, 2013, p. 102).

As stated previously, the participation of Indigenous people within Western environmental management is also a justice issue, especially considering that Indigenous peoples have lost land to colonial settlement and development throughout history (McGregor, 2016, p. 36-37). Additionally, while Treaties signed in many parts of Canada have given Indigenous people the right to take part in subsistence activities within designated areas, traditional land was also placed under federal jurisdiction (McGregor, 2016, p. 36-47; Olive, 2016, p. 208-211). As a result, Indigenous people are often left out of decisions that affect their traditional territories, enabling the continuation of environmental degradation from numerous sources, like industrial development, which greatly impacts Indigenous wellbeing and infringes on Treaty rights (McGregor, 2016, 36-44; Olive, 2016, p. 218-221). For example, oil and mining projects have contaminated water and traditional foods and decreased the ability of Indigenous people to engage in traditional activities like fishing and hunting (McGregor, 2016, p. 41-42). Such issues are exhibited in the Albertan First Nation community of Fort Chipewyan, which is experiencing higher than average rates of cancer and is located along the Athabasca River, downstream from an oil sands enterprise (McGregor, 2016, p. 38-39). Thus, IK within environmental management may allow for a more equitable sharing of decision-making power between governments and Indigenous people who rely on, and have a right to, healthy resources for both subsistence and cultural purposes (McGregor, 2016, p. 36-48).

Communication Methods

Considering the importance and necessity of implementing new ways of regarding the environment, it is imperative that an open dialogue is maintained between Western scientists and those who possess the values-based environmental knowledge that is so critical to addressing the current environmental crisis—the holders of IK (Huntington, 2000, p. 1270). To ensure clear and respectful communication, there have been strides toward learning the best methods of collaboration between those within the government and Indigenous peoples (Huntington, 2000, p. 1270-1272). More straightforward modes include the formulation of questionnaires, or encouraging Indigenous participation in collaborative field work (Huntington, 2000, p. 1271-1272). Another method consists of hosting analytical workshops for brainstorming sessions between scientists and IK-holders, which may enable each party to better grasp the various points of view that exist on the ecological matter in question, and may also inspire new environmental realizations and revelations (Huntington, 2000, p. 1271).

Due to the oral nature of IK, special attention has been paid to the applicability of semi-directive interviews, during which the conversation is somewhat controlled by an “interviewer,” yet allowed to

follow the thought processes of the Indigenous people involved (Huntington, 2000, p. 1271). Similarly, this method does not solely focus on questions or topics prepared in advance by the interviewer, who may have a limited range of knowledge, but instead allows participants to freely express their perception of the ecological subject under consideration (Huntington, 1998, para. 21; Huntington, 2000, p. 1271). For instance, in his 2000 article, Huntington provides insight into his experiences conducting semi-directive interviews about beluga whales (p. 1271). During one interview, Huntington (2000) states that the conversation shifted toward the region's growing beaver population; just as he was considering guiding the interview back to beluga whales, an Elder explained that beavers create dams in salmon habitat, reducing the number of salmon available for belugas to feed upon (p. 1271). Huntington (2000) acknowledges that if he had taken a more authoritative approach throughout the interview process, the relationship between beavers, salmon, and beluga whales may have never been considered or discussed (p. 1271).

Persistent Communication Challenges

Regardless of the techniques that have been devised for policy, communication issues remain tenacious; for example, because IK is a comprehensive oral tradition, it may be difficult to apply it to the Western science-based environmental management sector, which is "reductionist, and literate" (Nadasdy, 1999, p. 2). Similarly, communication can prove problematic when different groups of people with distinct knowledge systems attempt to work together despite vastly contrasting conceptions of the environment (Houde, 2007, p. 9-11; Nadasdy, 1999, p. 2-5). In fact, Nadasdy (1999) asserts that Western scientists often disregard important elements of IK, such as kinship and respect, in search of specific information or information that is more congruous with Western scientific discourse (p. 4-13). When communication erodes, non-Indigenous people may experience a lack of trust in the traditionally-collected data, while Indigenous people may feel as though their wisdom is perceived simply as a method of knowledge accumulation, or as something politically correct to integrate, rather than as a complex process of gathering and sharing knowledge that occurs across generations (Houde, 2007, p. 2-8; McGregor, 2004, p. 391-392; Nadasdy, 1999, p. 3; Shackeroff & Campbell, 2007, p. 344).

