Traditional Environmental Knowledge in a Changing Environment

Vuntut Gwitchin Observations of Change in the Yukon Territory

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Abstract: Scientists, resource managers and developers increasingly seek out Traditional or Indigenous Knowledge to deepen their understanding of the environment. Yet, even as the value of this knowledge is recognized, misperceptions remain; Traditional Knowledge is still often seen as something static, unchanged from one generation to the next rather than as something flexible and adaptive. Ethnographic research with the Vuntut Gwitchin First Nation challenges these perceptions. Their observations of contemporary environmental change in the western Canadian Arctic are becoming part of their Traditional Knowledge, proving that this system of knowledge is resilient and will continue even as the environment becomes ever more unpredictable.

Keywords: climate change; extractive industry; Porcupine Caribou Herd; Traditional Knowledge; Vuntut Gwitchin; Yukon Territory

Résumé : Les scientifiques, les gestionnaires de ressources et les promoteurs recherchent de plus en plus les connaissances traditionnelles ou autochtones pour approfondir leur compréhension de l'environnement. Pourtant, des perceptions erronées subsistent bien que la valeur de ces connaissances soit reconnue : les connaissances traditionnelles sont encore souvent perçues comme statiques, immuables d'une génération à l'autre, plutôt que flexibles et adaptables. Les recherches ethnographiques menées auprès de la Première Nation Gwitchin Vuntut remettent en question ces perceptions. Les observations des changements environnementaux contemporains dans l'ouest de l'Arctique canadien font désormais partie de leurs savoirs traditionnels,

prouvant ainsi que ce système de connaissances est résistant et qu'il se maintiendra même si l'environnement devient de plus en plus imprévisible.

Mots-clés : changement climatique ; industrie minière ; harde de caribous de la rivière Porcupine ; savoirs traditionnels ; Vuntut Gwitchin ; Territoire du Yukon

Introduction

With the effects of global climate change magnified in the Arctic, the knowledge and environmental understandings of Arctic peoples are needed now more than ever. Traditional or Indigenous Environmental Knowledge contributes to a deeper understanding of the environment and is increasingly sought out and included in environmental studies by scientists, resource managers and developers. Yet, misperceptions remain. Traditional Knowledge is still often seen as something static, as a body of knowledge passed down unchanged from generation to generation rather than as something flexible and adaptive, and valued for the things that are known rather than as a way of knowing things. Researchers working with Traditional Knowledge must therefore be careful to avoid limiting this knowledge to the "traditional," lest they fall into the trap of assuming that Indigenous Peoples would not have cultural perspectives to share regarding modern industry (Nadasdy 1999[1]).

This article challenges these perceptions through an ethnographic exploration of Vuntut Gwitchin Elders' observations of environmental change, in particular, the effects of these changes on the behaviour and migration patterns of the Porcupine Caribou Herd. Such observations are added to existing bodies of Gwitchin Knowledge, expanding these traditions to accommodate new phenomena from thawing permafrost to pollution caused by industrial development.

Old Crow is a fly-in community just north of the Arctic Circle in Canada's Yukon Territory with a population of about 250 people, mostly members of the Vuntut Gwitchin First Nation.[2] The Gwitchin are caribou people; they rely on the Porcupine herd for subsistence, and caribou feature significantly in Gwitchin culture. Caribou (*Rangifer tarandus*; Gwich'in: *vadzaih*) can be found throughout northern North America and Greenland. The Porcupine herd is made up of migratory barren-ground caribou, one of two subspecies found in the Yukon. This herd has a migration range covering 250,000 square kilometres in northwestern Canada and northern Alaska. Environmental change has

caused the caribou to change their migration in the past and continues to do so today; sometimes, the herd must change its route due to wildfires or because warming weather leads them to travel earlier or later in the year. The population also goes through cycles, as years with high insect activity or poor forage can affect birth rate and calf survival. A century ago, Gwitchin recall, the herd stayed on the Alaskan side of its range, starting to pass Crow Mountain regularly in the 1920s. Now, it has been observed overwintering in Alaska once again.

The Gwitchin have already observed the effects of climate change on the herd, which in turn affects traditional Gwitchin knowledge of caribou as the herd's behaviour becomes harder to read. Of particular concern are the calving grounds, located in the contested "1002" region on the North Slope of Alaska's Arctic National Wildlife Refuge. This area, so-called after section 1002 of the Alaska National Interest Lands Conservation Act (ANILCA) of 1980, provides protection for the caribou from predators and biting insects (see also Katz 2010), and the most nutritious plants grow here, helping the new mothers recover their strength after the long spring migration. While the herd covers a large area during the rest of the year, radio-collar data shows that they congregate in this coastal area every spring.[3] The Gwitchin refer to the calving grounds as *Iizhik Gwats'an Gwandaii Goodlit*, or "The Sacred Place Where Life Begins." They have always avoided this sacred space out of respect for the caribou.

The 1002 area under question is not only desirable to the caribou, it is also the subject of heated debates over the potential for oil. The Gwich'in Nation has been lobbying for nearly four decades against the expansion of oil and gas development. Oil infrastructure is a common sight along much of the northern coast of Alaska, but so far, the area to the east of Prudhoe Bay has been preserved. The threat to the Refuge has varied over the decades as different presidential administrations took office, with some seeking increased protection and others supporting development. Relationships between the US government and Indigenous Peoples can be strained in areas of resource extraction, where Indigenous voices are frequently ignored or marginalized in favour of industrial development (Zentner et al. 2019); as the level of threat to the Refuge changes, so do tensions between the US. government and the Gwich'in. Lease sales in early January 2021 represented the greatest threat the Gwich'in have faced to date, but there was hope that the suspension of these leases by the Biden administration later that year would eventually lead to restored protections to the Refuge.

