ARCTIC
VOL. 47, NO. 4 (DECEMBER 1994) P. 350–360

Wildlife Harvesting and Sustainable Regional Native Economy in the Hudson and James Bay Lowland, Ontario

F. BERKES,[1] P.J. GEORGE,[2] R.J. PRESTON,[3] A. HUGHES,[4] J. TURNER[5] and B.D. CUMMINS[3]

(Received 20 January 1994; accepted in revised form 22 June 1994)

ABSTRACT. To assist the Omushkego Cree in planning a community and regional economic development strategy that takes into account the traditional economy, we developed appropriate methodologies to investigate the quantitative importance and economic value of hunting and fishing for the Mushkegowuk region, Hudson and James Bay Lowland. Harvests of wildlife by the 6500 aboriginal residents of eight communities—Moose Factory, Moosonee, New Post, Fort Albany, Kashechewan, Attawapiskat, Peawanuck and Fort Severn—were estimated by means of a questionnaire study. A total of 925 persons were interviewed for 56% coverage in a stratified sampling design. Four species (moose, Canada goose, caribou, lesser snow goose) accounted for about two-thirds of the 1990 bush food harvest of 687 000 kg, the equivalent of 402 g meat or 97 g protein per adult per day. The replacement value of the bush food harvested in the region was about $7.8 million in 1990. Including other products of the land (fur, fuelwood, berries), the total value of the traditional economy, $9.4 million for the region or $8400 per household per year, was about one-third as large as the total cash economy. The results show that the traditional economy is a cornerstone of the regional mixed economy, and that such a mixed economy may persist as a culturally and environmentally sustainable base for the region.

Key words: Hudson Bay and James Bay Lowland, Canadian subarctic, Cree, sustainable development, subsistence, wildlife, fisheries

RÉSUMÉ. Dans le but d'aider les Cris Omushkego à planifier une stratégie de développement économique communautaire et régional qui tienne compte de l'économie traditionnelle, on a mis au point des méthodologies appropriées permettant d'enquêter sur l'importance quantitative et sur la valeur économique de la chasse et de la pêche pour la région de Mushkegowuk, dans les basses-terres de la baie d'Hudson et de la baie James. Une étude faite à l'aide d'un sondage a permis d'évaluer le nombre de prises d'animaux par les 6500 autochtones habitant les huit communautés de Moose Factory, Moosonee, New Post, Fort Albany, Kashechewan, Attawapiskat, Peawanuck et Fort Severn. Un total de 925 personnes ont été interviewées formant 56 p. cent d'un plan d'échantillonnage stratifié. Quatre espèces (l'orignal, la bernache du Canada, le caribou et la petite oie blanche) comptaient pour environ les deux tiers des prises provenant de la nature au cours de l'année 90. Le poids de ces prises était de 687 000 kg, soit l'équivalent quotidien de 402 g de viande ou de 97 g de protéine par adulte. La valeur de remplacement de la nourriture tirée de la nature dans la région était d'environ 7,8 millions de dollars en 1990. Si l'on inclut les autres produits de la nature (fourrure, bois de feu, baies), la valeur totale de l'économie traditionnelle — 9,4 millions de dollars pour la région ou 8400 dollars annuels par foyer — équivalait à environ un tiers de l'économie monétaire totale. Les résultats montrent que l'économie traditionnelle est un pilier de l'économie mixte régionale et que cette dernière peut persister en tant qu'assise durable sur le plan culturel et environnemental pour la région.

Mots clés: basses-terres de la baie d'Hudson et de la baie James, subarctique canadien, Cris, développement durable, subsistance, faune, pêcheries

Traduit pour la revué *Arctic* par Nésida Loyer.

INTRODUCTION

The role and importance of the traditional land-based economy in northern aboriginal communities remain controversial despite the availability since the 1970s of many studies on wildlife harvesting by native groups (NHR, 1982, 1988; Gamble, 1987). These harvests have been evaluated from a number of perspectives, including their contribution to nutrition (Berkes and Farkas, 1978), socioeconomic importance (Wolfe and Walker, 1987; Feit, 1991), and cultural value (Freeman, 1993). However, very few studies have tried to evaluate wildlife harvest data in the context of the overall regional economy or in terms of sustainable development strategies; exceptions include Quigley and McBride (1987) and Tobias and Kay (1994).