Ethical Concerns

Protecting IK and the Role of Intellectual Property Rights

Several ethical issues may arise when attempting to integrate IK into environmental policy-making and science-based decision-making, which require further investigation and consideration (Shackeroff & Campbell, 2007, p. 343-345). More specifically, it is important to examine how non-Indigenous people access, interpret, and utilize IK and engage in IK-related research (Nadasdy, 1999, p. 2; Wenzel, 1999, p. 8 & 11). According to the Assembly of First Nations (2011), many Aboriginal people are concerned that their knowledge will "be exposed, abused, or used against Aboriginal empowerment" (p. 3). Indeed, Indigenous groups are often hesitant to share information because they have observed academics neglecting to cite IK in published works, and industry professionals within the spheres of biodiversity and medicine have profited from patents developed from IK (Assembly of First Nations, 2011, p. 5).

Likewise, First Nations have expressed dissatisfaction at the way in which IK is separated from its spiritual and cultural contexts during the publishing process; for instance, IK, an oral and community tradition, becomes written within a scientific document, where it remains outside of the community (Wenzel, 1999, p. 8-9), sometimes within the confines of "a filing cabinet or book" (Nadasdy, 1999, p. 9).

Consequently, there has been great debate amongst those within the environmental management sector regarding methods to protect the integrity of IK, and one option has been the application of intellectual property rights, or IPRs, which include, but are not limited to, patents, trade-marks, and copyrights (Assembly of First Nations, 2011, p. 3-4; King & Eyzaguirre, 1999, p. 42; McGregor, 2004, p. 397). Overall, the objective of IPRs is a reduction in the use of IK in manners deemed unacceptable by the IK-holders (Wenzel, 1999, p. 8). As a result, academics would not legally be allowed to reveal IK without Indigenous consent, even if the information is not written down (Wenzel, 1999, p. 9). However, IPRs (a Western legal system) require a single 'owner' of information, who would accrue all profits, and therefore may be incompatible with IK which is passed down through generations and belongs to entire communities (Assembly of First Nations, 2011, p. 6-7; King & Eyzaguirre, 1999, p. 43-44). For that reason, it may be difficult to determine who would receive the IPR and how this would shift the dynamics of a culture within which knowledge is not possessed by a single person (Assembly of First Nations, 2011, p. 7-9; King and Eyzaguirre, 1999, p. 44). Accordingly, the Assembly of First Nations (2011) has created a list of recommendations pertaining to the appropriate use of IK for the Government of Canada, specific to the management of aquatic resources, which include promoting the participation of Elders and those with IK in environmental decisions, rejecting research based on stolen IK and, most importantly, that IK-holders may, "at their own discretion, grant or withhold consent to using, accessing, or sharing that knowledge" (Assembly of First Nations, 2011, p. 16).

Acknowledging Stereotypes

Another ethical issue that needs to be acknowledged when attempting to combine IK and Western environmental management is the idea of the "ecological Indian" or "noble savage," which came into being during colonialism and still exists today (Smithers, 2015, p. 83-84). This categorization perpetuates the racial stereotype of Indigenous people as those born with inherent environmental knowledge, making them more aware of, and receptive to, ecological occurrences than non-Indigenous people (Smithers, 2015, p. 83 & 88). Viewed through this narrative, Indigenous people become emblematic of times long past when life was less complicated, owing to the absence of features associated with modern living, such as technology (Morito, 2016, p. 224-225).

According to Morito (2016), it may be argued that there are few drawbacks associated with perpetuating this stereotype if it may reduce environmental degradation in the face of "wicked problems" (p. 223-225). Nevertheless, mythologizing Indigenous people is deleterious (Morito, 2016, p. 223-225) because such representations create a complex dichotomy that does not acknowledge human diversity, resulting in the portrayal of Indigenous people as either "authentic," meaning good

environmental stewards, or "inauthentic," meaning bad environmental stewards (Smithers, 2015, p. 90-92). Altogether, the notion of the "ecological Indian" contributes to continuing Western power and Indigenous invisibility, eliminates the potential for Indigenous people to express their myriad environmental perspectives, and decreases the ability of Indigenous and non-Indigenous people to communicate effectively, thus undermining the alliance between Indigenous and Western environmental worldviews (Morito, 2016, p. 224-225; Smithers, 2015, p. 83-103).