Although some variation in population or migration is normal, industrial activity can exacerbate these changes, potentially beyond the herd's ability

to recover. The Gwitchin, however, have been observing these animals for generations and have seen how they respond to development in other sections of the migration range. Even the Gwitchin themselves say that they do not know for sure how development in the calving grounds could affect the herd, but their knowledge of caribou behaviour can provide some insight into the potential impacts of industry and the consequences for the Gwitchin.

This paper is based on eleven months of fieldwork in Old Crow in 2016, where I worked with the Vuntut Gwitchin Natural Resources department on a project related to the possible expansion of oil exploration in the Eagle Plains Basin, a primary wintering area for caribou near the Dempster Highway. The Vuntut Gwitchin Government (VGG) collaborated with the Yukon Government to develop a document outlining best management practices for the Porcupine herd, weaving together both Traditional and Western scientific knowledge. I was in the community to research Traditional Knowledge and how it is used in wildlife management; because of my interest in Gwitchin caribou knowledge, I was invited to join this project, tasked with recording the Elders' knowledge for VGG. The following sections detail information shared through these formal Elders' interviews as well as through informal conversations with other members of the community over the course of the year.[4]

I interviewed Gwitchin men and women, both hunters and non-hunters, about their knowledge of caribou and how they respond to disturbance on the land. While responding to my questions about caribou, they shared so much more: accounts of unfamiliar species, increased willow growth, earlier river break-ups. Their stories of the effects of climate change in the western Canadian Arctic paint a picture of a dramatically altered landscape and changing animal behaviour. But more than that, they reveal how Traditional Knowledge is (re-) created every day through new encounters with an increasingly unpredictable environment.

Environmental Knowledge and Relationships with the Land

Learning from the Land

There are different types of knowledge about land, associated with different ways of relating to land. In much of Western thought, nature is seen as "grand and universal but also passive and mechanical. Nature was a backdrop and resource for the moral intentionality of Man, which could tame and master Nature" (Tsing 2015, vii). From this perspective, land, plants and animals are

viewed as resources for human exploitation rather than as living persons with agency of their own.

For First Nations in northwest Canada, however, "land" can have other meanings as well:

> [T]he simple English term land designates much more than mere terrain or area on a map. It is not limited to meaning soil or the surface of the Earth. Instead "land" encompasses the totality of beings existing in the place that a people live. It is a homeland, and includes the earth itself and its landforms – the waters, the sky and weather, the living beings, both plant and animal, spirit entities, history, and the will of the Creator. Land in this sense cannot be measured in hectares or reduced to a value of dollars, though the land provides both livelihood and identity. [...] Land and people are neither separate nor separable. (Johnson 2010, 3)

Here, as people interact with the land and animals, they are constantly aware that the land and animals are responding in what David Anderson (2000) terms a "sentient ecology." Animals, plants, even rivers or stones, are all seen as sentient "persons" who must be treated with respect. Traditional Knowledge then is "based on a moral understanding of the place of humans in their environment. Far from detracting from their capacity to make objective observations, a reflexive moral awareness is a critical part of learning what and how to observe" (Bravo 2009, 272). Knowledge is more than just a collection of facts, it is a way of knowing and being in the world, such that "Indigenous cultures are rooted in their own knowledge systems" (Wilson et al 2022, 414).

The Gwitchin describe a similarly close relationship to the land, based on the idea of a sentient landscape that responds to human actions. Animals not only have languages of their own, they are also believed to understand human language (Anderson 2000; Nadasdy 2007; Nelson 1983). The Koyukon of Alaska believe that animals always know what humans are doing, and "their presiding spirits are easily offended by disrespectful behaviour" (Nelson 1983, 20). Hunting thus becomes a social relationship, described in terms of reciprocity (see Brightman 1993; Nadasdy 2007; Ridington 1990; Tanner 1979). Animals are believed to "gift" themselves to hunters, in exchange for equal gifts of respect; animals will avoid disrespectful hunters, resulting in poor hunting (Fienup-Riordan 1994; Nadasdy 2007; Ridington 1990; Westman et al. 2020; Wray and Parlee 2013).

Stories told throughout northwest Canada describe how the environment responds to human actions; these are often "concerned with disruptive social acts, with everyday life gone out of control, and each concludes with a stark reminder that trouble would not have occurred if people had behaved in ways they knew they should" (Basso 1996, 28). Some of these records are shared through narratives associated with place names. Julie Cruikshank (2005, 131) found that "Tlingit place names [...] encapsulate ecological knowledge that is often rendered invisible by contemporary cartography and English toponyms." The information found in these narratives "unfolds the story of the long and complex relationship between the land and the people" (Collignon 2006, 200). Stories about places refer to specific events that occurred there, turning the landscape into what Mark Nuttall (1992, 54) refers to as "memoryscape," where place names are used to elicit collective memories about these significant events. Places, therefore, become social spaces where the land itself holds the records of knowledge gained over generations of living and travelling on the land.

In holding onto this knowledge, the land itself becomes a "teacher," passing on generations of knowledge to youth through storytelling and travel; it is also sometimes described as being like a "book," which is reflected in the way the Gwich'in speak about "reading the land" (Loovers 2010). Here, it is important to be careful as comparing the land to a teacher or a book "could easily be misinterpreted as a western reading *of* the land which undermines Aboriginal ways of reading *on* or *in* the land"; rather than simply "serving as a storage room for teachings in which knowledge can be discovered," describing the land as a teacher "implies a conversation between the land and the reader" (Loovers 2010, 299). Humans are not the only ones who "read" the land; the Gwitchin say that the caribou also "read the land" or "read the weather." Changes in the environment are now making this more difficult for both people and animals.