There is little agreement in the literature concerning the current importance of the traditional sector (Tobias, 1993), the nature of its decline (Berkes, 1990), and whether the traditional sector is likely to be replaced by a shift to a modern wage sector (Wolfe and Walker, 1987; Boldt, 1993). Most observers agree on the cultural importance of land-based activities, but even

[1] Natural Resources Institute, University of Manitoba, Winnipeg, Manitoba R3T 2N2, Canada
[2] Department of Economics, McMaster University, Hamilton, Ontario L8S 4M4, Canada
[3] Department of Anthropology, McMaster University, Hamilton, Ontario L8S 4M4, Canada
[4] Department of Geography, Brock University, St. Catharines, Ontario L2S 3A1, Canada
[5] Mushkegowuk Council, P.O. Box 370, Moose Factory, Ontario P0L 1W0, Canada

aboriginal people themselves differ on the question of whether the traditional economy is "healthy." When Cummins (1992) started his work in Attawapiskat, he was told that hardly anyone lived off the land anymore. Yet his studies showed that the land-based economy was active, and hunters obtained more wild food in absolute terms than that reported in the Attawapiskat surveys in the 1940s (Honigmann, 1961).

This paper reports findings of a harvesting study carried out jointly by the Research Program for Technology Assessment in Subarctic Ontario (TASO), the Mushkegowuk Council, its constituent First Nations, and the Omushkegowuk Harvesters Association. The overall purpose of the project was to assist the regional Council and its associations with the development of a strategy for natural resource co-management, self-government, and sustainable regional development. The present economic base for these communities is a combination of a) transfer payments and special government grants and programs, b) a geographically concentrated and relatively incomplete wage employment sector, and c) a traditional sector of hunting, fishing and other harvesting activities, most of which are non-market but produce income-in-kind, and some of which produce cash remuneration from the sale of commodities (e.g., fur).

The objective of this paper is to report estimates of the numbers of animals of the major species harvested over a one-year cycle in the study area, the potential food weight represented by this catch, and the imputed value of the harvest in relation to the overall economy of the region and to sustainable development planning. These estimates are of special interest to the Cree partners of the project to assess social and environmental impacts of potential hydroelectric projects in the Moose River Basin and other developments in the region, and to strengthen land use and hunting traditions in the communities. The context of the project is fully described elsewhere (George and Preston, 1987, 1992; George, 1989); experience with co-management may be found in Berkes et al. (1991), and the history and traditional economy of the Moose River Basin portion of the study area in George et al. (in press).

THE STUDY AREA

The Mushkegowuk region of Northern Ontario extends from the Quebec border along the coast of James Bay and Hudson Bay to the Manitoba border. The region is boreal and subarctic, with a fringe of tundra along the Hudson Bay coast. There is some forestry in the southern part, some mining, very little agricultural land, and limited hydroelectric potential because of the flatness of the terrain (OMNR, 1985). The region is both a productive wildlife area, especially for waterfowl (OMNR, 1985; Prevett et al., 1983), and an important hunting and fishing area for the local people (OMNR, 1985; Thompson and Hutchison, 1989).

The Omushkego Cree (also called the West Main Cree or Swampy Cree) are the people of the Western James Bay and Hudson Bay Lowland; historically, they ranged 200–300 km inland from the coast (Fig. 1). The Omushkego Cree make up the bulk of the resident regional population. The aboriginal population also includes the descendents of the Eastern James Bay Cree (the Mocreebec First Nation) living mainly in Moose Factory; Metis, some of whom have Indian status and some not, also living mainly in Moose Factory; and some Oji-Cree people, mainly in Fort Severn. The resident native population of the region was about 6500 in 1990, according to band council records. The two major settlements are Moose Factory, historically a major fur trade post, and Moosonee. The only concentration of non-native people in the region lives in Moosonee. Cree is the major language used at home in the region, with English used to a greater extent in Moosonee and Moose Factory.