Certainly, it is difficult to integrate IK into environmental management when such stereotypes endure (Smithers, 2015, p. 91), and so society must move away from viewing "Aboriginal people as objects to be studied to [viewing] Aboriginals as real people" (Smithers, 2015, p. 99). Likewise, there must be a balance between recognizing that the "ecological Indian" is a racial stereotype rooted in history, while also acknowledging that IK is the product of knowledge that has been accumulating for over two millennia (Smithers, 2015, p. 103). For that reason, IK may offer many solutions to our current ecological crisis, but only if we pay careful attention to the wisdom given, free of long-held and dangerous beliefs about the people who produce it (Smithers, 2015, p. 103).

Indigenous Perspectives in Environmental Management in Nova Scotia

Mi'kmaq and the Concept of Netukulimk

The first inhabitants of Nova Scotia were the Mi'kmaq, who at one point in time, made up the whole population of the province (Province of Nova Scotia, 2018, para. 1 & 13). However, only 25,070 individuals remain today and their lands are now limited to 35 government-owned reserves, which total 26,000 acres (Province of Nova Scotia, 2018, para. 13-14). The distribution of Mi'kmaq land is the result of negotiations between the Canadian government and the Mi'kmaq during the 19th century (Indigenous and Northern Affairs Canada, 2010, para. 49; Province of Nova Scotia, 2018, para. 13-14). Similarly, Mi'kmaq rights were determined by Treaties signed between Indigenous groups and colonial powers in the 18th century, like the Peace and Friendship Treaties which still govern the Indigenous right to hunt, fish, and gather in search of a moderate livelihood (Indigenous and Northern Affairs Canada, 2015, para. 1-10). Consequently, the Mi'kmaq are important managers of Eastern Canada's environment (Olive, 2016, p. 208-212).

Central to the Mi'kmaq framework for environmental management is spirituality, particularly the concept of Netukulimk (Giles et al., 2016, p. 169), which is defined as "the use of the natural bounty provided by the Creator for the self-support and well-being of the individual and community" (UINR, 2016b, para. 1). The goal of Netukulimk is to provide community health and economic stability while also maintaining environmental sustainability (UINR, 2016b, para. 1). Under the umbrella of Netukulimk is the concept of "two-eyed seeing" or Etuaptmumk, which outlines how two different knowledge structures can be used together to confront environmental challenges through principles like respect (McGregor, 2016, p. 46-47), and is described by Mi'kmaq Elder Dr. Albert Marshal 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 Western knowledges and ways of knowing… and learning to use both these eyes together, for the benefit of all (as cited in Giles et al., 2016, p. 167).

Ergo, under this worldview, IK may merge with Western science to manage Nova Scotia's resources in a sustainable manner (Giles et al., 2016, p. 179).

Unamak'ki Institute of Natural Resources (UINR) and the Atlantic Policy Congress of First Nations Chiefs Secretariat (APC)

There are several noteworthy examples of organizations within Atlantic Canada that exemplify the union between Indigenous and Western attitudes toward nature; these groups emphasize the inclusion of IK in Western environmental management and successfully address the role of Indigenous spirituality, effective communication, and ethical issues such as the protection of traditions (McGregor, 2016, p. 46-48). One such example is the Unamak'ki Institute of Natural Resources (UINR), which was established in 1999 in Eskasoni, Nova Scotia (McGregor, 2016, p. 46-47; UINR, 2016a, para. 1-6). The Institute's main purpose is to address the environmental interests and worries of the Mi'kmaq on Cape Breton Island, with a focus on collaboration and ensuring that Indigenous traditions are preserved (McGregor, 2016, p. 46-47; UINR, 2016a, para. 1). The merging of IK and Western knowledge at the government level is applied under the idea Netukulimk and the respect of different knowledges through "two-eyed seeing" (McGregor, 2016, p. 46-47; UINR, 2016b, para. 1-2). These ways of knowing are incorporated in all UINR's decision-making, and it is how the Mi'kmaq include spirituality in the protection and management of resources such as plants and animals (UINR, 2016b, para. 1-2). According to UINR (2016b), the power of the organization lies, not only in its ability to include spirituality in Western environmental management, but also in integrating Western scientific processes with traditional Mi'kmaq knowledge gathering and sharing methods (para. 2). While the Institute is First Nations-led, it has many strong partnerships with government entities such as Parks Canada, Fisheries and Oceans Canada, Cape Breton University, the Province of Nova Scotia, and the Cape Breton municipalities, all of which are conducted with Netukulimk at the centre (UINR, 2016a, para. 4; UINR, 2016b, para. 1; UINR, 2016c, para. 3).