Learning through Travel

Both humans and caribou developed their extensive environmental knowledge from centuries of living on the land. Tim Ingold (2000, 230) argues that "people's knowledge of the environment undergoes continuous formation in the very course of their moving about in it." The Gwitchin say that this is how the caribou also gain their knowledge of the land.

> I think they've got these little calves learning the land, I think that's why they travel so much, and I knew Elders in the past, they say people know

> the land, but the caribou more. Knows the land more than the people because they travel so much. (J. Peter, Old Crow 2016)

Similarly, Jo Vergunst and Arnar Árnason (2012, 147, 148-149) claim that "the experience of landscape" is "based fundamentally in movement rather than stasis," asking the question, "what difference does it make to one's experience of landscape if one is journeying through it?"

While detailed environmental knowledge can be essential for living on the land, it represents much more than mere survival. The relationship with land is "foundational" for Indigenous Peoples in the North and remains "the root of identity, culture, and health" (Johnson 2010, 6, 109). The metaphors of trails and trail-breaking reflect the significance of movement; Leslie Main Johnson (2010, 4) states that "trails rather than fields are the dominant land metaphor for people who travel through their homelands to make a living, who use a variety of resource sites located in different places throughout the cycle of the year, who hunt, encountering animals which sustain them in different places and at distinct times." David Turnbull (2007, 147) similarly argues that knowledge is created by movement through a space, "following and simultaneously creating trails." In Old Crow, trails are both physical and metaphorical. Networks of trails cross the land, some created by humans and others created by caribou. Other networks are created by Gwitchin leaders: from signing their Final Agreement (or modern treaty) to fighting for the protection of the calving grounds, they say that they are "breaking trail" for future generations.

There was a time when the Gwitchin followed the caribou tracks based on their knowledge of the land and of animal behaviour, setting up camp wherever the animals were. Travelling in this way, following the weather and the animals throughout the year, provided a deeper understanding of the land and environment. "People do not stumble onto caribou at random; rather, based on generations of knowledge and experience, Gwitchin people know where to find vadzaih each season" (Sherry and Vuntut Gwitchin First Nation 1999, 197). Before the international border was established, Gwich'in from Alaska and Canada could easily travel from one community to another. When there were few caribou in Alaska, Gwich'in from Arctic Village, Fort Yukon and Chalkyitsik could come to Crow Flats. They would stay through the summer, hunting and drying the meat, then raft it back down the Porcupine River to Alaska. When caribou could not be found elsewhere, Gwich'in from all over would travel to Snow Mountain, still remembered as an important place because caribou

could always be found there. Now caribou hunting is a seasonal event for most Gwitchin hunters, taking advantage of the brief times when the herd passes by Old Crow while migrating because high fuel costs make travelling further afield in search of caribou difficult.

Along with the border and high costs of travel, work and school responsibilities do not allow for the flexibility to travel whenever people would like. Across Canada, the government established permanent settlements for Inuit and First Nations, in some cases as part of an attempt to end subsistence hunting (Sandlos 2007; Usher 2004; Wray and Parlee 2013). Following World War II, the government claimed that the Qamanirjuaq, Beverly and Bathurst caribou herds were declining due to overhunting by Inuit and Dene; although there was little evidence of any "needless waste" by Indigenous hunters, the claims were nevertheless used to justify placing restrictions on caribou hunting by Indigenous hunters, as well as the relocation of Inuit and Dene into permanent settlements away from the migration path of the herds (Usher 2007).

Settlements, once considered beneficial by providing access to government services such as healthcare and schools, had the unfortunate consequence of reducing the flexibility of communities to respond to problems such as climate change (Whyte 2017). The nineteenth century brought fur traders and missionaries, leading people to settle first in trapping camps along the river, and then in Old Crow following the opening of a Federal Day School there in the 1950s (Balikci 1963). Since the Gwich'in moved into permanent settlements, they now have access to government-provided services. However, this also prevents them from spending as much time on the land and makes it more difficult to maintain their knowledge by relearning the landscape as the environment warms.

Changing the way People and Animals Read the Land

The Gwitchin say that they must take care of the land because it takes care of them; for centuries, they have worked to ensure that it will continue to take care of them for generations to come. Even so, outside influences are now affecting their environment in ways that are beyond their control. As it becomes more difficult for caribou to "read" the changing land, it also becomes more difficult for human hunters to "read" the caribou. Gwitchin report seeing caribou travelling in unusual places, or wintering in new areas, as well as delaying their migration so they travel later into the winter. The main disturbances to the herd come from human activity on the land, including industrial infrastructure, and from climate change.

Human Activity on the Land

> I notice that there's too many cabins being built along the river, right on the, where caribou are crossing. We, before that there were no buildings like that, and we'd see caribou crossing in those areas, but now today we wonder why caribou don't cross, because we're in their way. (R. Bruce, Jr., Old Crow 2016)

Caribou have been known to pass through the middle of Old Crow, although they usually avoid humans and their infrastructure. It is not just the activity within the town that can bother them, but also the hunting camps that people have built along the river. Caribou can become accustomed to areas with activity, even walking along the roads in Old Crow; however, the consensus among the Gwitchin who participated in this study is that caribou are highly sensitive to noise, and will try to avoid particularly noisy areas.

> If it was activity happening up there with the heavy equipment, you know, caribou won't be there. And because there's no activity, they're coming right on top of the mountain now. (E. Schafer, Old Crow 2016)

The gravel quarry on Crow Mountain, just to the north of town, is an often-mentioned example of such noisy activity. Caribou will come onto the quarry road, but not when the trucks are running. When caribou are in the area, the workers are required to stop until the herd has gone through to avoid disturbing them. Even so, some people have noticed a difference in the number of caribou on the mountain, a change they attribute to the presence of the quarry.

