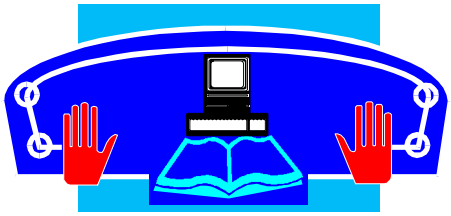

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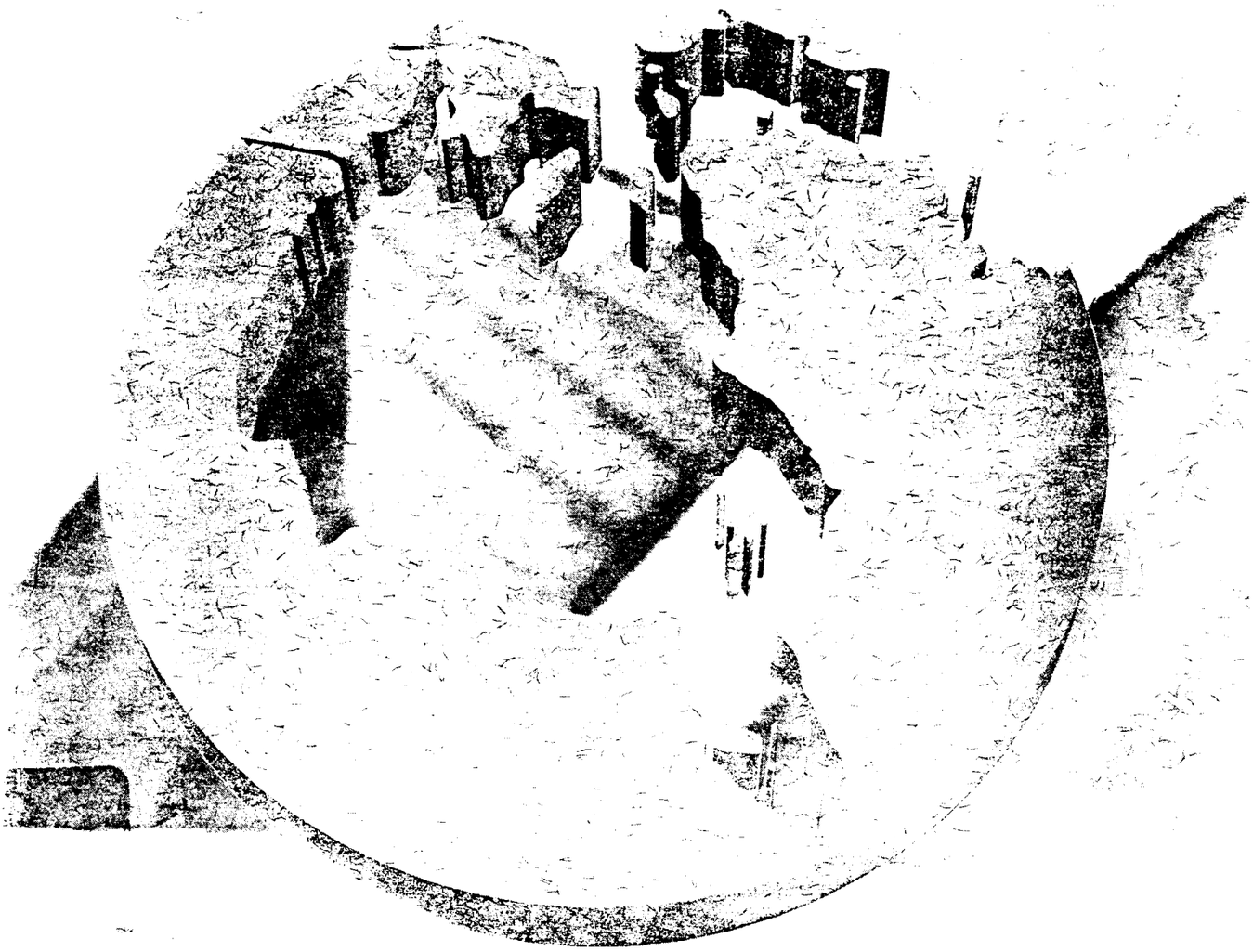

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Abstract

The Hudson Bay bioregion, with its sparse population outside the agricultural areas, looks empty to many southern Canadians. In reality, it is an area with extensive aboriginal land use, leaving few (if any) blank areas on maps, even in the more remote northern sectors. This report summarizes some 15 land use studies from all major parts of the bioregion. The dominant land use is aboriginal harvesting of wildlife (hunting, fishing, trapping), and this activity shapes the relationship between human societies and the environment. Use of the land is based on traditional ecological knowledge (or indigenous knowledge) and environmental management systems of the people, examples of which are provided from the bioregion.

The main product of the indigenous use of land at present is meat; land also produces wood for fuel, fur for commerce, some plant products as food and medicinal ingredients, and raw materials for the production of handicrafts. Based on seven regional studies, the subsistence production of bush meat falls in the range of 50 kg to 350 kg potential food weight per person per year, and there is little evidence that it has been declining in recent years. Even in the most recent studies in the Mushkegowuk region, northern Ontario, the bush harvest of meat was comparable to the values reported from the Mackenzie Valley in 1975.

Although the significance of subsistence varies from region to region (higher in the Inuit areas; intermediate in northern Ontario and Quebec; lowest in northern Manitoba), most of the replacement values for the bush meat harvest fall in the range of $5,000" to $20,000 per household per year, in constant dollars. Costs are difficult to calculate, and there is no standard methodology for comparing the value of bush economy to the total economy. In the more recent studies in the overall subarctic area, replacement values of bush products fall mostly in the range of one-third to two-thirds of non-bush values in regional economies.

Subsistence is not merely a material or economic aspect of Me; it is the basis of aboriginal culture and social health, which cannot readily be quantified in monetary terms. Thus, strengthening the bush economy would improve the quality of life of aboriginal peoples in the bioregion. A number of major projects have affected both the environment and local livelihoods, but before more extensive development takes place, there is an opportunity to plan for development alternatives which are more sustainable environmentally, culturally and economically.

Keywords: Native Land Use; Traditional Ecological Knowledge; Subsistence Economy; Harvest Studies; Wildlife Management; Hunting; Fishing; Trapping; Native Diets; Development Impacts

1. Introduction

The Canadian North has been traditionally viewed by the South as "frontier" to be developed for the benefit of the South. The aboriginal inhabitants see the North differently, as land which links them to a past shared by people who have always lived there. This alternative view of the North as "homeland", was introduced to the South by the Report of the Mackenzie Valley Pipeline Inquiry (Berger, 1977). It is not a view generally accepted by governments and industries, but it is a view asserting itself through land claims agreements and other self-government negotiations, and the increasing political control by aboriginal groups over their land and people's future.

As it is coming to be interpreted in Canada, sustainable development involves more than ecological sustainability; it also includes economic and social/cultural sustainability. Thus, sustainable development planning for the North involves multiple objectives, including those pertaining to economic development and its land and resource base, and environment-culture relationships (NMEDC, 1993; Chance, 1993; Huskey & Morehouse, 1992; Duerden, 1992).

We have therefore chosen a three-pronged focus for our report: traditional ecological knowledge (TEK), indigenous land use, and subsistence economies, which we consider to be closely interrelated. The local traditional economy requires a land resource base, and the use of that land is related to people's local knowledge and management systems (e.g., family-based hunting territory systems) and their institutions (e.g., hunters-trappers associations which can organize and oversee the operation of a trapline system). TEK, land use activities and subsistence economies are also related to ethics in the use of land and resources, including the sharing of subsistence foods. This paper attempts to synthesize available information in three areas (traditional ecological knowledge, land use, and subsistence economy) in the Hudson Bay bioregion (Figure 1).

Throughout the Canadian North, including the Hudson Bay bioregion, community economies may be characterized as a mix of transfer payments, wage employment based on service sector jobs and a traditional sector based on land (George & Preston, 1987; George, 1989). The significance of the subsistence sector in the overall economy has not been investigated in detail, but some studies suggest that it continues to be the cornerstone of the overall economy and the focal point of social health and well-being. The assumption is that a healthy traditional economy is predicated on a healthy land (and water) resource base, as well as healthy social institutions and cultural integrity (Berkes et al., 1992).

For purposes of this paper, the terms traditional ecological knowledge (TEK) and indigenous knowledge (IK) will be used interchangeably, IK being the preferred term for some anthropologists. TEK will be defined as "a cumulative body of knowledge and beliefs, handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment" (Berkes, 1993). TEK is an attribute of societies with historical continuity in resource use practices. Many of these societies are indigenous or tribal and include northern native societies in the Hudson Bay bioregion.

In legislation being proposed in Alaska, subsistence is defined as "the taking and use of wild fish and game as part of a way of life" (Freeman, 1993). In this report, we use the term subsistence not merely as an economic concept but one that denotes important societal relationships and cultural characteristics of indigenous societies (Freeman, 1993; Wenzel, 1991; Usher, 1987). The dictionary definition of the term subsistence as "what one lives on" accurately describes the northern native concept, even though there is no word for it in languages such as Cree. The term harvesting, which describes the activity of subsistence, does have native language equivalents. For example, in eastern James Bay Cree usage, the word ***nituuhun*** refers collectively to all hunting, fishing and trapping activities (Berkes, 1988). Accordingly, in *this* paper, the word harvesting is used to refer collectively to hunting, fishing and trapping. It does not include berries, wild rice, and other plant products used for food or medicine.

The term subsistence economy is used to indicate non-cash values from the bush. The term bush sector (used interchangeably in this report with land-based sector and traditional economy) denotes subsistence plus fur and fish production. Landuse refers, in this study, to areas in which harvesting takes place, as well as other information that native people themselves consider significant, including transportation routes, camp sites, burial grounds, and other culturally sensitive areas.

The geographic scope of this study is the Hudson Bay basin. The Algonquin family is represented by Cree and Ojibwa, and the main Athapaskan language in the area is Chipewyan. The traditional occupation of land is reflected in the distribution of native language families in the basin. The Inuit occupy the northern half of the area, and the Cree the southern part, with Ojibwa (Nishnabwe) in south central and the Chipewyan (Dene) in the west, between the Cree and Inuit areas (Figure 2).

2. Traditional Ecological Knowledge

There is considerable literature from the Cree and Inuit areas of the bioregion about indigenous knowledge pertaining to the use of natural resources in the local economy. A sampling of the published studies is provided in Table 1, with a place-names map of the region provided in Figure 3. This material has not previously been summarized or synthesized, although a review of human ecology in the Hudson Bay area maybe found in Berkes and Freeman (1986).

The best known kind of TEK is the aboriginal local information of animals and land that has been documented mainly by biologists and anthropologists. There is a large literature going back many decades which shows that Inuit and Cree hunters, trappers, and fishermen had detailed information on the natural history of the animals they hunted and their biophysical environment. Among the more recent studies, for example, is Freeman's (1979) summary of the importance of the knowledge of harp seal behavior for a successful hunt. Similarly, Feit (1987a) and Berkes (1977) showed the importance of the use of environmental and natural history knowledge by the Cree in moose hunting and in fishing, respectively. Detailed maps of animal locations, seasonal movements, and natal habitat, as known by the Inuit of the Hudson Bay area, have been documented by Freeman (1976) and Riewe (1992).