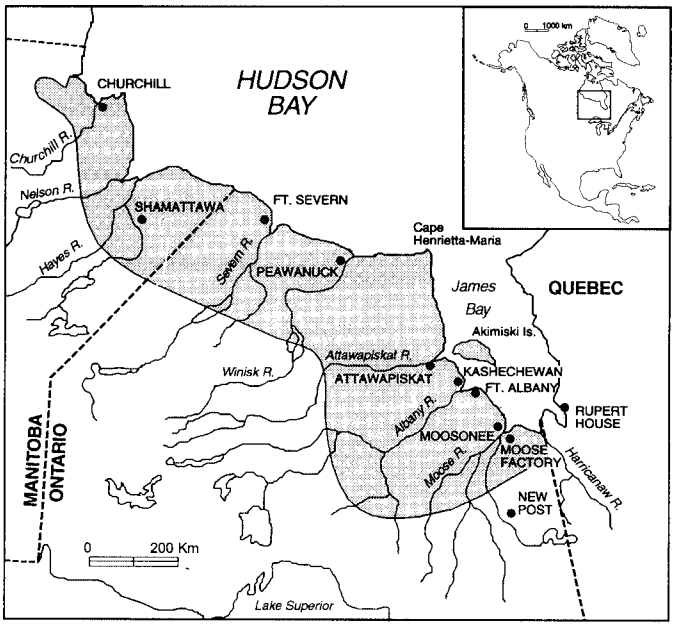

FIG. 1. Traditional territory of the West Main (Omushkego) Cree. The Mushkegowuk region excludes the Manitoba and Quebec parts of the historical territory, as well as Fort Severn, but includes New Post. Adapted from George and Preston (1987) after Honigmann (1981).

Traditionally, the aboriginal people of the region lived in scattered local bands, moving with the seasons and subsisting on fish and game (Honigmann, 1981; Flannery and Chambers, 1986; George and Preston, 1987). The locus of "home" gradually changed from the bush to village settlement (Preston, 1986). The population no longer lives in scattered hunting groups but is concentrated in Moosonee and eight First Nation communities: Moose Factory, Mocreebec, New Post, Fort Albany, Kashechewan, Attawapiskat, Peawanuck (formerly Winisk) and Fort Severn. Fort Severn is the only one of these which is not a member of the Mushkegowuk Council; it was included in the study because it is a member of the Omushkegowuk Harvesters Association, and utilizes much the same wildlife populations.

STUDY METHODS

Data were collected by administering a detailed questionnaire to "potential hunters" among the resident aboriginal population of the region. Potential hunters are defined as all males 18 years of age and over and female heads of household for households

having no adult males. The questionnaire was adapted from NHR (1982). Sampling of First Nations community members was conducted by selecting potential hunters from band lists. Moosonee, which is not a reserve, was sampled by selecting from a list of native households.

Since not all potential hunters could be interviewed, the sample was stratified by John Turner, the head of the field study, in consultation with local experts. In the two largest centres, the sample was stratified into four groups, as defined by level of participation in subsistence activities. An "intensive hunter" was defined as a person who repeatedly and regularly engaged in several types of harvesting activities during the annual cycle, and usually spent longer than a week at a time in the bush. An "active hunter" was a person who regularly engaged in at least one of the harvesting activities during the annual cycle, spending more than a weekend at a time. An "occasional hunter" was a person who participated in short-term harvesting activities, usually on day trips or weekend outings. "Non-hunters" were those who did not hunt, fish or trap. Respondents were chosen to give good representation of intensive and active hunter categories, important for improving the confidence levels of the community harvest estimate (Usher and Wenzel, 1987), and lower representation of the other two categories.

In Fort Albany, Kashechewan and Peawanuck, separating the "occasional hunter" and "non-hunter" categories made little sense to the community, and these two categories were combined. The two smallest samples, from New Post and Fort Severn, were not stratified but sampled randomly.

Throughout this paper, "reported" refers to the data gathered from the hunters actually interviewed. Reported harvest numbers were adjusted, using correction factors based on the ratio of respondents to the number of potential hunters in each of the four groups, to produce the "projected" numbers, considered the best estimates of the total harvests.

The questionnaire was administered orally and the answers recorded by the interviewer, himself a native from the community in question. To ensure consistency, all of the interviewers were trained by the head of the field study who also accompanied the interviewers (usually two per community) in the administration of several questionnaires. The number of respondents interviewed ranged from 235 for Moose Factory to 13 for New Post, for a total of 716 respondents, representing overall 52% of potential hunters, excluding Attawapiskat. Moose Factory data included Mocreebec. Including the part of the study carried out in Attawapiskat by Cummins (1992), a total of 925 hunters were interviewed, for a 56% coverage (Table 1). Cummins' (1992) data were based on 209 out of 275 potential hunters for a 76% coverage in Attawapiskat in a one-year recall study. Many of his questions and data were consistent with the rest of the study; those results are incorporated into the present paper.

