

LOCAL OBSERVATIONS OF CLIMATE CHANGE AND IMPACTS ON TRADITIONAL FOOD SECURITY IN TWO NORTHERN ABORIGINAL COMMUNITIES

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ABSTRACT

Objectives. Our primary objective was to record participant observations of changes in the local environment, harvesting situations and traditional food species and to explore what impact these may have on traditional food.

Study Design. A participatory study with 2 northern Aboriginal communities in Canada.

Methods. Focus groups were conducted in both communities. Both specific and open-ended questions were asked, to gather information about the traditional food harvest and a qualitative analysis was conducted.

Results. Members from both communities are witnessing variable changes in climate that are affecting their traditional food harvest. New species and changes in migration of species being observed by community members have the potential to affect the consumption of traditional food. Similarly, changes in water levels in and around harvesting areas are affecting access to harvest areas, which in turn affects the traditional food harvest.

Conclusions. Community members have been required to change their harvest mechanisms to adapt to changes in climate and ensure an adequate supply of traditional food. A strong commitment to programs that will ensure the protection of traditional food systems is necessary.

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Keywords: climate change, traditional food, aboriginal communities, food security

INTRODUCTION

Traditional food is local food; animals, fish, birds and plants that are harvested from the environment for human consumption (1). People living in the northern parts of Canada have a nutritional, spiritual and cultural dependence on these systems (1-6). In an intensive dietary survey of Dene, Métis and Yukon communities in northern Canada, researchers found caribou and moose meat to be the main sources of energy, protein, iron, zinc, copper and magnesium (3). Smaller mammals, fish and birds were shown to also provide a large quantity of nutrients vital for good health. Further, a shift from traditional food consumption to more market food has resulted in an increase of consumption in carbohydrates and saturated fat in these same Dene/Métis communities of the Northwest Territories (NWT) (1). A replacement of nutrient-dense traditional food with high-sugar, high-fat, market food has contributed to an emergence and continual increase in disease states, such as diabetes and obesity, in similar populations and has the potential to do the same with Aboriginal communities in northern Canada (4, 7).

A report published by the Canadian Institute of Health Research (8) identified environmental degradation as a major concern among Aboriginal northerners. Changes in climate have the ability to change the distribution and health of animal species, as well as to affect the land, water and ice, creating implications that can change the traditional food harvest. Unhealthy appearances of food sources, distance of travel, seasonal availability and the quantity of species have all been recognized as factors that have the ability to decrease the consumption of traditional foods (9, 10). A change in harvest has

the potential to create a greater shift away from traditional food and a loss of traditional knowledge and culture, affecting both the physical and spiritual health of the people. The extent of these impacts on the nutritional well-being of individuals and communities is not yet well understood, but is important to governments of all levels, in order to ensure that appropriate policies are created to protect these systems (11). The purpose of this paper is to document local traditional knowledge and observations of change in the local environment and traditional food harvest of two northern Aboriginal communities, record current adaptive strategies used by community members and, finally, to explore what effects the observed changes in climate may have on the diet of the people living in these communities.

MATERIAL AND METHODS

This participatory study was carried out as a partnership between the Centre for Indigenous Peoples' Nutrition and Environment of McGill University, the Council of Yukon First Nations (CYFN) and Dene Nation. Full community consultation remained a priority at all stages of the study. Ethics approval was obtained from the ethics committee of the Faculty of Agriculture, McGill University.

Invitations to participate in the study were sent out to communities by First Nation representatives. Two communities were chosen based on their concerns about climate change, food availability, their respective geographical locations, their resource availability, as well as the availability of previously published dietary data. Research agreements were signed with both communities.

A community coordinator was hired from each community to coordinate a focus group with community members in their home community. Focus groups are an ideal method to collect data quickly from a large number of participants in a naturalistic way, and they also provide an opportunity to create a discussion that may help to identify similarities and differences in informant's experiences (12). Male and female Elders, hunters, traditional plant harvesters, and any others who were considered to be knowledgeable in this area, were invited by the community coordinator to participate in the study. The group of participants was selectively chosen by the community coordinators, in order to represent each of the main hunting areas around the communities. Similar group settings have been shown to provide an environment where all informants can discuss openly about their experiences (13), which helped to provide a rich understanding of the state of the traditional food harvest and how it may differ from the past. A local translator was present to ensure that informants were able to express themselves fully, as well as to ensure that all participants understood completely what was being communicated. Ethic consent forms were translated and signed by all participants before the focus group began. To help generate interest and develop a relationship with participants, the purpose of the focus groups was explained ahead of time, recognizing that this may at the same time present a bias in the responses. Both specific and open-ended questions were asked about the harvest of traditional food , in order to facilitate discussion about these issues and to gather an understanding of how climate change may be affecting the traditional food harvest and,

further, what implications these changes could have for community members. A map of the harvesting area was presented to both focus groups to trigger memories, provide an opportunity for participants to specify harvesting areas, and to record any changes that they have noticed in these areas.