The Atlantic Policy Congress of First Nations Chiefs Secretariat (APC) is another organization that focuses on First Nations environmental policy creation, as well as Indigenous advocacy (McMillan & Prosper, 2016, p. 640). The APC carries out policy-related research, analysis, and development for 37 Indigenous communities in Atlantic Canada and promotes Indigenous environmental governance with a focus on fisheries management, in collaboration with Fisheries and Oceans Canada (McMillan & Prosper, 2016, p. 640). Both the APC and UINR work on large-scale environmental issues, such as those pertaining to pollution, endangered species, and habitat protection and restoration (McMillan & Prosper, 2016, p. 640). Like UINR, the APC aims to increase the involvement of Mi'kmaq within government environmental management through the "two-eyed seeing" framework (McMillan & Prosper, 2016, p. 640).

Further Opportunities and the Eel Fisheries in Nova Scotia

While Nova Scotia is making strides creating First Nations-managed environmental stewardship initiatives, much could still be done to further the inclusion of IK into programs at the government level. This is illustrated by the eel fishery and the challenges associated with incorporating IK into government science-based decision-making (Giles *et al.*, 2016, p. 167-182). Currently, many eel species are experiencing population declines, such as the American eel (*Anguilla rostrata*), which has been assessed as Threatened under COSEWIC (2012) but lacks a SARA listing (Giles *et al.*, 2016, p. 171). The dwindling eel populations may greatly affect Mi'kmaq communities who have a long-established and profound relationship with eels, which are not only an important source of sustenance, but have social, cultural, and economic significance as well (Giles *et al.*, 2016, p. 168 & 171). Moreover, eel fishing is a salient method by which many Mi'kmaq choose to recognize their Treaty rights to obtain a moderate livelihood and/or take part in commercial fishing activities (Giles *et al.*, 2016, p. 171). These rights were fought for, and won, through the extended and well-known court case brought about when Donald Marshall Junior was arrested in 1993 for fishing and selling eels without a license provided and approved by the government, resulting in the 1999 *Marshall Decision* (Giles *et al.*, 2016, p. 171).

Regardless of their Treaty rights, recent interviews conducted by Giles *et al.* (2016) revealed that only two out of 13 Mi'kmaq fishers in Eskasoni, Nova Scotia had ever been involved in the commercial eel fishery, and both had chosen to leave due to increasing concern regarding the reduction in eel population sizes (p. 169-170 & 175). Similarly, non-commercial Indigenous fishers have shown a readiness to engage in measures to protect eels, such as through voluntary monitoring programs, once Indigenous fishers noticed that catches were shrinking (Giles *et al.*, 2016, p. 174, 177 & 181). It is also important to note that traditional eel fishing is sustainable by nature, with IK aspects condemning overexploitation through Netukulimk*,* and outlining rules for harvesting based on respect for the eel, such as leaving small eels so that they may reproduce (Giles *et al*., 2016, p. 173 & 177). This is in stark contrast to the government's top-down approach, which is based on Western science and the compartmentalization of ecosystem services, and values economic security above all (Giles *et al.*, 2016, p. 177). In fact, both the commercial eel and elver fisheries, which are managed by several government sectors and have the overall goal of keeping populations at optimal levels for harvesting purposes, have been blamed for the decline of eel populations, alongside habitat fragmentation caused by development (Giles *et al.*, 2016, p. 174 & 177).