Time periods in the questionnaire were chosen according to Cree hunting seasons: waterfowl: spring, summer/fall (two periods); fish: winter (ice-fishing), spring, summer/fall (three periods); furbearers: the trapping season, usually October–March (one period); big game: winter, summer/fall (two periods); and small game: winter, summer/fall (two periods).

TABLE 1. Resident native population[1] of the study area: number of residents, households, "potential hunters"[2], their stratification, total numbers (T), and numbers interviewed (I).

			Intensive		Active		Occasional		Non-hunter		Total	
Communities	Pop	HH	T	I	T	I	T	I	T	I	T	I
Moose Factory	1750	292	93	75	151	99	150	48	50	13	444	235
Moosonee	1250	208	69	49	82	56	38	19	108	13	297	137
New Post[3]	72	12			20	13					20	13
Fort Albany[4]	625	104	14	11	110	45	49	34			173	90
Kashechewan	1000	187	29	25	168	122	76	21			273	168
Attawapiskat[5]	1214	220									275	209
Peawanuck	227	38	12	9	40	26	18	9			70	44
Fort Severn	332	55			92	29					92	29
Total	6470	1116	217	169	663	390	331	131	158	26	1644	925

[1] Population and household (HH) numbers are based on band records and Indian and Northern Affairs data for 1990 (1989 for Attawapiskat).
[2] "Potential hunters" are defined as all males 18 years and over, plus female heads of households.
[3] New Post and Fort Severn were not stratified but sampled randomly.
[4] In Fort Albany, Kashechewan and Peawanuck, the categories of "occasional" and "non-hunter" were combined.
[5] From Cummins (1992), estimated on the basis of 220 households from which 209 were inventoried by interviewing the household head.

The study was phased, beginning with the southern communities and moving north. In the southern communities of New Post, Moose Factory and Moosonee, the one-year period covered by the questionnaire started in November 1989 (freeze-up and beginning of winter 1989–90 season). In the other communities, the study was carried out after the spring goose season, and the one-year period started in June 1990 (the beginning of summer 1990). Thus, 1990 was the main calendar year covered by the study. The Attawapiskat data were for the calendar year 1989.

Respondents were asked background questions, the size of their harvest over the one-year cycle (i.e., the numbers of animals caught, by species and season), harvest locations, hunting success rates, the number of days of harvesting, and management techniques. The harvests of all individuals living in a house (i.e., female members of the family and males under 18 years) were included in the report of the head of the household. Other males 18 and over reported their own harvests.

The study included verification of the data by field personnel and community experts. Any unusual or questionable harvest numbers, species identifications and harvest locations were rechecked and adjusted accordingly. For example, it was found that some pairs of hunters had reported the same individual moose kill twice (among the Omushkego, partners in a moose hunt share equally). A follow-up study, by sampling hunter pairs, found that there was an estimated 12% double-counting for moose (but none for other species such as caribou) and the numbers were corrected accordingly.

Perhaps the most serious shortcoming of the study is that it was based on only one annual cycle in an environment which may fluctuate greatly from year to year. Berkes' (1990) review shows that even two- or three-year studies may be inadequate to capture the range of variation in subsistence fishery harvests. Under-reporting due to problems of recall is known to occur with

two groups, fish and small game (Berkes, 1983). Other limitations of the study include the inability to cover "intensive hunters" more fully (those who hunt a great deal tend to be less available for interviews); possible under-reporting of women's and children's harvests ("other-reported" data are less reliable than "self-reported" data); and differences among communities in the perception of what constitutes "intensive," "active" and "occasional" hunting.

The relatively small, opportunistic samples in Fort Severn and New Post resulted in projections which must be considered less reliable than those elsewhere. The large projected harvests of caribou and marten in Fort Severn need to be interpreted with caution. Similarly, there is a potential sample bias problem with relatively rare species, in particular, swan, polar bear and wolverine. For these species, only the reported values are given in this paper because community representatives indicated that projected values would be misleading and not acceptable to the communities. Finally, it is known that a lengthy and complex research instrument, like the questionnaire used in the present case, can generate "response burden" that may result in the omission of detail (Usher and Wenzel, 1987).

A technical report contains more details of the results and the questionnaire itself (Berkes et al., 1992). Distribution maps of harvesting locations may be found in a separate report (Hughes et al., 1993).