Interest in TEK as a means of resource management is relatively more recent than interest in TEK as a source of biological and ecological information. One of the earliest studies which suggested that aboriginal management systems were different from scientific management and yet ecologically viable comes from the work of Freeman (1979). When the NWT Game Management service started to explore the possibility of re-opening the musk-ox hunt in the mid-1960s, the plan was to allow a small number of old bulls, on a freed quota, to be taken by trophy hunters. Only reproductively inactive, biologically superfluous, solitary males would be killed, scientific data would be gathered from the animals harvested, and appreciable economic benefits would accrue to the local Inuit. However, the local Inuit community strongly opposed this plan. They argued that old solitary males were useless as trophy animals; the best trophy animals were in fact the prime bulls in the herds and these older bulls were important for the social organization of the herd, playing a dominant role in maintaining the integrity of the group and in defense. The Inuit argued that, given the importance of social organization for the survival of the small number of herds and the variable reproductive success of a herd from year to year, management by a fixed quota on older bulls was a most unsound management plan, and surplus yield calculations on a geographic basis did not make sense.

Berkes (1977, 1979) studied Cree subsistence fisheries (which are not regulated by government) in Chisasibi, and compared the Cree fishery use system with biologically based fishery management systems elsewhere in the subarctic. Government regulations normally include restrictions on kinds of gear and mesh size and prohibitions on fishing at certain times and places where fish are congregated and vulnerable to overexploitation. By contrast, Cree fishermen used the most effective gear available to them and the mesh sizes that gave them the highest return in a given season and location. The Cree concentrated their fishing effort on aggregations of fish that were most efficiently exploitable, rotating fishing areas according to season and changes in the catch per unit effort. Restraints on the fishing effort were supplied by social controls: restrictions by family hunting-fishing territories, prohibitions against wastage, and the Cree notion that the harvest be keyed to the consumption needs of the family and kin. Any short-term surplus was, in any case, given away to others; hence there was no incentive to fish harder than necessary. Comparing the biological prescriptions with indigenous practice, the Cree fishery practice violated nearly every biologically oriented, indirect-effort control measure in the repertory of scientific fisheries management Yet, the overall Chisasibi Cree fishery, based on social and ethical controls, appeared to be sustainable over time, with evidence of some overfishing only on one local stock of one species (Berkes, 1979, 1987).

Feit (1986a) studied beaver hunting of the subarctic Waswanipi Band of eastern James Bay Cree. Three hunting strategies were used- looking for beaver at dawn and dusk when both hunters and beaver were active; trapping by setting traps underwater so the animals would drown with a minimum of suffering; and "waking the beaver" which involved arousing beavers during the day and driving them from their lodges, thereby making them easy to capture. Waking the beaver was more productive than trapping, but it was used only when there was a pressing need for food. Trapping was the preferred method because it provided controlled harvests, allowing the trapper to exercise selectivity in harvest. Further evidence that the Waswanipi managed beaver populations was their practice of rotating subdivisions of their hunting territories, thereby resting parts of their land so that animals would replenish themselves. Feit's analysis of outcomes demonstrated a statistically significant difference in productivity between territories hunted during the previous year and those which had not been hunted for two or more years. Feit observed that beaver colony densities and beaver harvests were stable from 1968-69 to 1972-76, providing evidence of the viability of the beaver management practices of the Waswanipi.

Goose hunting practices of Cree hunters along the coast of James Bay have been studied by Scott (1989, 1986) and Berkes (1982). This activity was observed to have a very important communal aspect because coordination of all hunters was necessary for continued good hunting. Overseeing the hunt was a "goose boss", a senior hunter from a family with traditional hunting rights in the area. The main hunting strategy was to minimize disturbance to the main flocks of feeding and resting geese, and to kill small groups of geese at the periphery of main flocks quietly and efficiently. To achieve this, elaborate rules of group cooperation and code of hunting practices had been developed, as overseen by the goose boss. A hunter never shot unless there was wind to muffle the sound; a hunter never shot after sunset or before sunrise because the flare tightened the geese; no open frees were built; colourful objects were hidden; blood spots were covered; and all animal remains were cleaned up. Since geese would not return to an area which had been hunted frequently, sites were rotated and "rested". Ideally no site was visited on two consecutive days, and all hunters were expected to cooperate with the goose boss's choice of hunting area in a given territory on a particular day. The hunts were not regulated by government-established seasons or bag limits but only by traditional social practice (Berkes 198 1a).

2.1 Resource use institutions and ethics

Each of the traditional management systems summarized above requires an organizational basis. The term institution is used to refer to such social and political organizations. These include, for example, the system of Cree "family hunting territories" which are overseen by a family head, "beaver tallyman" or "goose boss" who *is* responsible for ensuring that the resources are shared equitably and optimally, and that they are taken in a proper manner. The Inuit associate specific family groups with specific hunting or fishing sites and place names are socially significant (Müeller-Wille, 1992). Nonetheless, access to resources is not restricted to these groups or individuals, and many hunting activities are performed cooperatively, under the guidance of the local group leader. Graburn (1969) writes that the indigenous inhabitants of various areas are known by names which describe their geographic location. The suffix *-miut* means "inhabitant of". In Arctic Quebec, for example, the inhabitants of the Belcher Islands are called *Qikirktamiut*, that is, the people of the Belcher Islands. Areas defined by the prefix are variable in size and frequently overlap. The *miut* designation is not merely a geographical identification; it is a moral and ethical statement signifying one's sense of place and belonging.

Just as sense of place in the native cultureis different to Euro-Canadian notions, the concept of property is also fundamentally different. According to Scott (1988), the traditional Cree understanding of "property" cannot be interpreted as ownership, but rather as a set of relationships between people. The fundamental relationship was that among members of a household, a self-

sustaining group; the second level was the collective relationship which dictated that members of a household should consider the needs of the larger community in their use of resources; and the third level was the relationship of the household and community with others. For example, territory stewards or goose bosses were required to exercise their authority over land access wisely and for the benefit of all. It was the steward's responsibility to ensure that the sacred relationship between humans, as well as between humans and the land and other living creatures, was maintained. One aspect of maintaining this relationship was knowing how many animals to take. Another was ensuring that everyone was *given* an opportunity to hunt.

Feit (1991) concurred with this description of the Cree understanding of property as land and resource rights, and observed that all Cree land was divided into territories which varied in size from three hundred to several thousand square kilometres, with a "steward" or "boss" for each territory. Hunting groups were formed by the steward, and included those with long-term rights of access to the territory as well as those without such rights who were invited to join a hunting group. The latter group was often the larger of the two. The invitation to join a hunting group was indicative of the importance of social relations to hunting practices in the society. It was in fact a gift of food.

Freeman (1979, 1985, 1988, 1989) described the traditional aboriginal hunter's understanding of the natural environment as being more complex than that allowed by the models of "carrying capacity" or "maximum sustainable yield". Rather, ecosystems were perceived as circular, complex, interrelated, dynamic and fluctuating. The relationship between the hunter and the hunted encompassed more than the economics associated with procuring food; it extended to encompass social relations between individuals, families and communities. Detailed studies elsewhere in the bioregion, including northern Manitoba (Brightman, 1993), the Rupert House (Waskaganish) area (Preston, 1975), and northern Mistassini area (Tanner, 1979), all indicate that social relations have their parallels in hunter-animal relations, and humans are part of a larger web of relationships in the environment. Relations between humans, animals and their environment were so important because they had to do with establishing an individual's identity in the world. A sense of place as a basic human need is symbolized for the hunter by the land on which he/she does his/her hunting.

2.2 Gaps in knowledge and areas for future research

Local knowledge is being lost for a variety of reasons: people no longer have the same level of intimate contact with the land which was prevalent before sedentarization and centralization and

their associated cultural and social changes; the traditional institutions that govern traditional management systems have been lost; and traditional environmental ethics with their associated practices and rituals which served to remind people of their obligations to nature have fallen into disuse. However, C. Scott (pers. comm.) has emphasized the importance of "the dynamic processes of resistance and adaptation of cultural practices to changing historical circumstances. Cultural change is not the same thing as cultural loss. And 'tradition' in all societies is perpetually reinvented in association with changes in custom and practice." Hence, promising areas for further research are not in "salvage anthropology" but in documenting and understanding cultural change.

The relevance of TEK for resource management and impact assessment has been amply demonstrated. However, TEK has not been used in "mainstream" environmental management, partly because of its marginalization by state management. More work is needed in the area of natural resources co-management and, more generally, in self-government, whereby indigenous knowledge may be used in decision-making. More needs to be known about strategies by which TEK can not only be "collected" but actually used.

Another serious gap in the knowledge base is that which flows from the lack of a conceptual framework for collecting and evaluating information on TEK. While methodologies used in the various land use studies undertaken to date on the Hudson Bay basin have been fairly consistent in their use of map biographies as the basis of the method used, results are most often not comparable due to varying map scales, differing emphases and objectives, different standards, various proprietary rights, and limited accessibility. The usefulness of TEK for environmental management will be more easily demonstrable once a standardized conceptual approach is applied consistently to the study of TEK for that purpose.

3. Land Use Studies in the Hudson Bay Basin

Since the 1970s, at least 20 aboriginal land use studies have been undertaken in Canada, mainly to document native land claims (e.g., Freeman, 1976; Riewe, 1992); some to assess environmental impacts (e.g., Kayahna, 1985); and one for regional planning and resource co-management (Hughes *et al.*, 1993). Fifteen of them include parts of the basin. Table 2 summarizes these studies by location, time period, objective, coverage and method(s), and Figure 4 depicts the areas covered. These studies include Freeman's land (and water/ice) use maps from 1976, Riewe's recent Nunavut maps, the TASO study of northern Ontario, and a number of land use studies of more limited geographical coverage, including Weinstein's map for Fort George (Chisasibi), and studies in Manitoba by researchers at the Natural Resources Institute at the University of Manitoba

and Manitoba Keewatinowi Okimakanak. Some areas, particularly the Mush.kegowuk Region and the West Hudson Bay Inuit, have been covered by more than one study.

3.1 Changes in traditional land use in west Hudson Bay

The massive cultural changes precipitated by the influence of southern institutions, values and technologies on the Inuit of arctic Canada over the last fifty years have been described by Stenbaek (1987). The North was made much more accessible to these influences following the Second World War when a number of northern air bases were converted into commercial airports. The political issue of arctic sovereignty arose during this time, and the federal government responded in part by relocating Inuit from the west coast of northern Quebec (especially from the area of Inukjuak) to Resolute Bay and Grise Fjord. A famine in the Keewatin and Ungava districts in the late 1940s and early 1950s contributed to the development of centralized communities in these regions. Centralized health, educational and social services were extended to the residents of these growing settlements, and central administrative structures were established.

The trend of diminishing land use which arose during the period of sedentarization in the late 1960s and early 1970s, however, has not continued. Usher (1990) in his study of the traditional harvesting activities of the Chipewyan-Denesuline Bands in the NWT noted that land use activities have continued to be an important aspect of life in aboriginal communities. This finding is consistent with MKO'S report (1993) which concluded that the current land use patterns of the Denesuline, in large measure, reflected the land use patterns of many generations of Denesuline harvesters (as they pertain to sites, areas and resources). The earlier nomadic existence which had been based on the search for caribou, however, was modified with the establishment of permanent settlements in the southern area of their territory, near former fur-trading posts to which the Denesuline typically travelled in the summer to trade and collect treaty monies.