While Indigenous consultation is required under COSEWIC (McGregor, 2016, p. 45; Giles *et al*., 2016, p. 171), recent attempts to include Mi'kmaq knowledge in government processes related to the conservation of eels have been plagued with complications (Giles *et al.*, 2016, p. 178-179). For instance, there are few frameworks outlining how to gather and integrate IK, especially as it relates to cultural and spiritual features (Giles *et al.*, 2016, p. 178). As well, there are often communication challenges due to languages barriers and differing ways of interpreting certain words in the same language (Giles *et al.*,

2016, p. 178). Indigenous people are also hesitant to share information, not only because there is little protection for it once it is made public, but also because of suspicion surrounding the government and organizations associated with the government, resulting from the government's historical treatment of Indigenous people (Giles *et al.*, 2016, p. 178-179). Furthermore, even when it is included, many feel that IK is not incorporated in any worthwhile way (Giles *et al.*, 2016, p. 171). Thus, it is imperative that Nova Scotia find meaningful mechanisms to integrate IK and Western science into the management of eels, which, together, may enhance the sustainability of the species through "two-eyed seeing," while increasing partnerships between governments and First Nations communities (Giles *et al.*, 2016, p. 179-181).

Looking to the Future and Amendments to the Fisheries Act

An important policy for Indigenous people, and the management of resources such as eels, is the *Fisheries Act,* which may provide a certain amount of protection for the American eel until a designation under SARA is provided (Species at Risk Public Registry, 2013, n.p.) The *Fisheries Act* governs human impacts on water, with an emphasis on sustainability through pollution reduction and the protection of fish populations and habitat (Environment and Climate Change Canada, 2017, para. 1). In 2012, the federal government passed omnibus bills C-38 and C-45, without consultation with Canadians, weakening the *Fisheries Act* (Ecojustice, 2013, p. 5; Olive, 2016, p. 221-222). Specifically, these bills dictated that only Indigenous, recreational, and commercially-valuable fish species and habitat would be protected, while also reducing opportunities for public and Indigenous participation and increasing the authority of Cabinet (Fisheries and Oceans Canada, 2018, para. 3; Olive, 2016, p. 221-222).

However, on February 6, 2018, the federal government announced changes to the Act, reversing the previous amendments and thus strengthening the legislation (Fisheries and Oceans Canada, 2018, para. 2). According to Fisheries and Oceans Canada (2018), the amendments to the Act will be influenced by the close consultation of over 200 Indigenous groups, which has already taken place (para. 1-2). As well, the application of IK in policy development and decision-making relating to the Act will become mandatory (Fisheries and Oceans Canada, 2018, para. 4). After becoming law, the regulations would be developed in collaboration with Indigenous groups (Fisheries and Oceans Canada, 2018, para. 17), who will aid in "project reviews, monitoring and policy development" (Fisheries and Oceans Canada, 2018, para. 11) The amendments to the *Fisheries Act* are an important step in the right direction for the inclusion of Indigenous perspectives in environmental decision-making at the government level.

Conclusion

Due to the copious and complex environmental issues facing Nova Scotia and the globe, it is of utmost importance that society recognizes its past environmental mistakes to avoid making such errors again. Perhaps then, it is time for Western environmental management to undergo a complete paradigm shift, away from sole reliance on Western scientific thought, and toward a more holistic worldview of nature (Ludwig, 2001, p. 763). More specifically, Indigenous perspectives on nature may

provide a better mode of interacting with the environment within a policy and management context (Ludwig, 2001, p. 763). While merging two different and somewhat conflicting views of nature may appear complicated and issue-laden, initiatives such as the Unamak'ki Institute of Natural Resources and the Atlantic Policy Congress of First Nations Chiefs Secretariat prove that Indigenous Knowledge, Indigenous spirituality, Western science, and the government can come together to create change (McGregor, 2016, p. 46-48; McMillan & Prosper, 2016, p. 640). In conclusion, Western environmental management must include IK if ecosystem sustainability and health is to be improved: IK has the power to not only govern, but change all human interactions with the environment through an important values-based perspective on nature which asserts that nature "is not a commodity to be bartered with to maximize profit, nor should it be damaged by scientific experimentation…[w]e do not dominate her. We harmonize with her" (McGregor, 2016, p. 21).

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