Digital audio recordings were made of both groups, in order to eliminate the threat of having inaccurate or incomplete data (14) . The recordings were transcribed twice by the researcher and "member checks" (14) were done with a selected group of the participants from each focus group to rule out misinterpretation. Transcripts were read and reduced into emerging themes and a qualitative analysis categorizing strategy was conducted. "Coding" in qualitative terms involves rearranging the data into categories that enable the comparison of data within these categories , in order to aid in forming theoretical concepts (14). In addition, a cross comparison analysis was done to compare information between the two communities.

The communities

The people of Deh Gah Got'ie First Nation live in Fort Providence, at the source of Deh Cho (the Mackenzie River), which flows into the Tucho (Great Slave Lake) 300 km southwest of Yellowknife in the NWT (Fig. 1). The 2001 Statistics Canada Census (15) reported a population of 753, a total of 200 families, and 235 dwellings. The community belongs to the electoral district of Deh Cho and to the land claim area of Deh Cho Treaty 11. Local languages are South Slavey and English. The main traditional food items include whitefish, northern pike, grayling, moose and waterfowl (6). Hunting and trapping small mammals,

such as marten, otter, and beaver, are very important economic activities.

The community of Beaver Creek in the Yukon is situated on flat terrain and is the most western community in Canada, located just east of the Alaskan border, about 500 km northwest of Whitehorse (Fig. 1). Beaver Creek is the home of the White River First Nation, made up of people from the Upper Tanana, and Southern and Northern Tutchone. The main traditional food items include moose, salmon, whitefish, grayling and berries (5, 15). The statistics Canada 2001 census (15) reported a population of 88 people, including 20 families and 44 dwellings.

RESULTS

A total of 22 participants were involved in two different focus groups. Participants included male and female adults, including Elders, who are from, and continue to live in, the local area, and who regularly harvest traditional food from the land. All but three of the participants lived in the community most of the time, otherwise spending time in camps outside of the community. Three of the participants lived full-time in camps that were a short distance away from the community. The main harvesting areas for each of the communities were represented. The number of people employed in the communities