The extent of changes in Inuit land use may be assessed by comparing maps in Freeman (1976) and Riewe (1992). Freeman (1976) sought to identify land use patterns of the Inuit residents of 33 communities in the Northwest Territories for three specific periods in living memory: 1) the years prior to the local arrival of traders (pre-1925 to 1935); 2) the fur trade period (1925-35 to 1955-67); and 3) the period of sedentarization (post 1955-67). Riewe (1992), by contrast, mapped Inuit land use in 1986-87. Both Freeman's (1976) and Riewe's (1992) land use maps show a good deal of overlap in land use between neighboring communities, and very little land (mainly in the far north, outside the Hudson Bay basin) on which harvesting does not take place.

Impacts of development projects have also affected traditional land use. A case in point is the controversy over uranium exploration in the Baker Lake area. Residents began expressing concern in 1969 concerning the effects of exploration when prospecting permits were issued for about one-third of a 78,000 km2 area of land around Baker Lake. While little exploration activity had occurred up to that time, some diamond drilling was underway. Later, in 1977, Polar Gas filed an application to construct a pipeline to transport natural gas from the Arctic to southern markets. The proposed pipeline would cross over this same area. The Inuit believed that pipeline activities and mining developments posed a serious threat to caribou populations in the region. Coastal Inuit depended on sea mammals for most of their diet, but the Inuit of Baker Lake, the only inland Inuit community in Canada, depended on caribou for over 30% of the 1977 real income of households, and over 42% of the 1977 real income of heads of households (Musk-Ox, 1978). The Inuit believed that caribou population declines were linked to uranium exploration activities, citing the use of low-flying aircraft, drilling and blasting as sources of severe disturbance to the caribou.

To protect their main source of food and their way of life, in 1974 the Inuit petitioned both the federal and territorial governments to stop exploration. The following year they demanded a development freeze around Baker Lake pending resolution of land claims. In February 1977 the minister of DIAND declared a one-year moratorium on mineral exploration and ordered a study on the effects of exploration in the area. The resulting report supported the Inuit position that the area contained important calving grounds for caribou, and that the Inuit used the area intensively for hunting and fishing. An interim injunction was invoked at the expiration of the moratorium. At that time the Inuit sought an injunction prohibiting the issuance of prospecting permits, the granting of mining leases, the recording of claims and the issuance of mining exploration permits in the area. This injunction was lifted in November 1978 in a federal court decision. Instead, the judge imposed protective measures restricting land use such as requiring a 4.8 km buffer around the four critical areas identified by the consultants: 1) major caribou migration corridors to calving grounds; 2) calving grounds; 3) areas of post-calving aggregations; and 4) caribou water crossings. Despite losing the case, the defendants noted that this was the first time the courts had recognized aboriginal title to Inuit occupied land in the Northwest Territories (Musk-Ox, 1978; Thompson, 1980). Uranium ceased to be an issue because of a market downturn shortly after the Baker Lake decision.

The Manitoba Cree also experienced first-hand the impacts of southern influences with major resource development projects which began in the 1960s with the first phase of the hydro-electric development on the Nelson River (Lithman *et aL,* 1992). Hydro-electric development led to the

diversion of the Churchill River and the impoundment of South Indian Lake in 1976. As a result, the mean lake level rose 3 m in the community. Prior to impoundment, South Indian Lake had largely been a self-sufficient community, with the largest commercial fishery in northern Manitoba. Since impoundment this fishery has remained the largest single source of gross income for the community, but its value has declined (Wagner, 1984). Significant effects have been observed on fishing activities and post-flood catches dropped dramatically from those which had been the norm prior to flooding (Bodaly *et al.*, 1984). The hunting of geese and ducks was directly altered by the flooding, since the shooting and retrieval of waterfowl was hampered by higher water levels. Moose were more difficult to see as well, and therefore harder to hunt. It was also observed that habitat for these species was reduced following impoundment. The majority of those community harvesters interviewed indicated they spent less time in the bush than they had at a younger age, and it was apparent that social and wage-earning opportunities afforded by town life had reduced the family component of bush life in this community. Hrenchuk (1991) concluded, however, that resource harvesting continued to be an important part of community life in South Indian Lake.

The Fox Lake First Nation in northern Manitoba is another community whose traditional land use area north of Gillam was flooded by the Kettle Darn reservoir (part of the Nelson River hydro-electric development project) in the early 1970s. In subsequent years, two additional darns were built further downstream. The impacts of this development on the Fox Lake Cree identified by Hill (1993) include the loss of wildlife habitat; reduced hunting, fishing and trapping opportunities; disruption of travel routes; disturbed environmental and social conditions; and displacement from traditional settlement areas. It is further noted that the Fox Lake Cree have not experienced a higher standard of living as a result of the development, nor have they enjoyed the long-term employment opportunities available to non-aboriginal residents of the region. The construction of major hydro projects in Manitoba has continued with the commissioning of Limestone Dam in 1990, but the construction of Conawapa Dam, scheduled for the 1990s, has been put on hold.

Although fewer studies have been conducted on the impact of development projects in Saskatchewan on native land use, Waldram (1988) has documented some major social and *cultural* changes. The traditional and current land use areas of the Metis and non-status *Indians* on the Churchill River in northern Saskatchewan were studied by Begrand (1978), as part of the background studies for hydro-electric development at Wintego Rapids on the Churchill River. He concluded that tradition land use activities continued to play an important role in the lives of the native people of this area.

3.2 Changes in traditional land use in eastern Hudson Bay and James Bay

Changes in land use experienced by the James Bay Cree have been described by Scott (1988) and Feit (1979, 1986b). Sixty years ago beaver and marten stocks throughout much of northeastern Canada were depleted as a result of overhunting by non-native trappers lured by high fur prices and the reaction by Indian hunters to trap the animals out first. As a result, those groups of Indians which depended on beaver for food faced starvation. The provincial government concluded that restoration of the indigenous tenure system of trapping was desirable, both for the native people and for conservation of the province's fur resources. Beaver preserves were subsequently established and native hunting territories recognized as "registered traplines". The federal government's perspective was that it retained ownership of these lands, allowing natives only the right to hunt on Crown lands. As beaver populations regenerated, traplines were mapped jointly by federal and provincial government representatives in the communities, and formal traplines were established, based on existing territorial systems.

The governments also recognized Cree stewards, called tallymen, who were paid an honorarium to annually count the number of active beaver lodges in a territory. This steward was responsible for allocating the harvest among the hunters he allowed to use his land. The concept of registered traplines with exclusionary and rigid boundaries conflicted with the Cree ideal of allowing movement from one territory to another in order to ensure that all families obtained their basic requirements and resources were equitably distributed. However, since adherence to registered traplines was not enforced, the policy did not immediately interfere with tree hunting practices. In addition, the government established band governments in each *community* and began issuing rations and eventually social assistance. In the late 1930s and early 1940s, Indian agents were sent to each community by the Department of Indian Affairs to establish an official band membership list and to elect a chief and council. The locus of "home" for the Cree gradually changed from the bush to village settlement (Preston, 1986).

In the 1950s and 1960s, the governments moved to "open the North" by making the region more accessible for resource exploitation. Rail networks had been extended into the James Bay area (Ontario and Quebec) initially in the 1920s. In the 1950s and 1960s, the road and rail networks were extended further, and several mining towns were incorporated, each disrupting one or more Cree hunting territories (Feit, 1986b). The Cree reported that land animals were disturbed by the noise, and fell ill from chemical sprays and pollution from mine wastes. Fish and aquatic animals were frequently found dead, and animals (as bush or country foods) over large areas tasted differently.

In 1965a pulp and paper mill went into operation in Lebel-sur-Quévillon, and released significant quantities of mercury into the streams leading into the Bell River and into airborne effluents. In the 1970s, the federal Department of Health and Welfare advised the Cree to stop eating fish from the region. Because fish was an important part of the Cree diet, this recommendation led to a demand for research which could provide more specific recommendations regarding safe consumption levels. The situation was exacerbated by evidence that acid rain maybe increasing the amount of mercury leached from the bedrock into the water systems and hence into the food chain (Feit, 1986 b). A similar story was being played out in the meantime in northwestern Ontario where mercury from a pulp mill north of Kenora was contaminating the English-Wabigoon river system heavily used by the local Ojibwa people for fishing and hunting (Hutchison & Wallace, 1977; Shkilnyk, 1985).

In 1971 the Quebec government announced its proposed James Bay hydro-electric development project. The first of three phases of the proposed project included a 700 km road across the hunting lands of six Cree communities; airports; communication infrastructures; construction camps; a new town; mines and forestry operations; the diversion of three major rivers; four main dams; 130 km of dikes; eight main reservoirs flooding 8,722 Km^2 (five percent of the land surface); and power transmission corridors 960 km long. In early 1972 the James Bay Cree and the Northern Quebec Inuit used legal means to force the Province of Quebec to discuss the implications of this project on their communities. In 1973, Mr. Justice Malouf ruled that "the Cree and Inuit people did appear to have an Indian title to the land; that they had been occupying and using the land to a full extent; that hunting was still of great importance, constituted a way of life, and provided a portion of their diet and incomes; that they had a unique concept of the land; that they wished to continue their way of life; and that any interference with their use compromises their very existence as a people; and that the project was already causing much interference". He ruled that the province was trespassing. Ultimately, the James Bay and Northern Quebec Agreement (JB&NQA) was signed in 1975 following negotiations for aboriginal rights impacted by the proposed development (Feit, 1986b).

Ten years after implementation of the JB&NQA, Feit (1986b) reported four general findings: 1) the agreement was beneficial to the Cree hunting economy because it specified and strengthened hunters' rights; 2) it had positive economic, social and political effects on the Cree community because it decentralized decision-making powers to local and regional govemrnents; 3) the records of both federal and provincial governments in support of the agreement were mixed; and 4) the Cree became politically more autonomous after the signing of the JB&NQA but threats to their self-

government and self-determination remained because expropriation clauses in the agreement allowed the Quebec government to build additional hydro projects.

George et al. (in prep.) undertook a historical and contemporary analysis of Cree land use and harvesting in the Moose River basin in western James Bay in northern Ontario. Non-native incursions into the upper Abitibi and Mattagami rivers became extensive early in this century, and extended as far north as Moose River soon thereafter. Spearheading these incursions were three railway lines, all of which affected traditional Cree hunting areas by 1915. Of these three, the TNO (Temiskaming and Northern Ontario) Railway, also known as the "colonization railway", paved the way for development of the Ontario northland. The local Cree were rarely hired for other than seasonal railway work. Another major development thrust which affected the region at this time was the building of extensive hydro-electric capacity by private companies along both the Abitibi and the Mattagami rivers. The Abitibi development began at Iroquois Falls in 1914 and extended to Abitibi in 1930. Mattagami hydro-electric development was associated with mining development and began as early as 1911; other hydro developments were associated with pulp and paper operations.