WILDLIFE HARVESTS AND HARVESTING EFFORT

Reported and projected harvests for the region are summarized in Table 2. A total of 41 species are listed; these were the major species and not all of the species in the hunt. Among the waterfowl, duck species were not enumerated separately; three species dominated the hunt. Among the fish, the two species of *Coregonus* and two of *Catostomus* were aggregated. Community totals by species are not given because the communities consider this privileged information that, if provided, might violate confidentiality of the data.

The single most important activity, in terms of time spent harvesting, was the spring waterfowl hunt (dominated by the Canada goose), followed by the fall waterfowl hunt (dominated by the lesser snow goose), and fishing, trapping, and big game (Table 3). The table does not include the small game hunt, which was often combined with other types of harvesting and was difficult to quantify on its own; many day-trips involved in small-game hunting created a response burden. Overall, two communities, Moose Factory and Kashechewan, accounted for over half of the hunting effort in the region as a whole, and there were major differences among communities in the distribution of effort. For example, Fort Severn differed from others in that trapping received more effort than any other type of harvesting. All communities, except Peawanuck and Fort Severn, spent more time waterfowl hunting than in any other activity.

Table 4 provides participation rates by harvesting activity. The waterfowl hunt attracted over half of the potential hunters in every community, with an overall 80% participation rate. Participation rates were 27% for moose, 15% for caribou, 60% for small game, 56% for fishing and 20% for trapping. Again there were major differences among communities. For example, participation in trapping ranged from a high of 62% in Fort Severn to a low of 4% in Fort Albany. The mean harvests, calculated by dividing the projected community harvest by the number of hunters projected as participating in a given activity, are found in Table 5.

Figure 2 summarizes the data on community harvesting effort. The average number of days of harvesting (all hunting,

TABLE 2. All species harvested in the region.

Species/Species Groups	Scientific Name	Reported	Projected
Waterfowl:			
Canada Goose	*Branta canadensis*	40 676	56 536
Snow Goose/Blue Goose	*Anser c. caerulescens*	38 022	55 076
Brant	*Branta bernicla*	294	616
Ducks:		15 538	21 766
Mallard	*Anas platyrhynchos*		
Black Duck	*Anas rubripes*		
Pintail	*Anas acuta*		
Loons:		64	89
Common	*Gavia immer*		
Red-throated	*Gavia stellata*		
Swans	*Cygnus columbianus*	47	n/a
Fish:			
Whitefish:		44 707	57 611
Lake Whitefish	*Coregonus clupeaformis*		
Lake Cisco	*Coregonus artedii*		
Walleye	*Stizostedion vitreum*	17 678	21 528
Pike	*Esox lucius*	19 758	24 063
Sturgeon	*Acipenser fulvescens*	3 850	4 768
Brook Trout	*Salvelinus fontinalis*	6 384	11 499
Suckers:		9 710	11 308
Long Nose Sucker	*Catostomus catostomus*		
White Sucker	*Catostomus commersoni*		
Burbot	*Lota lota*	4 451	5 206
Fur Bearers:			
Beaver	*Castor canadensis*	1 891	2 875
Marten	*Martes americana*	3 342	6 088
Mink	*Mustela vison*	608	876
Fox (Coloured)	*Vulpes vulpes*	743	1151
Arctic Fox	*Alopex lagopus*	138	238
Wolf	*Canis lupus*	58	123
Otter	*Lutra canadensis*	527	744
Muskrat	*Ondatra zibethica*	3 230	3 734
Weasel	*Mustela erminea*	185	299
Fisher	*Martes pennati*	7	15
Squirrel	*Tamiasciurus hudsonicus*	111	155
Wolverine	*Gulo gulo*	17	n/a
Big Game:			
Lynx	*Lynx canadensis*	19	22
Polar Bear	*Ursus maritimus*	26	n/a
Seal	*Phoca (pusa) hispida*	7	15
Moose	*Alces alces*	583	753
Caribou[1]	*Rangifer tarandus*	847	1 673
Black Bear	*Ursus americanus*	10	15
Small Game:			
Snowshoe Hare	*Lepus americanus*	14 379	19 862
Sharp-tailed Grouse	*Tympanucus phasianellus*	8 360	13 085
Spruce Grouse	*Canachites canadensis*	4 953	7 251
Ruffed Grouse	*Bonasa umbellus*	3 219	4 813
Willow Ptarmigan	*Lagopus lagopus*	6 512	11 420

[1] The projected number for caribou should be used with caution. It is higher than that estimated by some local experts, and based on a relatively small sample of hunters in Fort Severn, the major caribou-hunting community.

fishing, trapping) per potential hunter ranged, by community, from a high of 75 days per year in Fort Severn to a low of 10 days in Fort Albany. To provide the context for the harvesting effort, the catch per unit of effort must also be taken into account, and this requires the calculation of the food weight of the harvest.