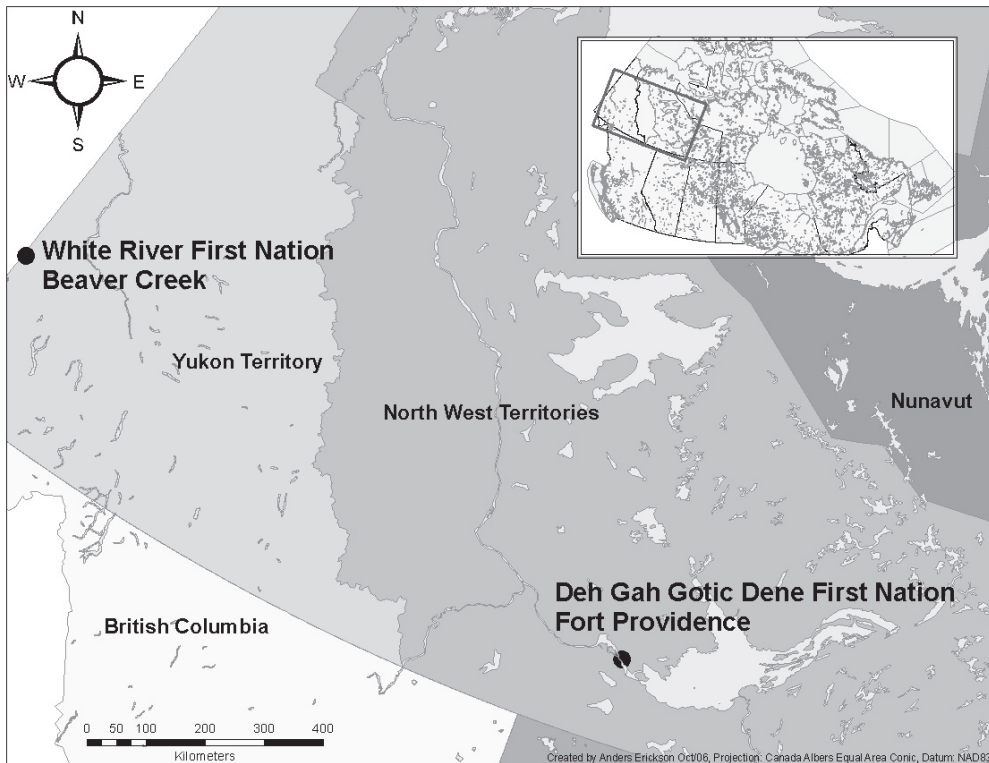


Figure 1. Map showing the locations of the two participating communities.

at the time of the focus groups and the number of people who were unable, or not willing, to participate in the focus groups, contributed to the low number of participants.

Table I. Gender of focus group participants.

	Deh Gah Got'ie	White River
Men	8	5
Women	4	5
Total	12	10

Climate related changes affecting the traditional food harvest

Although observations differ slightly between the two communities, when asked to share observations of changes in the climate and environment that affect the traditional food harvest, the same four themes emerged; changes in species, water, weather and ice. The themes are summarized in Table II.

Changes in species

Participants from both communities expressed that they have noticed changes in their local animals, bird, fish and plant species. For the first time, cougars have been seen around both communities. In addition, the people of Beaver Creek have also seen deer and lynx where they have not in the past.

A noticed change in the timing of migratory birds, and an increased amount of new bird species such as eagles, are all recent observations of the people of Deh Gah Got'ie First Nation. The later arrival of geese has shortened the spring goose hunt by about one week. Ducks have been found with spruce needles in their stomachs, indicating that the vegetation that they would normally consume as a food source may not be available until later than usual and suggesting a later spring

thaw. Along with the changes in bird species, women from Deh Gah Got'ie stated that they have noticed a number of different plant species that they haven't seen before. They did, however, question whether this was related to warmer temperatures, or if other environmental changes, such as pollution from rusty equipment and machinery left on the land and in the water, were the cause of this. An increase in beavers was also reported.

Community members from White River First Nation have also noticed a change in the timing of migratory birds. They reported birds coming back earlier in the spring and leaving later in the fall. Both the women and men from this group stated that they have noticed different plants in the area surrounding their communities. Once again the discussion as to whether this was related to climate or other factors came up. One participant believed it was the increase in lawn seed that is being shipped up by trucks on the highways. An increase in movement of the animals is being observed, which was attributed mostly to the increase in forest fires. People of White River First Nation have seen a huge decline in the population of their local caribou herd. Some focus group participants believe this is due to the vegetation drying up, while others believe that it is due to the increase of wolves present, making it more unlikely that the young caribou will survive. Community members reported that, due to the cyclical nature of rabbits, there have been few rabbits around for the past few years. One hunter from this group reported that he had seen a few moose with hair-loss and water bubbles between their joints, and was concerned that this might be from a change in climate. Focus group participants in Beaver Creek also stated that there were

Table II. Climate-related changes affecting the traditional food harvest.

Theme	Deh Gah Got'ie	White River
Changes in species	<ul style="list-style-type: none"> • change in timing of bird migration, geese later than before • spruce needles in ducks' stomachs • cougar seen • white spots on beaver • different bird species • lots of eagles 	<ul style="list-style-type: none"> • bird migration changing (coming back earlier and leaving later) • different plants around • deer, cougar and lynx seen • no more caribou • too many beavers • no rabbits • plants earlier in the season • animals move around alot • hair-loss on moose
Water	<ul style="list-style-type: none"> • more rain last year • recent flooding in the staging area for birds, never happened before • horn river really dried out • hardly any water in the fall • rain and snow before it gets really cold, so you get slush under the snow and creates overflow • water fluctuations are more evident • drier land • warmer water 	<ul style="list-style-type: none"> • dry lakes, dry creeks, dry swamps • lakes getting lower • beaver creek dry • no rain • way less snow
Weather	<ul style="list-style-type: none"> • chinook in December • season is about 2 months later, even in the winter the weather changes • February wind has lessened, normally called the wind month • stronger storms in the summer • warmer weather in the winter • fluctuations have always been there, but they are more evident now • diseases in animals due to warmer weather 	<ul style="list-style-type: none"> • thunder the wrong time of year • more weather activity • more danger of forest fires • lots of earthquakes • warmer • 1950's warm, then colder, now warm again • fluctuations in the weather
Ice	<ul style="list-style-type: none"> • so far no problem traveling on the ice • breaking up at different times, sometimes early, sometimes later • thicker ice, more abundant different break-up (a few years ago thick, then thin chunks again, then thick again) 	<ul style="list-style-type: none"> • no ice to go out • river is open year round

“*too many beavers*”, which was a contributing factor to the varying water levels around the community.