> If you're travelling on the mountain and all of a sudden you see caribou, even a quarter of a mile away, if that caribou hears your Skidoo or hears you, it'll stand there just a few minutes and it'll just take off. That's because it's been harassed before, and they know what's danger, by the sound of it and [...] they all spread out. (E. Schafer, Old Crow 2016)

Caribou that have never been harassed are less nervous and less likely to flee. This idea of harassment seems to be more of a factor in influencing caribou behaviour than noise alone. The noise from new development might initially frighten caribou, but as long as they are safe from harassment then it is possible that they might become accustomed to the new sounds.

> Caribou are curious too, like animals should be, sometimes they come and check it out. And then of course, if you start making noise or shoot it, they leave right away. (S. Frost, Sr., Old Crow 2016)

The herd passes through the middle of town because rules about firing guns within a certain distance of the houses mean that, despite the noise and activity, the caribou know that people will not bother them while they are there.

The type of human activity that Gwitchin talk about most is that associated with extractive industry. One of the primary concerns about oil and gas development in the area is the potential to further alter the Porcupine herd's migration patterns. Those that I spoke to agreed in their opposition to expanding oil development in the migration range, especially in the calving grounds; the long-term health of the herd was more important to them than short-term economic opportunities provided by extractive industries. Nevertheless, they recognize that they use oil and gas themselves every day to light and heat their homes and to fuel their vehicles.[5] Acknowledging the current necessity of fossil fuels, they talk about finding a "balance" between development and protecting the caribou (William Josie, personal communication).

> [When] caribou are coming towards where they're gonna work, we keep an eye on them, and if they're a kilometre away just stop everything. Let the caribou go through. If an oil rig is still running, whatever they're doing, if it's still going, they're going to change their route and it's going to be hard on the caribou. They should stop everything, let them go through. (R. Bruce Jr., Old Crow 2016)

The people I spoke to would like to see development halted when caribou are nearby, as they do at the quarry. Work can be scheduled seasonally and halted during peak migration times, but permanent infrastructure, such as pipelines, is more difficult to arrange around the herd's movements.

In the 1970s, Justice Thomas Berger conducted an inquiry about the proposed Mackenzie Valley Pipeline, recommending a ten-year moratorium on development in the North until land claims could be settled (Berger 1977). As late as 2016, some Gwitchin were still concerned that the project would move forward; the corridor was still there, and they told me that if oil were to be found in the calving grounds, it was likely that the pipelines would be built (Robert Bruce, Jr., personal communication). The project was finally cancelled in 2017, due in part to low natural gas prices which could not justify the high cost of the pipeline (Strong 2017).

During our interviews, my interlocutors explained that they do not want a pipeline, not only due to the danger of leaks that could damage the land, but in particular because no one knows for sure how the caribou will react. A common

argument made by oil companies and supporters of oil and gas development in the Arctic is that caribou would be undisturbed by pipelines, and would even come to the pipeline for protection or warmth. This argument is not well received in Old Crow.

> To have people right from the Prudhoe Bay pipeline explaining that the caribou actually come to [the pipeline] for protection, well, it's okay if they tell that to somebody that doesn't know nothing about caribou but they won't tell me that, now, I just know it's not right to believe, not true. (S. Frost, Sr., Old Crow 2016)

Gwich'in in Arctic Village, Alaska, agree; Gideon James said: "Those pictures of a caribou warming itself by the pipeline, [...] the only reason they do that is they're unhealthy. They don't need warmth. If the animal is healthy, he doesn't seek any other heat than his own" (cited in Bass 2004, 23). Studies of the Central Arctic Herd in Alaska support the Gwich'in arguments that caribou will not approach a pipeline, showing a decline in the number of caribou found in the main industrial complex at Prudhoe Bay, along with a 90 percent decrease in caribou movements that would take them across a road or pipeline corridor (Cameron et al. 2005).

Seismic cutlines are another matter of concern. Though the noise and activity would initially bother the caribou during the testing phase, over time the disused cutlines provide a travel corridor for wildlife; during several of my interviews, I learned that caribou like to follow the Dempster Highway where they can run faster in the open, and they will similarly follow cutlines. However, these lines also open access for predators such as wolves, and even human hunters. In the Athabasca oil sands region of Alberta, Métis trappers will use reclaimed cutlines as trapline trails, and recreational users access the lines as well (Joly 2017). This means that, even after the seismic work is complete, there can still be a significant human presence in the cutlines, disturbing the herd's migration.

Climate Change

Anthropogenic climate change is warming the North at a disproportionate rate, changing the landscape and affecting caribou migration. Caribou seem to instinctively know when plants will begin to sprout in the calving grounds; the spring migration is carefully timed so the pregnant cows will arrive at the coast in time to drop their calves just as the new shoots are at their most

nutritious. Deeper snow takes longer to melt, delaying plant growth and forcing the caribou to walk more slowly.

> One year it happened that way, here, all the calves were born in this area. That's a year a lot of those little caribou were drowned, didn't make it to the calving ground. That was a hard year, that time. (E. Schafer, Old Crow 2016)

In recent years, heavier snowfall has hindered the spring migration, so the new calves are born before they have reached the safety of the calving ground, sometimes before the herd has even crossed the Porcupine River. As the river ice is breaking up earlier than before, the newborn calves are forced to swim across.