TABLE 3. Number of person-days spent hunting, trapping and fishing (projected).

Communities	Waterfowl		Fish	Furbearers	Big Game		
	Spring	Fall			Moose	Caribou	Total
Moose Factory	4 651	3 371	3 560	2 600	2 421	296	16 899
Moosonee	969	835	1 682	1 335	747	14	5 582
New Post	223	102	145	323	142	0	935
Fort Albany	913	238	199	156	172	102	1 780
Kashechewan	4 154	2 623	1 988	1 495	975	151	11 386
Attawapiskat[1]	2 125	1 858	342	1 100	458	142	6 025
Peawanuck	392	164	640	792	14	220	2 222
Fort Severn	1 037	789	1 322	2 729	165	853	6 895
Total	14 464	9 980	9 878	10 530	5 094	1 778	51 724

[1] Attawapiskat furbearer trapping effort was difficult to estimate because of a large number of day trips, and was estimated by Cummins (1992) as a range, 1000–1200.

TABLE 4. Percentage of respondents participating in hunting, fishing and trapping activities (projected data), and the weighted average for all harvesters.

Communities	Moose	Caribou	Waterfowl	Trapping	Small Game	Fishing
Moose Factory	24	5	81	17	69	69
Moosonee	19	1	55	13	45	41
New Post	46	0	69	38	92	85
Fort Albany	10	5	59	4	30	12
Kashechewan	47	16	100	17	74	48
Attawapiskat	38	21	92	28	51	66
Peawanuck	6	52	84	33	68	78
Fort Severn	28	86	100	62	79	93
All Communities	28	15	80	20	60	56

TABLE 5. Mean catch per harvester (projected data) among harvesters responding as participating, and the weighted average for all harvesters.

Communities	Moose	Caribou	Waterfowl[1]	Trapping	Small Game	Fishing
Moose Factory	1.8	2.9	63.0	22.9	39.8	117.1
Moosonee	1.2	1.4	40.9	31.9	27.7	70.5
New Post	4.3	0.0	28.8	31.2	71.3	24.2
Fort Albany	1.8	7.4	50.7	12.2	15.9	63.3
Kashechewan	1.7	3.9	139.7	63.3	90.9	100.8
Attawapiskat	1.1	2.9	137.3	43.9	49.0	296.7
Peawanuck	1.2	7.8	170.6	64.6	101.6	235.5
Fort Severn	0.8	10.0	176.3	57.1	90.3	107.2
Overall Mean	1.5	3.8	93.7	37.4	51.0	133.7

[1] Waterfowl is defined to include geese (except brant) and duck species to be consistent with the OMNR study.

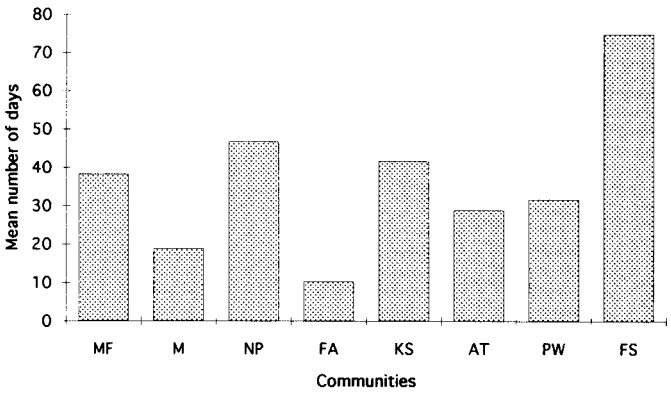

FIG. 2. Mean number of days of harvesting activity by community. MF = Moose Factory, M = Moosonee, NP = New Post, FA = Fort Albany, KS = Kashechewan, AT = Attawapiskat, PW = Peawanuck, and FS = Fort Severn.