When asked how community members would react to these changes in species, focus group participants from both communities communicated that they would hunt and harvest the species that were around them.

“*We have to do what we have to do*”
 “*Eat what is around.*”

Water

Recent changes in water levels in the local creeks, rivers and lakes were a huge concern for members of both communities. People of Deh Gah Got’ie have said that water fluctuations are much more evident from year to year now and that, most recently, they have seen an increase in the current year’s rain relative to previous years. This gave the women in the group reason to believe that there will be fewer berries in the summer to pick. The Horn River, a staging area for birds close to the community, is one area where major fluctuations in water levels are being noticed and have community members concerned. The staging area flooded in the spring and, soon after, became very dry. Participants attributed the drying of the area to an increase in beaver dams changing water levels of the local watershed. Community members were concerned that the spawning of fish could have been affected, decreasing the numbers of whitefish. Lower water levels in the Mackenzie River have made places that were accessible by boat inaccessible. Contrasting with this negative effect from dry water systems, drier conditions make it easier to travel during the fall harvest. Dry creeks, swamps, rivers and land require community people to change

their methods of transportation from a boat to a truck or all-terrain vehicle, which makes it easier to travel to the harvesting area for the moose, and to transport the moose back to the community. In addition, when there is less water, the people of Deh Gah Got’ie said that the moose come to the river and are therefore closer to the community, making the travel distance for the harvest shorter. A high amount of rain in the early winter before the snow fall creates a layer of slush under the snow, which can cause overflow and generates complications and unsafe conditions for travel across the ice. At this time of the year, trappers are setting their trap lines, and moose and caribou are still being harvested. When ice conditions are not safe, the ability to travel along the trap lines to the harvest areas is impaired, delaying the trapping period. Finally, residents of this community have also noticed a general warming of the water in the summer time. Community members recall that, when the water is warmer, they are more likely to catch fish that are “soggy”. Fish caught in this state are not favored and, therefore, would not be eaten.

White River First Nations residents have also experienced a general drying of the area, lakes, creeks and swamps around the community.

“*I see the biggest change in this (the water)*”

They have noticed much lower rainfall and snowfall amounts than in the past, which has contributed to fewer berries in the summer months. Beaver Creek, which flows close to the community, was completely dry and the water levels in the lakes around the community were lower than they had been previously. Participants stated that this was making it

easier for community members to travel out on the land and in the woods. This was concerning to community members, because they knew that this was not typical. On the other hand, participants stated that, when there is less snow, coyotes hunt in packs, making it more likely that they would kill more caribou, thus decreasing the numbers in the caribou herds.

Weather

Community members in Fort Providence have experienced unusual weather changes in the winter, describing these changes as “*fluctuations that have always been there but they are more evident now*”. Participants stated that there has been a trend of warmer winters. A “*chinook*” that occurred during the December prior to the focus group had participants alarmed. Participants have also noticed a shift in the season, stating that “*the colder season is happening about 2 months later than previously*”. Stronger storms in the summer is another change that is having an impact on the traditional food harvest. More frequent, stronger storms mean an increase in situations where it is unsafe for community members to travel on the water.

Residents of White River First Nation are also observing fluctuations in weather and more weather activity. Community members are witnessing thunder storms at the wrong time of the year, increasing the risk of forest fires. One participant recalled that there had been lots of earthquakes. An Elder in the group explained changes in weather, not as something unusual, but instead as weather patterns, recalling that, in the 1950’s, it was warm and then it became colder, and now has started to become warm again.

Ice

Although people of Deh Gah Got’ie First Nation have not had any trouble traveling on the ice so far, they have noticed changes in the ice. Spring break-up is occurring at different times, sometimes earlier than usual and sometimes later. The changes in break-up times are affecting the goose harvest, making the geese more difficult to get to. While participants from this community reported a general trend of warmer winters, they also described that thicker ice is creating a more abundant break-up, sometimes causing the ice to pile up in the river and make it hard to travel down.

“I remember my father crossing it (Mackenzie River) in May and now it breaks up and doesn’t move; break-up happens at different times than it used to.”