Some impacts of these projects included flooding Indian hunting lands; disruption of native fisheries; downstream pollution by pulp and paper effluent; and social problems resulting from the displacement of the Cree from their hunting, trapping and fishing areas. Following the Second World War, hydro-electric development on both rivers was resumed by Ontario Hydro (established in the 1930s as Hydro Electric Power Commission), and continued into the 1960s. Additional hydro-electric projects for the Moose River basin were proposed in the 1980s and hearings held in 1990-91, but no construction has yet taken place. The extensive resource development projects undertaken in the region hastened the settlement of Cree in villages and increased their reliance on wage employment or social support incomes. Despite significant disruption to hunting and trapping lands and resources, traditional harvesting pursuits continued to be highly valued. For example, in Moose Factory (a predominantly native community) 89% of all adult males participated in some kind of hunt; 64% did so in nearby Moosonee (a non-native town) in 1990 (George et *al.*, in prep.).

Extensive use of the land by north central Ontario Ojibwa Indians is described in *The Kayahna Region Land Utilization and Occupancy Study* (1985). The authors reported, as a primary finding, that the social organization of the Nishnawbe-Aski in Ontario was enduring despite the influence of strong external forces. Traditional social organization was evident in their communal hunting

lands, the areas used by families related through the male line, and the shared living areas of two or three households (called a co-residential unit) which continued to be the land controlling group. The study reported that the Nishnawbe-Aski continued to hunt in adjacent parts of Quebec and Manitoba, as was typical of earlier land activities, and as further evidence that traditional harvesting patterns continued to be used today.

The Hudson Bay basin's aboriginal people have been acculturated by Euro-Canadian cultural influences. In addition, much of the land within the basin historically used by aboriginal people has been permanently altered as a result of major development projects. Nonetheless, aboriginal people have demonstrated a great capacity for adaptation to these changes, and the land use studies reviewed here document that aboriginal people's historical ties to the land remain strong.

3.3 Gaps in knowledge and areas for future research

A broader conceptual framework is needed to facilitate a more standardized approach to land use research. Such an approach should include the capacity to capture information on intensity and duration of land use since this information is not always gathered using the map biography method. As well, studies do not routinely provide information on the context in which they are undertaken. The importance of providing information regarding a community's economy, social structure, cultural setting, physical geography and demographics must be recognized and accommodated in future studies. This is needed to enhance the relevance of such research and to facilitate the evaluation of a community's land use in relation to these other factors and the comparison of different studies. It should also be noted that land use studies have concentrated primarily on male activities. The role of women (and children as in the transfer of TEK) in land use activities should be investigated.

Another important area for further research is co-management as it pertains to decision-making for land use and resource use, and as it links traditional land use with emerging local and regional self-government organizations. A recent inventory in northern Manitoba uncovered 18 co-management agreements of various descriptions (Haugh, 1994). Such an inventory does not exist for other parts of the bioregion, but there is a literature on some Quebec, Ontario and NWT cases (Osherenko, 1988; Berkes et al., 1991).

A major area for further research is the relationship between the impact of development projects and native land use. This is perhaps the single most controversial area that comes Up in any new project development proposal. Even though a number of studies have addressed this issue

(Waldram, 1988; Berkes, 198 lb), many crucial questions remain unanswered: What kinds of development can be made compatible with native land use? How much and what kind of development would cause irreparable damage to native land use? What social and economic measures (such as income security programmed for hunters) can be adapted to compensate for the impacts of development? In the case of eastern James Bay, for example, Feit (1986b) has argued that the level of compensation provided was not adequate to SUpport the development of an economically viable community.

It is obvious that there is more at stake than merely compensation in the case of major development projects; the larger issues involve self-government and co-management of land and resources. Access to natural resources has become problematic for many aboriginal communities, especially in the southern parts of the bioregion, Quebec, Ontario and Manitoba. Natural resources are needed to develop local and regional economies, yet the resource base is being constricted by competing land uses from hydro-electric development, large-scale forestry and mining (Feit, 1986b; Waldram, 1988; NMEDC, 1993).

4. Subsistence Economy in the Hudson Bay Basin

Usher (1989) compared the northern native village economy to that of the rural economy in southern Canada— one sustained by wildlife and the other by agriculture. He defined the term "domestic economy" as including harvesting as well as processing activities for the provision of food, fuel, and other material household needs. This domestic economy provided "a net self-sufficiency in protein for the Native population of the NWT (and probably much of the rest of northern Canada), not only on a regional basis, but also largely, village by village. This is of no small importance in a region in which there is virtually no agricultural production . . ..Wildlife is thus the nutritional basis of health and well-being for most Native northerners, and remains today the foundation of a distinctive Native economy..." (Usher, 1987).

In the NWT in 1987, domestic production added about 10% to total labour income, and an estimated 80% of native households participated in the domestic economy, for a total of 4000 native households and 5500 active harvesters. In addition to the hunting effort, several thousand women prepared the meat for consumption. Despite the fact that harvesting was done on a part-time basis, Usher estimated that the average arctic hunter took 1000 to 1500 kg of meat and fish annually with an imputed value of $ 10,000 to $15,000. Imputed values are calculated using the Berger Commission approach in which the harvest of bush food can be converted into cash-equivalents using replacement values (Usher, 1976; Berger, 1977). Using this method, the value

of bush food is converted into dollar equivalents by calculating the cost of a comparable amount of meat in the local store. For example, harvested waterfowl is valued by comparing it to the local store cost of chicken, and big and small game is compared to local red meat prices to determine Replacement value.

In the Hudson Bay bioregion, the major harvest of the land for the aboriginal populations is meat from hunting, fishing and trapping. Table 3 summarizes wildlife harvesting studies by region; it does not include nutritional surveys or other studies based on actual consumption. The review shows that most of the values fall in the range from 50 kg to 350 kg of potential edible meat per capita per year. The more northerly Inuit communities seem to range between 200 and 400 kg per capita per year. Quebec Cree communities fall between 100 and 150 kg per capita per year (in the 1970s), and the Ontario Cree (Mushkegowuk region) averaged 106 kg per capita per year (in 1990). By contrast, the figure for the northern Manitoba Cree (52 kg per capita per year) appears low. There are no detailed regional studies for Saskatchewan groups or for the Dene of Manitoba and Saskatchewan. There are, however, some studies on the fish harvests (but not total wildlife harvest) in Saskatchewan, summarized in a synthesis of native subsistence fishery studies (Berkes, 1990).

Table 3 provides little evidence that wildlife harvests have been declining in recent years. Certainly, the hunters' "homes" have changed from bush to settlement (Preston, 1986), and patterns of harvesting activity have changed (Usher, 1976), but bush activity continues. One might expect a decline in per capita harvests, if not in the total harvest community-wide. But that is not borne out in Keewatin and Hudson Bay Lowlands/Mushkegowuk regions. It may, however, be the case for Northern Quebec-keeping in mind that the James Bay I hydro-electric project was under construction in the 1970s. Other analyses of quantitative changes in harvesting over time indicated that there is evidence of both declines and increases in different communities in per capita subsistence fish harvests (Berkes, 1990).

Table 4 provides a summary of the imputed value of subsistence bush meat in various parts of the Hudson Bay region. Regional studies in Table 3 are also listed in Table 4 if the author provided replacement values for bush food. Table 4 also includes three more detailed community studies: Sanikiluaq (NWT), Pinehouse (Saskatchewan), and Wemindji (Quebec). Under various assumptions of store prices, any harvest value reported in Table 3 can be converted into imputed food values. Table 4 shows a wide range of values from over $50,000 per household per year (in constant 1991 dollars) in the case of Sanikiluaq, to a low of $1,600" for Manitoba communities.

Quebec Cree communities are in the $8,000 range and Ontario Cree in the $7,000 range. Most of the replacement values for bush meat fall in the range of $5,000 to $20,000. Note that the inclusion of values for fuelwood, berries and fur adds about another $1,000 per household per year in the case of Mushkegowuk Cree (Berkes *et aL,* 1992). It should be noted that northern food costs may be several times higher than southern food costs, and some of these higher imputed values do not imply that the communities in question are necessarily well to do. As well, the households in the North are larger; this report assumes 5.5 people per household.

In converting harvests into cash equivalents, care has to be taken to specify the assumptions made. The usefulness of these calculations is that they provide one measure against which potential losses to the subsistence economy (development projects; loss by contamination) can be quantified. Cash-equivalents are not the only measure for assessing value, however, for the traditional economy has health, cultural, social and educational values which are non-quantifiable but nevertheless significant.

Offsetting the value of country food are the cash costs incurred in conducting harvesting activities using modem, more efficient technology and rapid transportation such as snowmobiles, canoes with outboard motors, charter aircraft, trucks where roads are available, and all-terrain vehicles. Usher (1989) estimated the capital and operating costs to range from $5,000 to $10,000 annually for the NWT, one reason why a household's domestic activities must be subsidized by some form of cash income. Quigley and McBride (1987) have emphasized the importance of providing a supplement to cash-constrained families to enable their participation in the domestic economy. The ISP (Income Security Programmed), part of the JB&NQA, made direct payments to all "intensive hunters" to compensate them for the loss of traditional resources, thereby making it possible for them to meet the higher costs of going hunting, despite the declining prices for fur and the lack of increase in social assistance and seasonal employment opportunities (Scott, 1982).

4.1 The bush sector in the overall economy

Table 5 provides a summary of studies of the bush sector compared to the overall cash economy of Hudson Bay bioregion communities and areas. The Sanikiluaq study collected data on income and expenditure flows to quantify the economic significance of the traditional sector in one Inuit community. In the case of western James Bay Cree (Mushkegowuk region), Farley (1992) estimated average household income of $25,500" for 1990/91, including $10,000 in wages (formal employment), $13,000 in income support (including transfer payments), and $2,500 "other". The

table also includes data from northern Manitoba, Waswanipi and Wemindji (Quebec), and Pinehouse (Saskatchewan).

Some authors have expressed the value of the traditional sector as a percentage of the overall economy (e.g., Quigley & McBride, 1987). Other authors think that the cash economy and imputed values for the subsistence economy should not be combined. F. Hill (pers. comm.) has "great reservations about the legitimacy of adding the value of country food production to the value of the wage or cash economy, and then expressing the former as a percentage of that sum." Therefore, in Table 5 we have chosen to express the magnitude of the imputed values of the harvest not as a percentage of the total economy, but as a ratio of the cash economy to the bush economy. These ratios range from a high of 1:1.37 in Sanikiluaq (where the community has questioned the numbers used in the economic study), to a low of 1:0.13 in northern Manitoba (for which information is not adequate). Most of the ratios fall in the range of 1:0.33 to 1:0.66 for the more recent studies. Note that Table 5 does not include any other Inuit area, where the ratios would have been undoubtedly higher. Note also that the table includes commercial fisheries only in Pinehouse, and excludes a range of bush commodities and incomes such as handicrafts (except in Waswanipi), tourism and recreation including native-inn outfitting camps, and medicinal products. Feit (1991) lists several other products of bush camps which are not accounted for in cash values and not included in his calculations or in Table 5: the value of housing and fuel while in bush camps, clothing such as mitts and moccasins for own use, camp equipment made from bush products such as snowshovels, snowshoes and net floats.