> And this time we lost a lot of caribou, they were calving right in the timber where they don't [usually] do, you know, and the wolves got them right there. So we lost quite a bit of caribou I think, that time. (P. Josie, Old Crow 2016)

The calving grounds provide protection from predators and biting insects. Winds from the coast keep insects at bay, while grizzly bears and golden eagles tend to stay closer to the mountains and foothills. Calves born during the migration not only have to deal with travelling across difficult terrain before they have gained their strength, they are also highly vulnerable to predators. Years with higher-than-average calf mortality, resulting from either increased predation or poor-quality forage, will affect the overall population of the herd for several years.

Along with the variations in migration timing, the caribou have also been varying their routes, travelling in unexpected places. One reason for this could be the availability of forage. When a preferred food is no longer available in a certain area, Gwitchin Elders say that the caribou will travel to other places in search of it, rather than eating an alternate plant. By the time of this study, the herd had begun wintering in Alaska rather than in the Eagle Plains area of the Yukon, which my interlocutors attributed to lower-than-average rainfall affecting plant growth. Even when the plants do grow, they are not always easily accessible. A caribou's hooves are well-suited to digging through snow, but ice presents a problem. Repeating cycles of rain and freezing temperatures result in layers of ice covering the plants, preventing the caribou from finding enough to eat.

> For two years, and everybody knows it, they mostly spent in Alaska, around the Arctic Village area and that's not too normal, it's good for

> them, but then you wonder why. So, it is maybe because of fires, too much disturbance. (S. Frost, Sr., Old Crow 2016)

Wildfires have a long-lasting effect on plant cover, as the preferred lichen grows so slowly and faster-growing plants such as shrubs will take its place after a fire. This is another possible explanation for the herd's recent choice to overwinter in Alaska. Although the herd has returned to the Yukon in recent winters, they will typically avoid burned areas for years to come, changing their migration routes or wintering grounds to find more favourable forage. Plant growth can disrupt migration in a different way as well. Warmer weather is causing the treeline to creep north, leading to increased willow growth in the Crow Flats area north of Old Crow. The thicker brush creates a physical barrier that the caribou must travel around.

> This year [the herd] stayed north, it never came to the Porcupine River this year. It never crossed the Porcupine River, and it just went close to the Porcupine River then it turned back and went back to Arctic Village and went right to Venetie, and that's beyond Arctic Village. So, they [spent the fall] out there and now they're here, back here in Old Crow, and I think they're travelling mostly towards Salmon Cache area but, you know, if it's trying to make it to the Dempster Highway, you know, it'll be lucky if it does. (E. Schafer, Old Crow 2016)

In the fall, the herd continues travelling until the weather becomes too cold, then they will stop and spend the winter wherever they are (Robert Bruce, Jr., personal communication, see also Katz 2010). An unusually heavy snowfall could cause the herd to stop early because the deeper snow is challenging to walk through and, consequently, more difficult to escape from predators. The herd displayed some unusual behaviour in 2016, with early sightings in August followed by no sign of the herd at all until November, months later than they typically arrive. Temperatures were already dropping by the time the herd finally returned to Old Crow, and the caribou remained around Crow Mountain all winter.

Maintaining Traditional Environmental Knowledge in a Changing Environment

The Resilience of Knowledge

When recognizing the agency of the more-than-human includes knowledge itself (Wilson et al 2022), Traditional Knowledge can be seen as a "living thing"

that "dies" when it is no longer used (Carroll 2015), highlighting the importance of caring for it. Kyle Whyte (2017) argues that renewing Indigenous Knowledge is an important step in developing effective climate adaptation strategies. Traditional Knowledge is not only a source of resilience, it is itself resilient. "Although specific components or aspects of knowledge may be lost, and a process of hybridization with other knowledge forms occurs, what the authors identify as critical, is whether society retains the ability to generate, transform, transmit and apply traditional ecological knowledge – in other words the system of knowledge endures" (Brown 2016, 121). Gwitchin knowledge is still passed down through classes at the school and college and through other cultural programmes, so while there may have been changes in the way knowledge is transmitted to younger generations, the "system of knowledge endures."

Another way of looking at resilience follows Bravo's (2009) description of "maintaining a healthy social order in new civic spaces"; traditional practices themselves may change or even stop, as long as the values that underlie them persist. There are limits to this kind of resilience, however, demonstrated by recent declines in the practice of food sharing. Food sharing has always been a significant feature of northern Indigenous subsistence livelihoods, as "subsistence is about provisioning all those who need food" (Wenzel 2009, 92). Store food is available, but it is expensive and unhealthy. Food sharing was once essential to survival, and even today, hunters and fishers will share their catch with those who are unable to hunt for themselves, such as elder hunters whose health prevents them from going on the land, or women living alone without a hunter in the household. Food sharing thus contributes to the resilience of the community.

Yet, even as hunters try to continue sharing with their community, the practice nevertheless seems to be in decline.

> In those days too, when they went with dogs, and then people came back with caribou, you know they shared, because everybody wants caribou. But that is, I'm sad to say, but that's not happening anymore either. (M. Schafer, Old Crow 2016)

Food sharing has not been completely abandoned, but it is not happening as often as it once did. Sometimes this is due to harvest quotas limiting the amount of fish and wildlife that can be taken, and in many cases, there are simply fewer resources to go around. For example, the government has tightened restrictions on salmon fishing, while diminishing salmon runs leave fishers with fewer

fish in their nets. Hunters and fishers are finding it increasingly difficult to get enough to feed other people along with their own immediate families, despite feeling an obligation to do so. Whatever the cause, a decline in the practice of food sharing could have wider cultural implications. Hunters were taught by their Elders to share with others, and by doing so, they continue that tradition and the knowledge behind it. The loss of cultural traditions such as food sharing thus involves a loss of cultural knowledge.