The discrepancy of this may simply be due to participants recalling different years, as the fluctuation of weather patterns from year to year was a consistent response among all participants.

People in Beaver Creek are noticing a drastic difference in the ice around the community. Community members have not had any ice to go out fishing. The river south of the community had open water throughout the entire winter, making it impossible to cross by snow machine.

Adaptability

The environmental changes that are being observed by people from Deh Gah Got’ie First Nation and White River First Nation are of great concern to the people, but, at the same, time people from these communities have been able to adapt in a way that fits their best interest.

Focus group participants were asked what individuals do to deal with these changes. Deh Gah Got'ie participants agree that the changes have been small and, therefore, they have been able to continue to adapt. Although the amount and type of traditional food varies from year to year, focus group participants have not noticed a difference in the overall amount of traditional food in the community.

“The change is so gradual that we adapt without even noticing, our ability to adapt kind of makes it easier, we change without even knowing, we do what we have to do”

DISCUSSION

As documented in Table III, a change in species has the potential to alter the nutrient composition of the diet. For residents of Deh Gah Got'ie First Nation, a shortened goose hunt means less geese harvested for consumption by the community. In a community that has previously reported 76% of the population to be consumers of geese (6), a reduction in the consumption of geese could mean a reduction in high quality protein and important minerals, such as iron and zinc (16). On the other hand,

an introduction of species such as deer and new plant species could have a positive effect on the nutrient composition of the diet. Deer would be a likely addition to the diet if available for harvest, especially for the people of White River First Nation whose local caribou herd has declined. An addition of new plant species could contribute to an increase in the variety and size of berries available and, if available and consumed in large enough quantities, could increase the intake of nutrients such as fiber, a nutrient previously reported at low levels of intake for all age groups (6).

There is great potential for the fluctuations in the water levels to create nutritional shifts in the local diet. The type of transportation used to cross the water, or travel into the bush, has a huge influence on the level of harvest brought back to the community.

“We are just changing techniques; we drive instead of using boat, so more hunters on the highway instead of the boat or on the water.”

“We have to go further on the land if things change”

“We would go further away to hunt them.”

In situations where the land is dry enough for a truck or all-terrain vehicle to be used,

Table III. Possible nutritional implications of observed changes in species.

Observation	Consequence	Traditional food consumption	Nutrients affected
New animal and bird species	• will begin to hunt	↑ deer	Protein Iron Zinc
Changes in bird migration	• shortened hunting period	↓ geese	Protein Iron Zinc
New plant species	• will begin to harvest	↑ or ↓ berries ↑ or ↓ traditional greens	Vitamin C Fiber

hunters will be able to travel longer distances to reach the animals. In addition, the ability to carry a greater amount of food back to the community will increase when using a truck as compared to traveling by boat. Moose meat is the most consumed traditional food in both of the communities; it is perceived as being good for the health and would be consumed more if available (6, 17). If hunters were able to provide more moose for the community, we could expect an increase in the consumption of moose by community members, contributing to optimum protein, iron and zinc levels. At

the same time, a decrease in travel over water could mean a decrease in the local fish harvest, negatively affecting the intake of these same important nutrients. Whitefish is one of the main traditional food sources for the people of Deh Gah Got'ie, contributing energy, protein, iron, zinc and calcium to the nutrient composition of their diet (6). The difficulty in transportation created by an increase in rain and a decrease in snow has the potential to decrease the caribou and berry harvest, further impacting nutrient intake of Vitamin C, fiber, protein, iron and zinc.

Table IV. Possible nutritional implications of observed changes in water.

Observation	Consequence	Traditional food	Nutrients affected
Drier lakes, swamps, creeks and land	<ul style="list-style-type: none"> • hunt by land instead of by boat, makes hunting easier • decrease in spawning area • vegetation dried up • increase in thunderstorms 	↑ moose ↓ fish ↓ caribou	Protein Iron Zinc
Rain before snow	<ul style="list-style-type: none"> • trap lines delayed • dangerous, people would not go out • people would eat less 	↓ rabbits ↓ spruce grouse	Iron Zinc Calcium
Warmer water	<ul style="list-style-type: none"> • “soggy” fish 	↓ whitefish	Protein Iron Zinc
More rain	<ul style="list-style-type: none"> • smaller berries 	↓ berries	Vitamin C Fiber
Less snow and rainfall	<ul style="list-style-type: none"> • coyotes hunt in packs • fewer berries 	↓ caribou ↓ berries	Protein Iron Zinc Vitamin C Fiber

Table V. Possible nutritional implications of observed changes in weather.