A significant part of the cash income of households is used to support country food production. Quigley & McBride (1987) pointed out that hunting was possible only following certain capital expenditures for equipment and transportation. These costs can be considerable, but since hunters no longer live on the land year-round but operate from communities, they are dependent on rapid transport to be able to do any hunting at all. Support for hunters is a controversial subject, with some experts holding that the expenditures of subsistence often exceed the replacement value of the food produced. The evidence indicates, however, that the costs of expenditures such as snowmobiles and outboard-equipped canoes cannot be entirely attributed to harvesting. For example, the communities of Fort Albany and Kashachewan have similar populations but had a very different harvesting activity profile in 1990, with a total of 11,386 person-days of harvesting in Kashachewan (one of the highest in the Mushkegowuk region), as compared to 1,780 person-days in Fort Albany (one of the lowest). However, the percentages of equipment (motor-canoes

and snowmobiles) owned by heads of households in the two communities were almost identical (Berkes et *al.*, 1992).

Quigley & McBride (1987) argued that support for the continuation of the harvesting sector was critical to the future well-being of the community. Hunting was important not only for food procurement, but also for employment of Sanikiluaq's rapidly growing population, assuming sustainable levels of harvesting. They maintained that access to credit would not satisfy the need for capital to outfit a hunter since loans must ultimately be repaid. Cash support which allowed households to remain predominancy in the traditional sector, however, would result in an increase in the harvesting of bush food and could help develop the community's overall economy.

In the 1980s and early1990s, a number of background studies have been undertaken for subsidizing the traditional sector through hunters' income SUpport programmed in the Mushkegowuk region, the Nishnabwe-Aski area, and the NWT (e.g., Usher, 1989). However, as of 1994, there is only one regional programme. Under the JB&NQA, a Cree Hunters and Trappers Income Security Programme (ISP) was introduced in 1976 (Scott& Feit, 1991).

Hunters and trappers who met eligibility criteria received payments for days spent outside the settlement in harvesting activities. The impact of this programme on access to lands and to social exchanges was analyzed by Scott (1982), Scott & Feit (1991) and Feit (1989, 1991). There was an initial increase in the number of active hunters and trappers, as well asin the amount of time they spent in the bush, but the demand levelled off over the years. The prograrnme encouraged more family-level bush activity, reversing the trend of women staying in the settlement, and in some communities the number of children going into the bush increased as well. The ISP contributed to making bush-life viable again in the perception of hunters and trappers.

Despite the increased number of hunters, access to hunting territories continued to be controlled by hunting leaders (stewards). The hunting territory system appeared to continue to be effective for managing wildlife despite intensification of hunting effort. For example, following an initial increase in moose hunting effort, the Waswanipi reduced annual harvests to the earlier, presumably more sustainable, levels. The ISP had a positive cultural impact also by supporting the traditional Cree values of sharing. Over half the hunting groups harvested more than they could use, and shared the surplus with others in the community.

The ISP benefits accounted for almost half the cash income in Waswanipi. Many wage earners were part-time hunters and the transition from full-time hunter to full-time wage earner and back again was common. Most extended families had members in each group, and full-time community residents got country food from relatives and friends who harvested surplus game, in exchange for money or purchases. The use of charter airplanes and trucks in getting to the bush allowed more frequent trips, and enabled hunters to take more supplies and to bring back more food. Increased mobility also spread hunting activity over a wider area and enabled access to the more remote, infrequently used regions. The purchase of used equipment such as snowmobiles, all-terrain vehicles, canoes, boats, and outboard motors at a good price from high income-earners had become common. Bush food continued to be highly valued and gift exchanges of food, Feit concluded, and represented not only consumer preferences or biological needs, but "a primary commitment to sociality, and to recreating an active practice of mutual aid and responsibility in daily lives in which generosity is expected". While households now had cash incomes and with the option for independence, access to the land and its resources depended on an invitation from a steward. The result was a relationship of interdependency and cooperation rather than one of competition (Feit, 1991).

Scott (1982) reviewed the impact of the ISP on the Wemindji Cree and concluded that conflicting demands on resources driven by hydro-electric development were the most immediate threat to the "domestic mode of production". The native priority on subsistence resources, as established by the JB&NQA, was severely challenged as development needs for roads and other infrastructure were met. In the shared lands (Category III land under the JB&NQA), there was disturbance of Cree harvesting activities by non-native hunters using the new road network. Scott (1988) noted that the additional income following the introduction of the ISP had been distributed equitably, partly as the result of traditional mechanisms which included kinship relations that served to redistribute income at the household level, and partly through community feasts which were important for redistributing food. New mechanisms of redistribution included bingo games and sports lotteries in Support of community projects. Whether the philosophy of sharing would ultimately win out over the individualistic philosophy of accumulating personal wealth, observed Scott (1988), had yet to be determined.

Cox (1987) examined debates over the prospects of a native hunting economy in northern Canada and observed that proper institutional support such as that provided under the ISP was necessary for a native mixed economy to survive into the next century, despite increasing populations. He argued that it was possible to stretch out the supply of bush protein, as cereal products and bush

food complemented each other nutritionally. Cox emphasized that native northerners drew much of their income from bush food, and that any decrease in access or bush food availability would reduce their health status and standard of living in general.

4.2 Trends and consequences of change in subsistence resource use

Culture change is not the same as culture loss. Aboriginal groups in the Hudson Bay bioregion have been adapting to changes brought about by European contact since 1670 (Francis& Morantz, 1983). The work patterns of the West Main Cree of northern Ontario have been studied by George and Preston (1987). They observed that the Cree adapted to European technology, which included tools and equipment and institutions such as those associated with the fur trade, without cultural disintegration. Historically, government transfer payments had been tied to compulsory school attendance, and this requirement had greatly influenced the move to settlement life. Wage employment opportunities were now being sought by all northern communities, making settlement life even more attractive, yet most part-time wages were being used to SUpport hunting and trapping activities. Pure self-sufficiency in subsistence was not a realistic objective. However, the authors suggested, with some financial support, families would become more self-reliant. They noted that most of the participants of such income support would be people who had been raised in the bush, and that young Cree may not choose this way of life. They recommended rotational employment schemes, including flexible work periods, to enable natives to continue traditional harvesting activities.

To what extent is wage employment a part of this mixed economy? Does employment creation through larger-scale power, forestry, and mining development have an appropriate role to play? The opposition of the Mushkegowuk (West Main) Cree to the proposed Moose River basin development in 1991/92 indicates that the Cree considered the costs of large-scale development to be greater than the=.

Large-scale developments and other environmental impacts have affected native land use, traditional knowledge, and subsistence economies in the Hudson Bay bioregion. Development projects in several parts of the region have triggered a renewed struggle for control of the land and resources. Developments such as the James Bay project, the Churchill-Nelson project, Moose River basin development and proposed uranium mining in the Baker Lake area have helped focus attention on degradation of the natural environment of the basin and the consequent impact on the health, subsistence economy and the cultural way of life of the indigenous peoples (Chance,

1993). The loss of subsistence resources has three potentially major impacts on communities: health, subsistence economy and culture.

The first documentation of loss of subsistence resources on the health of the native population seems to go back to the turn of this century. The disappearance of the Hudson Bay caribou herd, at that time, coincided with a period of starvation for the Cree, the Naskapi and the Inuit of the Quebec-Labrador peninsula (Elton, 1942). Records of the Hudson's Bay Company indicate that some aboriginal groups in the basin started to include European food in their diets shortly after the Start of the fur trade (Francis & Morantz, 1983) but it was not until the turn of the century that the bush Cree (i.e., those who were not living at the trading posts) became dependent on non-native foods such as flour and lard.

Depletion of waterfowl populations in the first decade of this century created hardships for the peoples around James Bay. With depletion of the beaver throughout the subarctic in the 1920s, followed by the crash of fur markets in the 1940s, many subsistence economies in the subarctic entered a period of collapse. The results of health surveys in the 1940s were bleak (Vivian *et al.*, 1948; Moore et al., 1946). It was shown by Moore *et al.*, (1946) that the diet of bush Indians at Norway House, Northern Manitoba, significantly deteriorated in the first half of the twentieth century. In 1941 the Indians were taking about eight times as much of white man's food into the bush as they did at the turn of the century, probably as a result of game depletion. In that same year, purchased food in Norway House was calculated to provide over half of the caloric requirements. No less than 85% of the total was supplied by white flour, lard, sugar and jam, all of them virtually devoid of vitamins and minerals.

During this time public opinion in southern Canada came to consider that a hunting way of life was difficult and brutal and, in any case, impossible to sustain. The late 1940s saw the federal government introduce policy that provided family allowance cheques and allocated rations to native peoples (Kerr, 1950). The dietary acculturation of northern natives was further encouraged by improved transportation to and in the North.

The first of the native wildlife harvest studies in the 1970s indicated that bush food was still important in the diet, providing, in the case of eastern James Bay Cree, an overall mean of 114 g of protein per adult per day, which is double Nutrition Canada's minimum adequate standard of 49 g protein for a 70 kg person (Berkes & Farkas, 1978). Even in 1990, in the Mushkegowuk region, bush food supplied the equivalent of 97 g per adult per day (Berkes *et al.*, 1992). In northern

Manitoba, which has been affected by hydro projects, Waldram (1985) found a significant shift in diet. In the pm-project period, food came primarily from the bush; 87% of female respondents indicated that bush was their main source of food prior to the Churchill-Nelson hydro project. By contrast, 82% suggested that "the store" was the main source of food following project completion.

Usher and Weinstein (1991) studied the loss of subsistence values and commercial incomes in the Churchill-Nelson Project area, but were not able to derive solid conclusions for lack of baseline (i.e., pre-project) data. As data summarized in Tables 4 and 5 show, there are very few studies on the value of the bush economy and its importance in overall community economies. The studies do not allow for comparisons over time in any one area, nor do they allow comparison of different communities for a given period of time. This makes it very difficult to study quantitatively the loss of subsistence resources on the local economy, even though much evidence might indicate subsistence economies have declined in certain areas, such as many parts of northern Manitoba.

In addition to loss of subsistence resources as a result of flooding, bush food sources have also been lost through contamination. Elevated mercury levels due to increased mobilization of mercury in reservoir sediments have affected subsistence fisheries in northern Manitoba and in the James Bay area. Despite much circumstantial evidence for mercury poisoning (Shkilnyk, 1985), there is no agreement on the actual consequences of mercury intake on diet and health in general (Berkes, 1980). Long-range transport of atmospheric contaminants is suspected in the contamination of Hudson Bay, Foxe Basin (and Arctic Ocean) food chains, and the accumulation of PCBs and other toxic organics has been documented in the larger marine mammals (Kinloch & Kuhnlein, 1988; Cameron & Weiss, 1993).

A major consequence of loss of subsistence resources may be seen in the realm of social health and culture. Although there is a large literature, mostly in anthropology and sociology, about loss of culture and social pathology of some northern native communities, there is very little available specifically on the relationship between loss of subsistence resources and social/cultural loss. "Subsistence is generally thought of as a material or economic aspect of a people's lifeway, whereas in reality...it is perhaps most important in today's mixed economy northern communities in sustaining very important social relationships and distinctive cultural characteristics in that society" (M.M.R. Freeman, pers. comm.). Native dependence on harvesting activities for purposes of maintaining social and cultural identity remains strong. Freeman (1993) has written that the subsistence complex provides a source of social values, with important knowledge,

including ethical values and cultural identity, being transferred to succeeding generations through the annual, cyclical repetition of subsistence activities. The loss of subsistence resources would dismantle "the social relations of production" which include "the socialization of children, mutual aid and sharing, and the reinforcement of stewardship and use arrangements with respect to land and resources" (Usher, 198 1).