Traditional Livelihoods in the Modern World

Climate change narratives that are presented as crisis narratives focus on images of Arctic peoples as a single, unified community, which oversimplifies the intricacies of human-environmental relationships in the Arctic, and ignores the diversity of opinions and responses to climate change across the North (Tejsner 2013). Such crisis narratives portray Traditional Knowledge as being at risk from environmental change, yet knowledge is, in fact, becoming increasingly important for dealing with these changes. When resources become scarce, detailed knowledge of the land helps to locate other resources that can be exploited instead, and can also be crucial when technology fails.

Technology is everywhere in Old Crow. It connects the small Arctic community to the rest of the world via the Internet, monitors the movement of caribou and other wildlife wearing satellite collars, and helps to power the town with a new array of solar panels. While some types of technology are disparaged as being a distraction, removing people from the land, others can help to connect people to the land. These can even strengthen resilience by "provid[ing] a level of buffer against increasing environmental disequilibrium" (Tejsner and Veldhuis 2018, 705), such as the satellite tracking that helps hunters know where the caribou are, even as migration patterns change. Technology can assist in many traditional activities from hunting to travelling on the land.

Yet while technology can be a useful tool alongside Traditional Knowledge, it cannot replace knowledge entirely. Successful hunting still relies more on the knowledge of the hunter than on the tools used (Tejsner and Veldhuis 2018). One of the limitations lies in the difficulty of adapting technology designed for a different environment to the Arctic; "it takes time for hunters to familiarize themselves with the properties, capacities, and especially limitations of new technologies. Drifting floe ice and rapid shifts in weather are not the easiest conditions under which to learn from personal mistakes" (Tejsner and Veldhuis 2018, 708). Sometimes, this is merely an inconvenience, but at other times, it

can be dangerous. Engines can stop working, and a GPS can lose its connection in poor weather. If these things happen while hunters are on the land, they must rely on traditional survival knowledge from a time before such technology existed. In these types of situations, dogs can be more reliable than technology, as dogs can find their way home even when visibility is poor, and will also stay away from unsafe areas such as thin ice (Tejsner and Veldjuis 2018).

Narratives that show First Nations and Inuit peoples as vulnerable or at risk do so in the sense of traditions; northern Indigenous Peoples are portrayed as being at risk of losing their Traditional Knowledge, practices and livelihoods. The more modern aspects of northern life are often left out of these narratives, giving the impression of an Arctic that is "frozen in time." When issues such as unemployment or the high cost of fuel are mentioned, it is "only insofar as they undermine traditional knowledges and practices" (Cameron 2012, 108). Similarly, the reliance on waged employment, which is as necessary for life in the Arctic as it is elsewhere, is depicted as undermining Traditional Knowledge by reducing the time spent on the land where such knowledge is gained and transmitted (Cameron 2012), which in turn reduces the ability of northern hunters to adapt to environmental change. These narratives underestimate the resilience of Traditional Knowledge. Traditional Knowledge may be changing, but this does not mean that it is weakening; rather, Gwitchin knowledge is expanding to accommodate new information about technology, about new behaviour observed in caribou and other familiar wildlife, and about the unfamiliar species that are now arriving in the region as habitats spread further north.

Conclusion

Global climate change is dramatically altering the environment in the North, affecting animal behaviour and migration patterns. For Indigenous Peoples who still rely on subsistence hunting, supported by Traditional Knowledge, environmental change is already disrupting this land-based lifestyle. If, as Clint Carroll (2015) claims, Indigenous knowledge "dies" when it is not used, one reason for its disuse can be traced back to colonial practices that encouraged sedentarization, including settlements (McGregor et al 2020). The Gwitchin no longer live on the land year-round, following the animals seasonally; today, work and school responsibilities keep people busy in town. Less time on the land means interactions with caribou are more likely to be closer to town. When people do return to their camps in areas like Crow Flats, many find that it is not

as they remember. Familiar places have become unrecognizable, and increased willow growth impedes travel for humans as it does for caribou, disrupting long-established trails.

The history recorded in stories about the land, such as narratives connected to place names, reveals changes in the landscape over time due to climate change or other causes (Basso 1996). If people wish to maintain their knowledge of the land, they will need to spend time there relearning the new landscape. As families spend less time on the land, the young people are becoming more accustomed to the conveniences of living in town. Many Elders worry that young people are spending too much time with technology, blaming Facebook and video games for the waning interest in learning cultural traditions. These Elders have a good reason for wanting their youth to learn about the land. For years, Elders have talked about how times used to be hard, warning that those hard times will come back again one day. If the plane stops bringing regular deliveries of fuel and groceries, then the Gwitchin will go back to living off the land as they once did, Elders say. They know that this transition will be especially difficult for the young people who are used to having gas monitor heaters and store-bought food. Younger hunters are also accustomed to hunting by gas-powered snowmobiles and four-wheelers; most families have a dog or two, whereas only a few still keep enough trained dogs to pull a sled. But the changes brought by colonialism and capitalism do not necessarily mean the end of Traditional Knowledge or the loss of culture that is connected to it. On the contrary, surviving these colonial changes in the past has provided Indigenous peoples with the experience and knowledge needed to face environmental change (McGregor et al 2020).

During years with fewer caribou, those who can afford to will travel further onto the land to hunt. Other animals, such as moose, take the place of caribou at community events. Once, a local trader even provided reindeer from a herd in Inuvik, which one Elder described as "almost" like caribou.[6] Yet, despite these alternatives, Elders still say that the fate of the Gwitchin is tied to that of the Porcupine herd; just as the limits of caribou resilience could be tested by the expansion of extractive industry, the limits of Gwitchin resilience could also be tested should the herd decline.