Observation	Consequence	Traditional food	Nutrients affected
Warmer	<ul style="list-style-type: none"> • pack less weight • cannot fill toboggan up as much • less gear • moss could be covered in ice and there is no food for caribou 	↑ moose ↓ moose ↓ caribou ↑ caribou	Iron Protein Zinc
Stronger storms	<ul style="list-style-type: none"> • cannot go fishing 	↓ fish	Iron Protein Zinc

The biggest concern about the change of weather that community members from both focus groups have is the unpredictability that now exists when traveling out on the water, or on the land.

“Can’t predict anything anymore”

Stronger, more frequent storms are alarming the people and posing a safety risk to those who are out on the water, decreasing the time that community members spend fishing out on the lakes. Warmer weather is affecting food preservation methods, making it harder to successfully dry meat; the higher temperatures increase the chance that the meat will spoil before it is able to dry. On the one hand, warm weather can be hard on the skidoo, complicating travel by snow machine and affecting the amount of harvest brought back to the community. On the other hand, warmer weather means hunters are able to go out on the land with less gear, thus leaving for more space for traditional food to be taken back.

When harvest is dependant on travel across ice and changes in the ice create conditions unfit for travel, lower levels of fish and geese harvested will impinge on the nutrient composition of the diet (Table VI).

“If it is more difficult to go out, people would just eat less (traditional food).”

Fish is a regular part of the annual diet for people from both Deh Gah Got’ie and White River. In the Deh Cho region, 86% reported eating fish at least once a day (6).

The most obvious impacts of climate change on the traditional harvest have been the required changes in mechanisms that are used to gather the food. Focus group participants stated that more funding is needed for the purchase of gas, in order to enable hunters to reach the animals when they are further away. Further enhancements to existing initiatives that assist trappers with their trap lines are needed, as are improvements to the trails that are used to travel to trapping areas. Continual and increased support to the community hunt program, which is currently responsible for providing caribou to all community members, would ensure that more people of Deh Gah Got’ie First Nation are able to acquire traditional food. A similar program would be of great use for the people of White River First Nation, where very few people have snow machines and are therefore unable to get out hunting. A long-term initiative to restore and maintain community freezer programs would be an asset to both communities

Table VI. Possible nutritional implications of observed changes in ice.

Observation	Consequence	Traditional food	Nutrients affected
Less ice	<ul style="list-style-type: none"> • would not be able to get whitefish until later • have to resort to using other fish species, even though the preference is whitefish • geese are getting harder to get because of the ice • cannot cross rivers or lakes 	<ul style="list-style-type: none"> ↓ fish ↓ geese 	<ul style="list-style-type: none"> Protein Iron Zinc

Conclusions

Members of both White River First Nation and Deh Gah Got'ie First Nation are experiencing changes that are affecting their local traditional food harvest. Accessibility and availability of traditional foods are changing and, due to the immense adaptive qualities of the people, harvesting techniques and mechanisms are being changed, in order to ensure a constant supply of traditional food to the community.

The World Health Organization (18) defines food security as when; *“all people at all times have both physical and economic access to enough food for an active, healthy life; the ways in which food is produced and distributed are respectful of the natural processes of earth and are thus sustainable; both the consumption and production of food are governed by social values that are just and equitable, as well as moral and ethical; the ability to acquire food is ensured; the food itself is nutritionally adequate and personally and culturally acceptable; and the food is obtained in a manner that upholds human dignity.”*

Programs need to be put in place to support the people of Deh Gah Got'ie and White River First Nations as well as all other Aboriginal people of Canada, in order to ensure traditional food security by making certain that these foods are available and accessible and that they remain nutritious, safe and culturally appropriate. Traditional food is an essential part of the culture for people in these regions (1, 4, 5, 6, 7, 17), and the potential for environmental changes to alter their cultural way of life is devastating. The changes in the availability and accessibility of the traditional food

harvest are not only an issue of food security, but also one of cultural preservation, and they deserve serious recognition by governments all around the world.

“The most important thing is that the land is changing and our people are changing at the same time, because of the relationship we have with the land we have lived on for thousands of years. Once that relationship changes, it means that we are not distinct anymore, we are not Dene anymore and that's the most important thing and the very biggest challenge we are dealing with; once we stop hunting and doing those traditional things, we are not Dene.”

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