4.3 Gaps in knowledge and areas for future research

There is lack of agreement on how to calculate the value of the bush economy. Government statistics do not include the value of subsistent harvests and they categorize self-sufficient hunters as "unemployed". Thus, on the one hand, the values of subsistence are dismissed. But on the other hand, imputed values of bush food are over-stated by not taking into account the costs of harvest and the opportunity cost of time spent in the bush. Another problem requiring attention is the development of a standard and defensible methodology, and a consistent currency, for comparing the values of subsistence activities to the cash and wage economy.

There has been little systematic work on cooperative processes for decision-making among governments, aboriginal groups and other stakeholders. Some research has been done on natural resource co-management (Osherenko, 1988; Berkes *et al.*, 1991), but the issue of fostering development of sustainable economies through co-management has not been addressed.

Another area requiring further work is the calculation of future losses from development projects. As the experience of Usher & Weinstein (1991) shows, lack of baseline data on subsistence harvests is a major problem, and has impeded the calculation of compensation payments for northern Manitoba groups affected by hydro-electric development Provision of compensation is, in any case, not a satisfactory social solution. Better means and methods need to be developed to calculate present values (and future potential 1oSWS) for northern communities.

As the debate in Cox (1987) and Hill (1986) shows, the question of carrying capacity is crucial for sustainable development planning in the North. Thus, work is needed in the area of assessing biological productivity of the land base, in relation to current and projected aboriginal populations and their land use. Such work would not be on carrying capacity in the classical biological sense of a constant and deterministic limit, but rather on carrying capacity in a dynamic sense, with multiple equilibrium points. As well, such research would need to include evaluation of planned and potential impacts of development on carrying capacity.

Available literature On the role of subsistence in the overall economy is fragmentary. More detailed and consistent studies are needed to analyze trends and their likely causes. As C. Scott (pers. comm.) has put it, "devising methodologies for making these studies more comparable from one community or region to another, and providing longitudinal data through re-studies of the same communities/regions at consistent intervals, would be necessary to address a number of the questions raised by the report about changes in land use and economies, and development project impacts." Social and economic programmes (such as hunters' income support) can then be formulated to remedy the loss of land and resources. The areas of social health and culture need to be integrated into the planning of such programmes, since there is more to the loss of subsistence resources than merely economic losses. As a major research agenda, the larger Canadian society would need to know the cost of maintaining self-sufficient, viable northern mixed economies, as opposed to the costs of dealing with social pathologies of native populations migrating into urban centres following the collapse of local northern economies.

5. Conclusions

The view of the North as a development frontier has not led to policies that can be considered successful either from a northern of a southern perspective (e.g., Chance, 1993). Development has not been sustainable for the most part; local economies probably have more cash flow than before, but social and socio-economic problems of development and social change have been very costly. Despite government policies to that effect in the 1950s, 1960s and the early 1970s, the Northern economy has not been converted into a "model-n" one. But nowhere in the North is there a pure subsistence economy, either. Local and regional economies everywhere in the Hudson Bay bioregion may be characterized as mixed economies, as identified earlier by George & Preston (1987) and others.

Although many observers have played down the role of the traditional land-based economy, characterized it as an anachronism, and predicted its demise, the fact of the matter is that it has not disappeared. There are very few wage income opportunities in northern communities; people need food; the major produce of these non-agricultural areas is wild meats; and wildlife harvesting is a socially and culturally appropriate way of obtaining food. As Usher (1976) put it, "the North may well be the only place where a poor man's table is laden with meat." Although the significance of subsistence varies from region to region, most of the replacement values reviewed in this report fall in the range of $5,000 to $20,000 per year per household. Similarly, the production of bush meat falls in the range of 50 kg to 350 kg per person per year.

Even in the most recent studies, in the Mushkegowuk region, northern Ontario, the bush harvest was 106 kg/person/year (Berkes *et al.*, 1992), which is comparable to the value (100 *kg/person/year)* given for 1975 in the Mackenzie Valley region (Berger, 1977). A case can be made that the extensive use of land and the harvest of bush food may actually have increased in the last two decades because of revival of interest and the availability of more disposable cash for the purchase of mechanized transport for hunters who are community-based (Usher, 1987; Berkes, 1990). However, on the basis of Tables 4 and 5, it appears that most northern native households do not derive most of their income in the form of country provisions, as Berger (1977) claimed at the time (see Hill, 1986). An exception may be the most remote communities where the cost of store-bought protein is prohibitive.

The sustainable development of the North as "homeland" may do well to start with the assumption -- but without overselling the quantitative importance of subsistence – that strengthening the bush economy would substantially improve the quality of life of aboriginal peoples (Hill, 1986). The link between cultural sustainability and subsistence is real (Freeman, 1993). As with the Income SUppOrt Program for Hunters under the James Bay Agreement, the traditional economy warrants support under a broader calculus of socio-economic benefits (Scott & Feit, 1991).

Behind economic and cultural sustainability is the native indigenous knowledge of land and animals which constitutes a distinctive and different ethnoscientific tradition. TEK has not been brought to bear on the real issues, and this is only partly because the study of TEK is a relatively new area for research. Collecting information about TEK is in itself "no guarantee of the preservation of this knowledge in any form relevant to resource management and sustainable development", as C. Scott (pers. comm.) put it. Further,

> TEK has not been used in mainstream natural resource management despite its demonstrated efficacy in various indigenous contexts; and it has yet to be brought to bear in environmental review in decisive ways -- this, no doubt, has as much to do with the politics of development as with the applicability of indigenous knowledge to the intellectual issues of environmental assessment Indigenous knowledge is, after all, valid in precisely those social contexts that development projects put at risk, and it is difficult to accept the validity of local expertise without accepting the validity of the society-land relationship that sustains it (Scott, pers. comm.).

The future of indigenous knowledge, like the future of the subsistence economy, is being debated in government, university, non-government organization and indigenous peoples circles. Policies for northern economic development, land use and control, and self-government are all in a period of rapid change. The failure of many of the past policies, in effect, forces a new discussion which creates opportunities for a re-assessment of development alternatives which are more sustainable environmentally, culturally and economically.

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List of Tables

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Table 1: TEK Studies of the Hudson Bay **Bioregion**

Area of Study	Reference
Distribution **and use** of living **resources m** the NWT	**Freeman.** 1976
Marine mammals in Hudson Bay and large terrestrial mammals m west Hudson Bay	**Freeman, 1979.1985.1989**
Indigenous **knowledge** of **eider ducks m** Hudson Bay	Nakashima. 1991. 1993
Distribution **and use of** living resources in Nunavut area	Riewe. 1992
Indigenous knowledge and use **of** sea ice	Riewe. **1991**
Social **and** economic change among the Inuit of Sugluk	Graburn. 1969
Cree use of beaver and moose in the Waswanipi region	Feit.1 '986. 1987a. 1987b
(lee use of fish **and** waterfowl **m** the Chisasibi **area**	Berkes. **1977,** 1982.1992
Waterfowl **and** hunting ideology in Wemindji	Scott, 1986. 1 '989
Hunting ideology **and traditional** religion m Mistassini	Tanner. 1979
Subsistence hunting and fishing m Mistassini	Rogers. 1973
The role of narratives in the cultural life 01 Waskaganish (Rupert House) Cree	Preston. 1975
Land and resource use in Attawapiskat	Honigmann. 1961
Fur trade ethnohistory, northern Ojibwa	Bishop. 1974
Ethnoecology of Algonquian hunting territories	Bishop & Morantz. 1986
Historical geography of Ojibwa wild rice	Moodie. 1991
Social and economic change among the northern (Mario Ojibwa of Pekangekum	Dunning. 1959
Ojibwa fisheries in northwestern Ontario	Rogers. 1972
Subsistence strategies of the Weagamow Ojibwa	Rogers & Black. 1976
Ojibwa sturgeon fisheries on the Rainy River	Holzkamm *et al* . 1988
Resource harvesting in native northern Manitoba communities	Usher & Weinstein. 1991
Traditional spiritual life 01' the Churchill River Cree	Brightman. 1993

Table 2: Land Use Studies of the **Hudson Bay Bioregion**

Location	Year(s)	Objective	Coverage	Method	Reference
NWT	Pre - 1925 35 1925(35)-55(67) 1').'$.5(07) -7-J	To document native land claims.	Land use over time, including habitation.	Map biographies and interviews	Freeman, 197C,
Nunavut Region of the NWT	I 9X()-87	'1'0 document native land claims.	land use and intensity, and wildlife.	Used previously published information, map biographies and interviews	Riewe, 1992
Tadoule Lake and Lac Brochet	1990-91	To document native land claims	Land use including travel routes and habitation	Map biographies and stratified random sampling	MKO, 1993
Use of NWT by The Fond du Lac, Black Lake & Hatchet Lake Bands	1989-90)	To document native land claims	Land use including travel routes and habitation	Map biographies	Usher, 1990
Inuit Communities in Northern Québec	1973-80	To document native land claims	Land use based on distance from the community.	Questionnaires and statistical sampling methods	JB&NQNHRC, 1988
Cree Communities in Northern Quebec	1974-1979	To document native land claims	Cree wildlife harvests of 32 species.	Diary 'calendars and questionnaires/interviews	JB&NQNHRC, 1982
Chisasibi	1972-74	To document native land claims.	Harvests; family and household composition including incomes and subsistence activities	Map biographies and interviews	Weinstein, 1976
Mushkegowuk Region	1!)8')-91	To facilitate regional planning and resource c(~-management	Distribution and intensity of land use by community; by hunter type; and b) species	Questionnaires and computerized relational database	Hughes *et al.*, 1993

Table 2: Land Use Studies of the Hudson Bay Bioregion

Location	Year(s)	Objective	Coverage	Method	Reference
North Central Ontario	1920-XI	To assess environmental impacts.	Land use and intensity over time.	Map biographies, questionnaires and genealogies	Kayahna, 1985
South Indian Lake	Pre-1946-90	To document land-use activities over time.	Land use pre- and post-flooding, including travel routes and habitation	Map biographies and interviews	Irenchuk, 1991
Fox Lake First Nation	1957-92	To document land use activities over time.	Travel routes and habitation	Map biographies and interviews	Hill, 1993
The Churchill and Reindeer Rivers	197.{-7.5	To assess environmental impacts.	*(Not available)*	*(Not available)*	Ballantyne, 1976
The Churchill and Reindeer Rivers	1977	To assess environmental impacts	Land use including travel routes and habitation.	Map biographies and interviews	Begrand, 1978
Grande-Baleine	1990	To fulfill environmental impact assessment requirements	Hunting and wildlife areas	*(Not available)*	Hydro-Quebec, 1993
Waterhen	1991-1992	To document land use activities over time.	Land use.	Map biographies and interviews	Stock, 1994