The fear of hard times is linked to the fear of environmental destruction caused by pollution and industrial development. When hard times return, Elders convey their hope that the land and animals will still be there to support them. Their wish to share their knowledge of the land with young people is not

just about wanting them to have the skills to live on the land, but also about ensuring that they will know how to take care of the land and animals, to act as stewards of their environment as the Gwitchin have been doing for centuries. There is some hope for this, especially as more young Gwitchin are showing interest in learning and practicing traditions from hunting to running teams of sled dogs. By learning Traditional Knowledge from their Elders, and adding their own observations and experiences, this younger generation would ensure that Gwitchin Environmental Knowledge endures, even as the environment changes around them.

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Notes

1 See also Agrawal 1995; Butler 2006; Scott 1996.

2 The Vuntut Gwitchin are part of the larger Gwich'in Nation, which is spread throughout fifteen different communities in Alaska, the Yukon and the Northwest Territories. Although most communities use the spelling "Gwich'in," in Old Crow the First Nation government uses the older spelling "Vuntut Gwitchin." Following this convention, in this paper I use the spelling "Gwich'in" to refer to the Gwich'in Nation as a whole or to the Gwich'in language, and I use the spelling "Gwitchin" to refer specifically to members of the Vuntut Gwitchin First Nation.

3 See Porcupine Caribou Management Board (https://pcmb.ca/migration/) for an animated map.

4 Quotations from the interviews have been lightly edited, primarily to remove repeated words and "filler" words (um, ah, you know). This was done to improve clarity, while retaining the speakers' patterns of speech.

5 This is beginning to change with the recent addition of a solar array that reduces the community's reliance on the three big diesel generators that power the town, and with further plans for future sources of renewable energy.

6 Although reindeer are also *Rangifer tarandus*, the Inuvik herd was originally imported from Russia and is a different subspecies.

References

Agrawal, Arun. 1995. "Dismantling the Divide between Indigenous and Scientific Knowledge." *Development and Change* 26: 413–439. https://doi.org/10.1111/j.1467-7660.1995.tb00560.x.

Anderson, David G. 2000. *Identity and Ecology in Arctic Siberia: The Number One Reindeer Brigade.* Oxford: Oxford University Press.

Balikci, Asen. 1963. "Family Organization of the Vunta Kutchin." *Arctic Anthropology* 1 (2): 62–69. https://www.jstor.org/stable/40315560.

Bass, Rick. 2004. *Caribou Rising: Defending the Porcupine Herd, Gwich-'in Culture, and the Arctic National Wildlife Refuge.* San Francisco: Sierra Club Books.

Basso, Keith H. 1996. *Wisdom Sits in Places: Landscape and Language among the Western Apache.* Albuquerque: University of New Mexico Press.

Berger, Thomas R. 1977. *Northern Frontier, Northern Homeland: The Report of the Mackenzie Valley Pipeline Inquiry: Volume One.* Ottawa: Minister of Supply and Services Canada.

Bravo, Michael T. 2009. "Voices from the Sea Ice: The Reception of Climate Impact Narratives." *Journal of Historical Geography* 35: 256–278. https://doi.org/10.1016/j.jhg.2008.09.007.

Brightman, Robert. 1993. *Grateful Prey: Rock Cree Human-Animal Relationships.* Berkeley: University of California Press.

Brown, Katrina. 2016. *Resilience, Development and Global Change.* London and New York: Routledge.

Butler, Caroline. 2006. "Historicizing Indigenous Knowledge: Practical and Political Issues." In *Traditional Ecological Knowledge and Resource Management,* edited by Charles R. Menzies, 107–126. Lincoln and London: University of Nebraska Press.

Cameron, Emilie S. 2012. "Securing Indigenous Politics: A Critique of the Vulnerability and Adaptation Approach to the Human Dimensions of Climate Change in the Canadian Arctic." *Global Environmental Change* 22: 103–114. https://doi.org/10.1016/j.gloenvcha.2011.11.004.

Cameron, Raymond D., Walter T. Smith, Robert G. White and Brad Griffith. 2005. "Central Arctic Caribou and Petroleum Development: Distributional, Nutritional, and Reproductive Implications." *Arctic* 58 (1): 1–9. https://doi.org/10.14430/arctic382.

Carroll, Clint. 2015. *Roots of Our Renewal: Ethnobotany and Cherokee Environmental Governance.* Minneapolis and London: University of Minnesota Press.

Collignon, Béatrice. 2006. "Inuit Place Names and Sense of Place." In *Critical Inuit Studies: An Anthology of Contemporary Arctic Ethnography,* edited by Pamela Stern and Lisa Stevenson, 187–205. Lincoln and London: University of Nebraska Press.

Cruikshank, Julie. 2005. *Do Glaciers Listen? Local Knowledge, Colonial Encounters, and Social Imagination.* Vancouver: UBC Press.

Fienup-Riordan, Ann. 1994. *Boundaries and Passages: Rule and Ritual in Yup'ik Eskimo Oral Tradition.* Norman: University of Oklahoma Press.

Ingold, Tim. 2000. *The Perception of the Environment: Essays on Livelihood, Dwelling and Skill.* London and New York: Routledge.

Johnson, Leslie Main. 2010. *Trail of Story, Traveller's Path: Reflections on Ethnoecology and Landscape.* Edmonton: AU Press.

Joly, Tara. 2017. *Making Productive Land: Utility, Encounter, and Oil Sands Reclamation in Northeastern Alberta, Canada.* PhD Dissertation, University of Aberdeen.

Katz, S., 2010. *Traditional Knowledge on Caribou Ecology: Vegetation -> Caribou -> Wolf Food Chain Final Report.* Inuvik, NT: Aurora Research Institute.

Loovers, Jan Peter Laurens. 2010. '*You Have to Live It': Pedagogy and Literacy with Teetł'it Gwich'in.* PhD Dissertation, University of Aberdeen.

