Predictions of Global Warming Influences on Aboriginal Food Use Patterns in Northwestern Canada[1]

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Abstract

Aboriginal traditional food consumption patterns have tended to change only slowly. Today, Aboriginal people still prefer traditional foods over marketed alternatives and strongly believe that traditional foods are better for health. Current global climate change research forecasts significant warming in northern regions over the next thirty to fifty years, causing changes in sensitive biological systems. As a result of hydrological and vegetation changes, the abundances of mammals, birds and fish could change. Traditional harvesting locations may no longer be dependable. New and different food sources may be required. If traditional food resources, which in northern Alberta, contribute from a quarter to a half of all red meat, poultry and fish consumed by Aboriginal Canadians, diminish, people are likely to shift to a greater proportion of marketed food. This may decrease the nutritional quality of Aboriginal diets and lead to a greater incidence of nutrition-related diseases, already prevalent in the South: obesity, cardiovascular diseases and diabetes mellitus.

Human food consumption patterns are strongly influenced by resource availability. Traditionally northern Aboriginal Canadians moved with the seasons to locations noted for an abundance of specific resources. Camps were located at good fishing sites, along caribou migration routes, or near deltas rich in waterfowl and aquatic mammals. For example, Fort Chipewyan, located near the Peace-Athabasca Delta, is known for its abundance of muskrats and beaver, ducks and geese, berries, fish, and bison (Wein, Sabry and Evers 1991a). The northern Yukon community of Old Crow is well sited because it is a good fishing location, it is close to the resource-rich Old Crow Flats, and because the Porcupine Caribou Herd, upon which the people depend, migrates twice annually across the Porcupine River nearby (McClellan 1987). Aklavik, located in the Mackenzie Delta, is similarly surrounded with rich biological diversity.

Although new technology, such as snow machines, all-terrain vehicles and other hunting equipment, has been adopted quite readily in the North, food habits tend to change only slowly. Depending on the geographic region, moose, caribou, salmon, whitefish, lake trout, and berries are still eagerly sought and widely used. Most often they are prepared by traditional methods, such as boiling, or frying, or preserved in the form of dry meat or dry fish. Bannock, introduced by early

traders and made from flour, lard, baking powder and water, is also still widely used, despite the availability of yeast-leavened bread.

The objectives of this paper are to review selected recent literature on aboriginal use of traditional food and to hypothesize how use may change under predicted climate change scenarios. Our geographic focus is northwestern Canada and our discipline bias is as a nutritionist and as a vegetation ecologist.

Present Food Preferences and Beliefs

Traditional foods are still very well liked and generally preferred over marketed alternatives, even by children and teenagers (Wein, Sabry and Evers, 1989; Wein and Freeman, 1992; Wein, Hawrysh and Gee, 1993). Among Native Canadians near Wood Buffalo National Park, preference ratings of 22 traditional and marketed foods showed that moose, bannock, caribou, orange juice, duck, carrots and apples were best liked. Very few differences in preference ratings were found between men and women, or among young, middle and older adults (Wein, Sabry and Evers, 1989). In the Mackenzie Delta community of Aklavik, Inuvialuit children's food preference ratings were not statistically significantly different from adults' for 31 of 34 traditional foods studied (Wein and Freeman, 1992). Some favourite foods of Inuvialuit children and adults were caribou, fish, beluga whale, hare, muskrat, and several kinds of berries.

Many Native people also strongly believe that traditional foods are better for health than store-bought replacements (Wein, Sabry and Evers, 1989; Wein, Hawrysh and Gee, 1993). When asked to describe the ideal diet for health, many Yukon Indian people stated that one should eat mostly traditional food, or more traditional food than found in contemporary diets.

Climate Change in Space and Time

Independent approaches to global atmospheric circulation modelling by scientists in Britain, the USA and Canada predict that a doubling of the atmospheric greenhouse gases will result in strong global warming (Houghton, Jenkins and Ephraums, 1990). It is predicted that this effect will be enhanced northward, raising mean annual temperatures from 4 to 7 °C, with greatest increases in winter. Moisture predictions are less clear cut but with increased temperature, evapotranspiration will increase and moisture deficits could occur in the summer. Since the distribution of vegetation is strongly linked to temperature and moisture, areas much further north will become suitable for southern vegetation types in the next 30-50 years. Grasslands could expand

northward and the boreal forest could be pushed into the Arctic Islands (Sargent, 1988).