Table 3: Wildlife Harvest Studies by Region

Region	Year	Potential Edible Weight (kg)[1]	Population	Per capita (kg/year)	Reference
Baffin Region[2]	1984	924,635	2,689	344	Pattimore, 1985
Keewatin[3]	1981-82	829,440	3,769[4]	220	Gamble, 1984, 1987
	1982-83	793,003	3,882	204	Gamble, 1984, 1987
	1984-85	895,228	3,999	224	Gamble, 1984, 1987
Northern Quebec Inuit[5]	1976	1,403,846	3,427[6]	410	JB&NQNHRC, 988
	1977	1,181,159	3,530	335	JB&NQNHRC, 988
	1978	852,432	3,636	234	JB&NQNHRC, 988
	1979	1,096,408	3,745	293	JB&NQNHRC, 988
	1980	1,100,179	3,857	285	JB&NQNHRC, 988
Northern Quebec Cree[7]	1974-75	918,182	6 267	147	JB&NQNHRC, 1982
	1975-76	783,909	6,462	121	JB&NQNHRC, 1982
	1976-77	876.954	6,626	132	JB&NQNHRC, 1982
	1977-78	766.964	6.870	112	JB&NQNHRC, 1982
	1978-79	809,181	7,022	115	JB&NQNHRC, 1982
Hudson Bay Lowlands[8]	1981-82	9350,147	4,700[10]	75	Thompson & Hutchison, 1989
	1982-83	351,595	4,700	75	
Mushkegowuk[11]	1990	686,713	6,470	106	Berkes *et al.*, 1992
Northern Manitoba[12]	1983-84	355.529	6,808	52	Wagner, 1985

1. Calculated by converting the number of animals harvested into food weights. Does not include berries, wild nce or waterfowl eggs.
2. Foxe Basin only. Includes Cape Dorset, Hall Beach, I gloolik, Lake Harbour and Sanikiluaq.
3. Includes Baker Lake, Chesterfield Inlet, Coral Harbour, Eskimo Point, Rankin Inlet, Repulse Bay, and Whale Cove.
4. population given only for 1983. Other years estimated on the basis of" 3% per year adjustments.
5. Includes Kuujjuarapik, Inukjuak, Akulivik, Salluit, Kangiqsujuaq, Quaqtac, Kangirsuk, Aupaluk, Tasiujaq, Kuujjuaq, Kangiqsualujjuaq, Killiniq, and Chisasibi.
6. Population giv en only for 1976. Subsequent years are estimated on the basis of 3% per year increase.
7. Includes Great Whale, Fort George, paint Hills, Eastmain, Rupert House, Nemaska, Mistassini, and Waswanipi.
8. Includes Moose Factory, Moosonee, Winisk (Peawanuck), Fort Severn, A ttawapiskat, Kashechewan, Fort Albany, and Moose River Crossing. Some communities did not participate in the study and their harvests were estimated on the basis of adjacent communities.
9. Beaver, muskrat and sturgeon (considered commercial species) were not included in the questionnaire.
10. Resident native population (Indian status), OMNR Moosonee District (OMNR, 1985).
11. Includes Moose Factory, Moosonee, New Post, Fort Albany, A ttawapiskat, Kashechewan, Peawanuck and Fort Severe.
12. Includes the communities of Berens River, Cross Lake, Hollow Water, Mathias Colomb (at Pukatawagan), Split Lake and The Pas. Excludes agricultural communities. Wagner's harvest numbers were converted into potential edible weights using conversions in Berkes *et al., 1992.*

Table 4: Imputed Value of Subsistence Bush Meat

Region	Year	Potential Edible Weight (kg)[1]	Imputed Value[2] $	No. of Households[3]	Value per Household per Year		Reference
					Current $ (Year of Study)	Constant $ (1991)[4]	
Sanikiluaq[5]	1984	[illegible]	[illegible]	79	36,930	50,594	Quigley & M[illegible] 1992
Keewatin[6]	1981-82	829,440	7,879,680	665	11,849	17,892	Gamble, 1984, 1987
	1982-83	793,003	7,533,529	[7]685	10,998	15,727	Gamble, 1984, 1987
	1984-85	895,298	8,505,331	705	12,064	16,026	Gamble, 1984, 1987
Mushkegowuk[8]	1990	686,713	7,648,133	1,116	7,031	7,453	Berkes *et al.*, 1992
Fitchouse	1983-84	84,455	451,307	98	4,605	6,290	NVP, 1987; Tobias 1993
Wemindji	1975-76	67,636	372,000	117	3,180	8,459	Scott, 1982
	1976-77	79,272	436,000	121	3,603	8,863	Scott, 1982
N. Manitoba[9]	1983-84	355,529	1,402,931	1,238	1,167	1,594	Wagner, 1985

1 [illegible] harvest weights. Does not include berries, wild rice, or waterfowl eggs.
2. The average price of the replacement value of store meat was applied to the harvest value to estimate imputed value.
3. If the number of households are not provided, it is estimated assuming 5.5 people per household.
4. Source: Canadian Almanac & Directory, 1992. Toronto. Conversions have been made to current dollars using the Consumer Price Index.
5. The figures for Sanikiluaq should be used with caution as the community considers the harvest figure to be inflated (Lucassie Arragutainaq, pers. comm.).
6. Includes Baker Lake, Chesterfield Inlet, Coral Harbour, Eskimo Point, Rankin Inlet, Repulse Bay, and Whale Cove.
7. Population given only for 1983. Other years are estimated on the basis of 3% per year adjustments.
8. Includes Moose Factory, Moosonee, New Post, Fort Albany, Attawapiskat, Kashechewan, Peawanuck and Fort Severn.
9. See Note 12 in Table 3.

Table 5: The Bush Sector in the Overall Economy

Region	Year	Total Cash Economy per Year		Imputed Value of Native Traditional Activities[1]			Reference
		Current $ (Yr of Study)	Constant $ (1991)	Current $ (Yr of Study)	Constant $ (1991)	Cash Economy to **Traditional** Economy	
Sanikiluaq	1984	2,155,000	2,952,350	2,946,515	4.036,726	1.1.37	Quigley & **McBride,** 1987
Mushkegowuk[2]	1992	25,370,880"	24,237,737	9,397,120	8.974,250	1:0.37	Berkes *et al.,* 1992; Farley, 1992
N. Manitoba	1985	178,827,6(K)	236,052,430	322,367,500	29,525,100	1.0.13	NMEDC, 1992
Waswanipi[4]	1968-70 1982	251,315 [5] ,814,451	774,050" 2,739,821	209,665 684,667	645,768 1 ,033,847	1:0.83 1:0.38	Feit, 1991 Feit, 1991
Wemindji	1975-76 1978-77	625,(00) ,184,(00)	1 ,687,5(M) 2,960,(00)	531,()(M) 732,(00)	1 ,433,700 1 ,830,000	1:0.85 1:0.62	Scott, 1982 Scott, 1982
Pinehouse	1983-84	**2,101,289**	2,878,766	[6]1, 135,281	1 .555,335	1054	NVP, 1987, Tobias, **19Y3**

1. Includes all bush products for which data are available. These include meat, fur, fuelwood, berries, and wild rice.
2. Includes Moose Factory, Moosonee, New Post, Fort Albany, Attawapiskat, Kashechewan, Peawanuck and Fort Severn.
3. Edible meat only. Comparable data for fish, fur and fuel not available.
4. Excludes fuelwood, berries; includes fur, handicrafts, sales-tourism.
5. Includes payments of $915,851 under the Income Security Programme (ISP). There was no ISP in 1968-70.
6. Of this value, $451,307 is for bush meat, $108,307 is for other bush commodities, and $575,667 is for commercial fisheries.

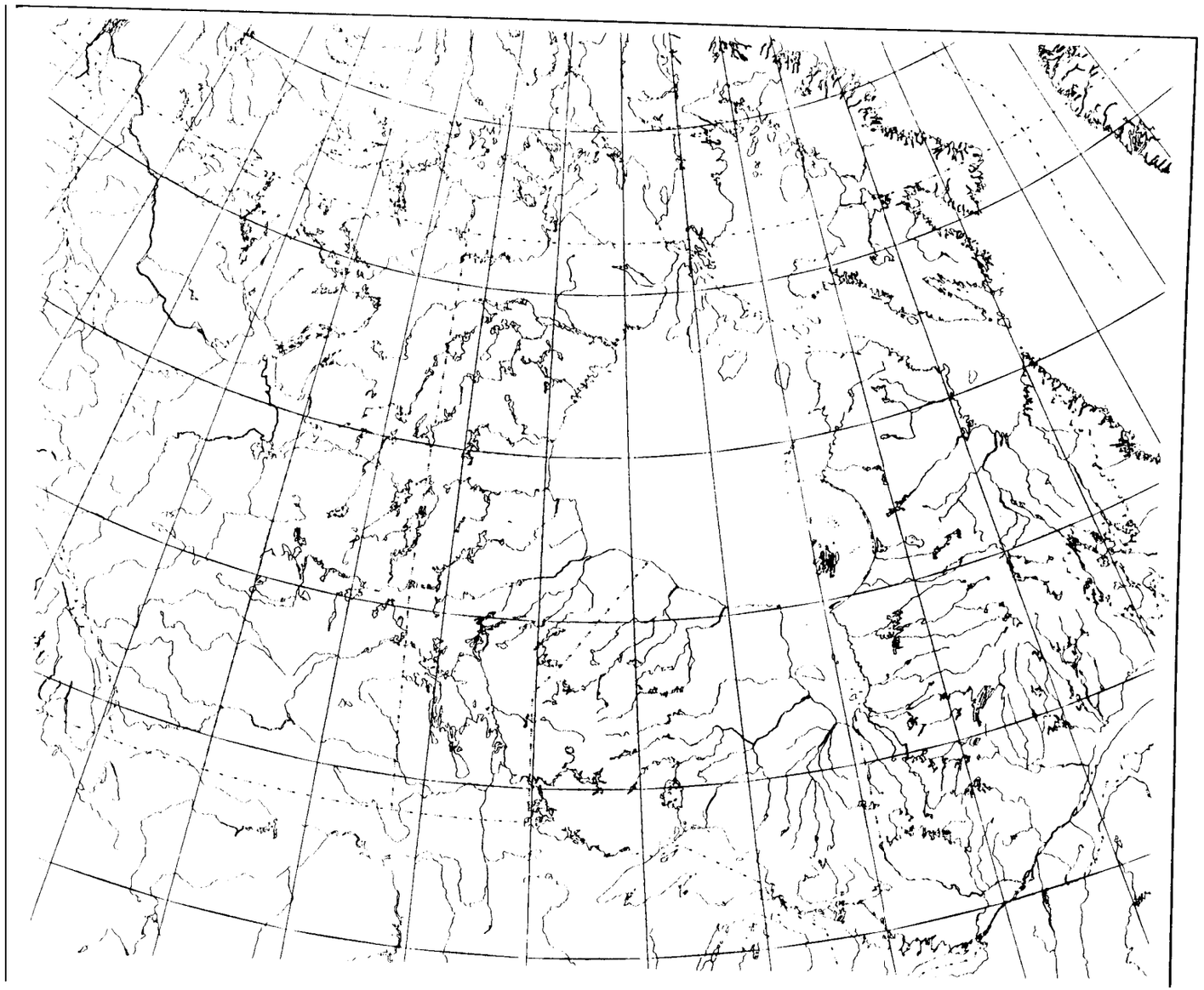

Figure .. Hudson Bay Bioregion (Drainage Basin)