McGregor, Deborah, Steven Whitaker and Mahisha Sritharan. 2020. "Indigenous Environmental Justice and Sustainability." *Current Opinion in Environmental Sustainability* 43: 35–40. https://doi.org/10.1016/j.cosust.2020.01.007.

Nadasdy, Paul. 1999. "The Politics of TEK: Power and the 'Integration' of Knowledge." *Arctic Anthropology* 36 (1/2): 1–18. https://www.jstor.org/stable/40316502.

———. 2007. "The Gift in the Animal: The Ontology of Hunting and Human-Animal Sociality." *American Ethnologist* 34 (1): 25–43. https://doi.org/10.1525/ae.2007.34.1.25.

Nelson, Richard K. 1983. *Make Prayers to the Raven: A Koyukon View of the Northern Forest.* Chicago and London: The University of Chicago Press.

Nuttall, Mark. 1992. *Arctic Homeland: Kinship, Community and Development in Northwest Greenland.* London: Belhaven Press.

Porcupine Caribou Management Board, No title. http://www.pcmb.ca/ (Accessed 17 September 2018).

Ridington, Robin. 1990. *Little Bit Know Something: Stories in a Language of Anthropology.* Iowa City: University of Iowa Press.

Sandlos, John. 2007. *Hunters at the Margin: Native People and Wildlife Conservation in the Northwest Territories.* Vancouver and Toronto: UBC Press.

Scott, Colin. 1996. "Science for the West, Myth for the Rest? The Case of James Bay Cree Knowledge Production." In *Naked Science: Anthropological Inquiry into Boundaries, Power, and Knowledge,* edited by Laura Nader, chapter 3. New York: Routledge.

Sherry, Erin and Vuntut Gwitchin First Nation. 1999. *The Land Still Speaks: Gwitchin Words about Life in Dempster Country.* Whitehorse: Vuntut Gwitchin First Nation and Erin Sherry.

Strong, Walter, 2017. "Mackenzie Valley Pipeline Project Officially one for the History Books.", December 28. CBC https://www.cbc.ca/news/canada/north/mackenzie-valley-gas-project-no-more-1.4465997 (Accessed 18 July 2022).

Tanner, Adrian. 1979. *Bringing Home Animals: Religious Ideology and the Mode of Production of the Mistassini Cree Hunters.* London: C. Hurst and Company.

Tejsner, Pelle. 2013. "Living with Uncertainties: Qeqertarsuarmiut Perceptions of Changing Sea Ice." *Polar Geography* 36 (1-2): 47–64. https://doi.org/10.1080/1088937X.2013.769282.

Tejsner, Pelle and Djuke Veldhuis. 2018. "Climate Change as (Dis)Equilibrium: Behavioral Resilience in the Greenlandic Arctic." *Human Ecology* 46: 701–715. https://doi.org/10.1007/s10745-018-0026-7.

Tsing, Anna Lowenhaupt. 2015. *The Mushroom at the End of the World: On the Possibility of Life in Capitalist Ruins.* Princeton and Oxford: Princeton University Press.

Turnbull, David. 2007. "Maps, Narratives and Trails: Performativity, Hodology and Distributed Knowledges in Complex Adaptive Systems - An Approach to Emergent Mapping." *Geographical Research* 45 (2): 140-149. https://doi.org/10.1111/j.1745-5871.2007.00447.x.

Usher, Peter J. 2004. "Caribou Crisis or Administrative Crisis? Wildlife and Aboriginal Policies on the Barren Grounds of Canada, 1947–60." In *Cultivating Arctic Landscapes: Knowing and Managing Animals in the Circumpolar North,* edited by David G. Anderson and Mark Nuttall, 79-92. New York and Oxford: Berghahn Books.

Vergunst, Jo and Arnar Árnason. 2012. "Introduction: Routing Landscape: Ethnographic Studies of Movement and Journeying." Landscape Research 37 (2): 147–154. https://doi.org/10.1080/01426397.2012.669955.

Wenzel, George W. 2009. "Canadian Inuit Subsistence and Ecological Instability – If the Climate Changes, Must the Inuit?" *Polar Research* 28 (1): 89–99. https://doi.org/10.1111/j.1751-8369.2009.00098.x.

Westman, Clinton N., Tara L. Joly, H. Max Pospisil and Katherine Wheatley. 2020. "Encountering Moose in a Changing Landscape: Sociality, Intentionality, and Emplaced Relationships." *Ethnos,* 87 (5), 932–962. https://doi.org/10.1080/00141844.2020.1841262.

Whyte, Kyle. 2017. "Indigenous Climate Change Studies: Indigenizing Futures, Decolonizing the Anthropocene." *English Language Notes* 55 (1-2): 153–162. https://doi.org/10.1215/00138282-55.1-2.153.

Wilson, Shawn, Andrea V. Breen and Lindsay DuPré. 2022. "Mining for Culture or Researching for Justice? Unsettling Psychology through Indigenist Conversation." In *Cultural Methods in Psychology: Describing and Transforming Cultures*, edited by Kate C. McLean, 410–426. Oxford: Oxford University Press.

Wray, Kristine and Brenda Parlee. 2013. "Ways We Respect Caribou: Teetł'it Gwich'in Rules." *Arctic* 66 (1): 68–78. https://doi.org/10.14430/arctic4267.

Zentner, Emilie, Maik Kecinski, Angeline Letourneau and Debra Davidson. 2019. "Ignoring Indigenous Peoples - Climate Change, Oil Development, and Indigenous Rights Clash in the Arctic National Wildlife Refuge." *Climatic Change* 155: 533–544. https://doi.org/10.1007/s10584-019-02489-4.