In glacial advance and retreat time spans, vegetation types can migrate sufficiently fast to occupy suitable habitat; however, the rates predicted under climate change are unprecedented. Many tree species in the boreal forest have life spans that reach 250-300 years and with gradual warming they may tolerate the change even though growth conditions are not ideal. More likely the extremes of climate, combined with insect outbreaks and forest fires, will remove the present stands, and then shape the new forest composition. Flannigan and Van Wagner (1991) have predicted that, under a doubling of atmospheric carbon dioxide, fires could occur later in the season, be more severe, and increase in areal extent by 50% across Canada. It is interesting to note that this predicted increased area of burn has already occurred during the 1980's. This raises the possibility that, with climate change, fire could increase even further.

With increased disturbance, the vegetation cover of the landscape will change. As the old-age-forest characterized by needle-leaved trees such as spruce decreases in area, populations of old-age-forest dependent species, such as caribou, will decline. Unless climate cools, the above is an irreversible change—or at least the climate could hold for many decades.

The new landscape will be covered with early succession stages of forests, i.e., more broad-leaved trees such as aspen than needled-leaved trees; there is some evidence that broad-leaved trees have been advancing, as well, onto the arctic tundra after recent fires (Landhausser and Wein, 1993). In geographic area, this early succession vegetation could cover most of the continental climate boreal forest west of the Great Lakes. In this huge region, unprecedented areas have burned during the past decade (Van Wagner, 1988; Hirsch, 1991). The vegetation change to broad-leaved trees, in turn, will lead to early succession wildlife species, such as deer, moose, bear, and sharp-tailed grouse; northern hunting success should begin to reflect this change.

Some regions of the North may not be so fortunate. Where food resources are concentrated in biologically rich areas, such as river deltas, the effect on traditional food supplies could be severe. For example, the Peace-Athabasca and Mackenzie Deltas may become drier, and populations of fish, waterfowl and aquatic mammals may decrease. An analogue of this situation is already apparent in the dramatic decrease in peak runoff water levels and overall drying of the Peace-Athabasca Delta since construction of the W. A. C. Bennett Dam on the Peace River in the late 1960s. The yearly flooding that replenished the waters of perched basin lakes of the Delta, brought in nutrient-rich soil

and drowned woody vegetation, no longer occurs. Due to low water levels, overwintering muskrat habitat has been lost, small stream access to spawning fish has been reduced, spring and autumn staging areas for waterfowl have been lost, and bison habitat has been invaded by willows and weedy species, thereby lowering forage quality (Peace-Athabasca Delta Project Group, 1973; Rieneit *et al.*, 1971; Hogenbirk and Wein, 1992). Similarly, under climate change scenarios, traditional food supplies in deltas could decrease and there could be serious pressure to overharvest the remaining or alternate food resources.

Proportions of Traditional Foods in Daily Diets

Presently in Fort Smith and Fort Chipewyan, traditional meat, birds and fish comprise one-fourth to one-half of all meat, poultry and fish consumed by Native Canadians (Wein, Sabry and Evers, 1991). The proportion is higher among older adults than among adolescents and young adults. On a Cree reserve in northern Alberta, traditional red meat, poultry and fish in mothers' diets provided 8% of daily energy intakes, but 30% of daily protein and zinc, 22% of iron, 24% of niacin, and 19% of riboflavin (Wein, Gee and Hawrysh, 1992). In the northern Yukon, traditional food comprises a much larger proportion of the diet. In Old Crow, a village that depends heavily upon caribou, traditional meats, birds and fish supply 67% of daily protein intake (Wein, 1994). Thus traditional foods comprise a substantial proportion of contemporary northern aboriginal diets.

Change Toward More Marketed Foods

If traditional food resources diminish due to global warming, people are likely to shift toward a greater proportion of marketed food, just as during past shortages (e.g., Vivian *et al.*, 1948). At least this pattern is expected when extreme climatic events, which are predicted under climate warming, lead to short term shortages.

What marketed foods are most often purchased at present, and what is the overall nutrient quality of northern diets? Most frequently used marketed foods in Yukon aboriginal diets are sugar, coffee, tea, margarine, butter, evaporated milk, coffee whitener, white bread, potatoes, carrots, eggs, and macaroni.

In comparison to Canadian recommendations for health (Health and Welfare Canada, 1990), current diets of northern Native people provide adequate protein, phosphorus, thiamin, riboflavin, niacin, vitamins B6 and B12, and in some studies, iron, and zinc, and vitamin C. However, diets tend to be low in calcium, folate, vitamin A and vitamin D (Wein, Sabry and Evers, 1991b; Wein, Gee and Hawrysh,

1993; Sevenhuysen and Bogert-O'Brien, 1987), and sometimes in iron, zinc or vitamin C. Dietary fibre intakes are often low as well. Fat, saturated fat, and cholesterol intakes are often higher than recommended. Much of the fat comes from lard used in frying or other additions to food, since traditional meats are generally very lean. Regardless of whether or not the climate changes and traditional food sources change, the nutrient quality of the diet could be improved. Our basic understanding of the principles of nutrition suggest that greater consumption of foods rich in calcium, folate, vitamins A and D, and fibre is needed. Some examples of such foods are low fat dairy products; canned fish with edible bones; fish head soup; leafy green and deep orange vegetables and fruits such as Swiss chard, fireweed greens, carrots, turnips, or oranges; liver of game or fish; and whole grain products.