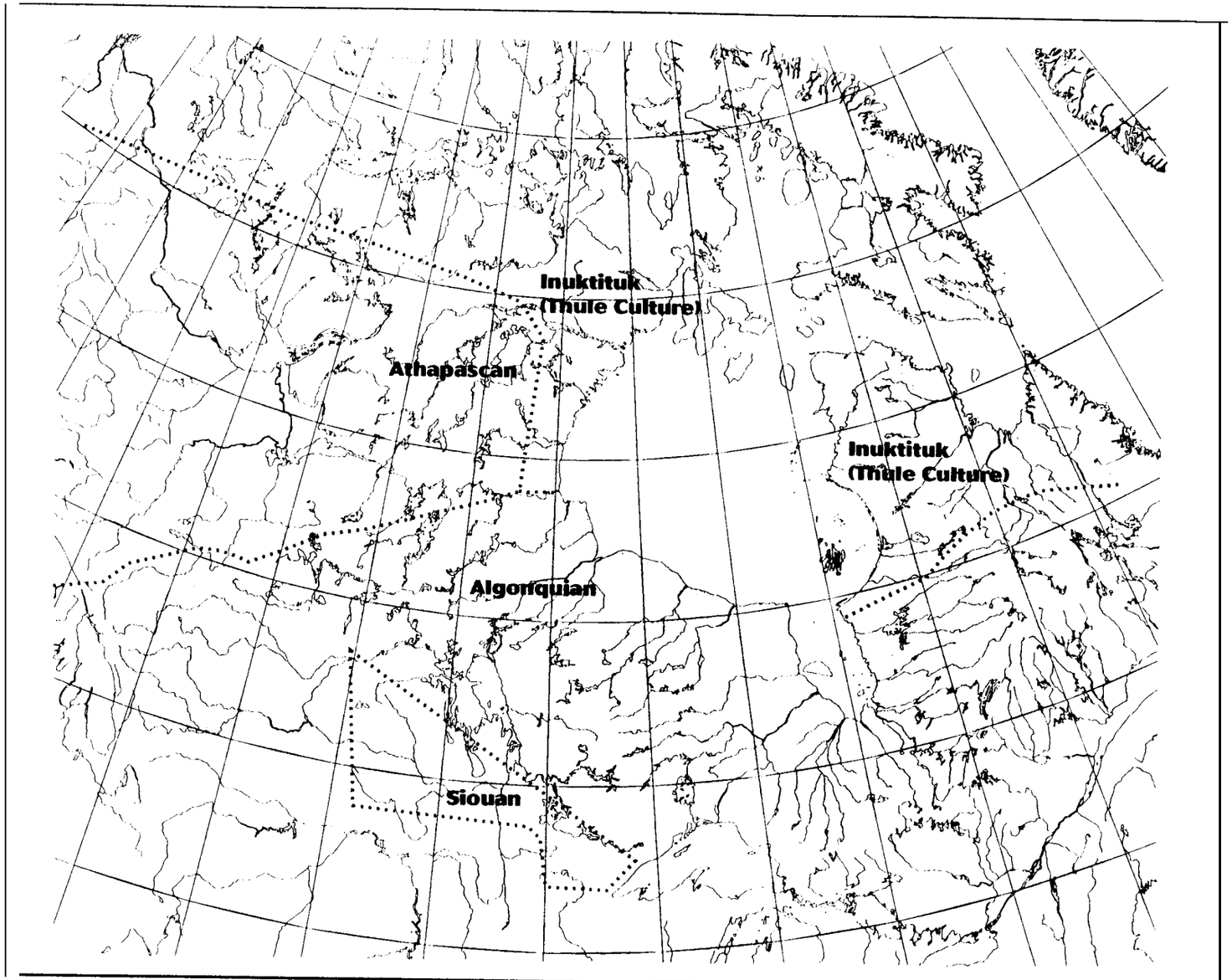

Figure 2: Aboriginal Language Families of the Hudson Bay Bioregion in the 17th Century
(After McMillan, 1988, and Harris, 1987)

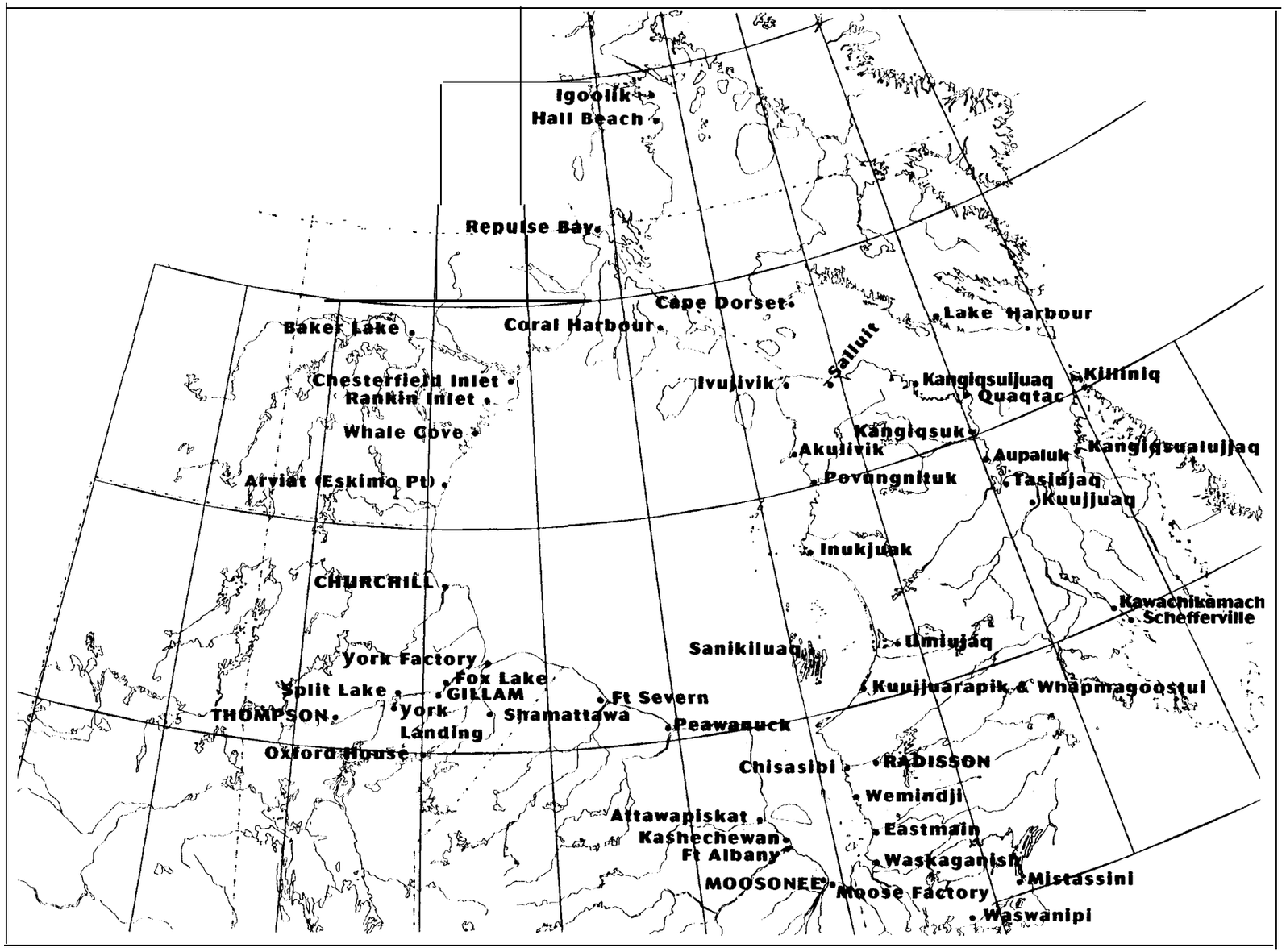

Figure *3: Place* Names of Hudson Bay Communities

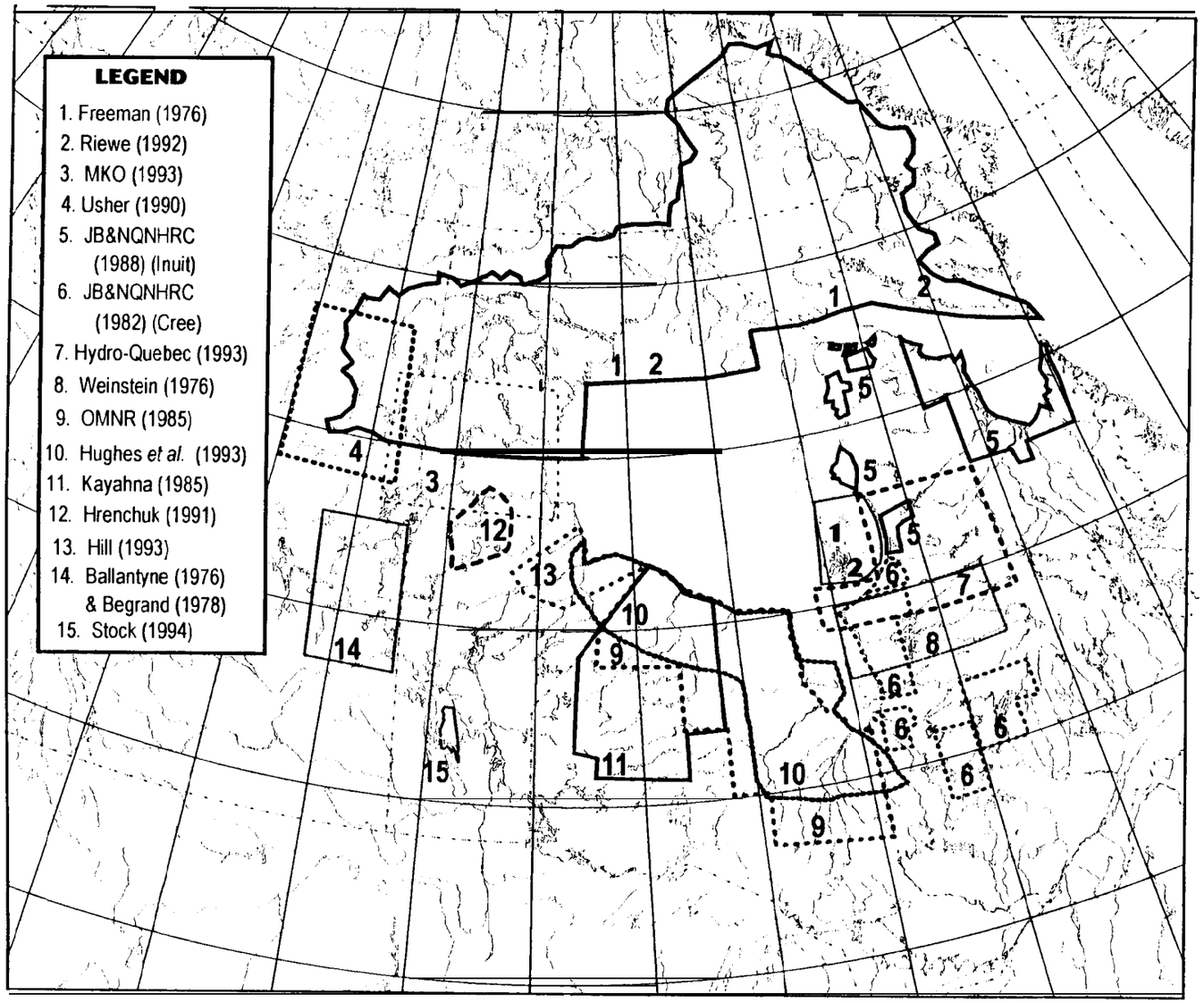

Figure 4: Land Use Studies in the Hudson Bay Bioregion