Cost of Marketed Food in the North

Can people afford to purchase an nutritionally adequate diet? The cost of marketed food in the North is very high, especially in remote communities that rely on air transport of perishables. For example in Aklavik in October of 1991, 1 litre of milk cost $2.42, and 1 loaf of bread cost $2.38 (Freeman, Wein and Keith, 1992). Based on the 46 food items that comprise the Northern Nutritious Food Basket (Indian and Northern Affairs, 1990), the cost of a nutritionally adequate diet, for a family of four for one week, was calculated for several Yukon communities. Compared to Edmonton, where the diet cost $109.71 for one week, the same diet cost $146.97 in Teslin, $181.49 in Haines Junction, and $348.99 in Old Crow (Wein, 1994). Teslin and Haines Junction are on the Alaska Highway so, as a result, prices are relatively low. Old Crow relies entirely on air transport of marketed food; hence, in the northern Yukon, it costs more than three times as much as in Edmonton to purchase a nutritionally adequate diet.

Under a changing climate, the greater reliance on imported food will mean a greater direct economic burden on northerners. In addition, should northerners continue to harvest traditional foods, they will likely need to expend greater resources to travel beyond present harvest sites to more distant areas with higher numbers of food species.

Potential Implications of Dietary Change

With climate change and a shift toward greater use of marketed foods, depending upon which foods are selected, the nutrient quality of the overall diet may diminish. This situation is likely to lead eventually to an increased prevalence of nutrition-related diseases. For example,

diabetes mellitus appears to be increasing rapidly among the Canadian Indian population. A recent national survey found that the incidence was highest in the eastern and southern parts of Canada, and lowest in the West and North (Young, Szathmary, Evers and Wheatley, 1990). Since Native people in the East and South have adopted more urban lifestyles than in the North, this finding suggests that lifestyle factors may be associated with the increased incidence of this disease. Obesity is also common among the Indian population of the provincial Norths, especially among middle aged women (Young and Sevenhuysen, 1989). Obesity is associated with increased risk of several chronic diseases, such as cardiovascular disease, gallbladder disease, as well as diabetes mellitus.

Would Diets Change Under Climate Change?

It is well documented that the diet of Aboriginal people has changed during historic times. Within the lifetime of older Fort Chipewyan residents, herds of caribou migrated regularly along the north shore of Lake Athabasca into the Birch and Caribou Hills. Now the caribou are no longer available locally, and moose is the predominant meat. Early traders introduced tea, flour, lard and baking powder. Many people consider tea and bannock, made from the latter three ingredients, to be aboriginal foods. Aboriginal participants in contemporary dietary studies report hamburgers, Chinese food, deep fried prawns, pizza, and other ethnic dishes among their daily intakes. Thus food patterns do change, albeit slowly, as socio-economic conditions change.

Conclusions

Climate change, a physical influence, will not occur in isolation, but will be accompanied by socio-economic factors influencing food consumption patterns. With climate change, traditional food patterns are likely to be disrupted, and daily food patterns are expected to shift towards greater use of marketed foods. In remote settlements, given the high cost of marketed foods and the types currently consumed, the overall nutrient quality of the diet could diminish. Higher saturated fat, higher sugar, lower protein, and lower vitamin and mineral intakes are associated with increased risk of chronic disease.

Over the 30-50 year period that is commonly used in climate change scenarios, many socio-economic changes could influence food consumption patterns. Increasing numbers of northerners are employed in decision-making positions in community and transportation services, education and administration. Land claim settlements (for example, the Inuvialuit and the more recent Gwich'in settlements in northwestern

Canada) are leading to greater resources for Aboriginal people, and greater control over them, including foods from the land. This may ensure that cultural and social links to traditional foods remain strong. Even if, in the future, these foods are no longer used on a daily basis, they will be featured at special community events and celebrations. We predict, however, that Aboriginal elders will do all they can to ensure the continuing availability and consumption of these foods.

Eleanor E. Wein has worked with northern aboriginal groups since 1985 quantifying the contribution to health provided by traditional foods. Ross W. Wein has studied northern vegetation and the impact of disturbance since 1969; more recently he has been studying extreme events that might prove to be analogues of future climate change.

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Note

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