POTENTIAL FOOD WEIGHT OF HARVEST AND ITS IMPUTED VALUE

The numbers of animals harvested (Table 2) were converted into edible food weights by using the average edible weights in Table 6. These data are given as potential food weights, as food that was harvested and available for consumption. The actual consumption is not known. A summary of potential edible weights by species group and by community is given in Table 7. In the region as a whole, moose (about 150 000 kg/yr), Canada goose (120 000 kg/yr), caribou (105 000 kg/yr) and lesser snow goose (88 000 kg/yr) were the top four species, accounting for about two-thirds of the total bush food harvested. By species group, big game and waterfowl were about equally important, followed by fish, small game and furbearers (Table 7).

Community bush harvest totals (Table 7) divided by the total community harvesting effort (Table 3), allows the calculation of the catch per unit of harvesting effort. Hunters in the more northerly communities harvested over 20 kg of meat per day of effort, but even in the more crowded hunting areas of Moose Factory and Moosonee, hunters still obtained about 8 kg of food per day of harvesting (Fig. 3).

To assess the nutritional value of the bush harvest, food weights were converted into protein equivalents. On the average, waterfowl contain 24 g protein per 100 g meat; big game, 26 g; fur animals, 20 g; small game , 25 g; and fish , 21 g (from standard nutritional tables, as applied to James Bay area wildlife by Berkes and Farkas, 1978). Multiplying these values by the harvested weights (Table 7), shows that the annual regional harvest was 165 400 kg protein.

To calculate the per capita values of edible bush meat and protein available, the region's population figure was converted to adult-equivalents. The resident native population of 6500 produced a figure of 4680 adult-equivalents, in which children below the age of 12 are considered to be one-third of an adult unit and adolescents up to 18 years, two-thirds (Berkes and Farkas, 1978; NHR, 1982). The total bush meat available (Table 7), divided by 4680 adult-equivalents, was 402 g per adult per day. Similarly, the protein available was calculated to be 97 g per adult per day.

TABLE 6. Average edible raw weight (kg) per animal[1].

Species	Edible Raw Weight (kg)
Canada Goose	2.14
Snow And Blue Goose	1.59
Ducks	0.77
Other Birds[2]	1.00
Whitefish	0.76
Walleye	0.62
Pike	1.14
Sturgeon	5.68
Brook Trout	0.63
Suckers	0.89
Burbot	0.96
Beaver[3]	7.91
Muskrat	0.64
Moose	199.00
Caribou	61.80
Black Bear	95.40
Grouse	0.32
Ptarmigan	0.36
Snowshoe Hare	0.86

Footnotes for Table 6:

[1] According to NHR (1982, Appendix 8), except for fish. Edible weights of fish based on the Ontario data of Hopper and Power (1991).

[2] Includes loons, brant, swans and large shorebirds.

[3] Among furbearers, only beaver and muskrat are normally eaten.

TABLE 7. Potential edible weights (kg) by community and by species group.

Species Group	MF	M	NP	FA	KS	AT	PW	FS	Total
Waterfowl	36 391	11 047	519	9 401	77 263	61 145	17 578	28 576	241 919
Fish	41 932	8 486	382	1 433	12 655	51 517	10 060	7 407	133 872
Furbearers	4 426	2 399	782	143	4 863	4 603	652	7 292	25 158
Big Game	42 926	16 031	7 960	10 410	53 709	33 864	18 894	72 728	256 523
Small Game	6 751	1 771	1 020	470	8 731	4 501	2 316	3 681	29 240
Total[1]	132 426	39 734	10 663	21 856	157 220	155 630	49 499	119 684	686 713

[1] Differences in total potential edible weights are due to rounding.

TABLE 8. Replacement values of bush food harvested (1990$).

Species Group	MF	M	NP	FA	KS	AT	PW	FS	Total
Waterfowl	296 222	89 924	4 225	91 844	754 857	597 383	200 387	325 769	2 360 610
Fish	461 253	93 347	4 206	18 914	167 043	710 886	154 919	114 063	1 724 633
Furbearers	44 256	23 986	7 819	1 716	58 351	41 735	9 122	102 083	289 068
Big Game	429 624	160 312	79 600	124 925	644 508	406 373	264 519	1 018 189	3 128 049
Small Game	67 508	17 708	10 200	5 634	104 777	54 010	32 420	51 538	343 794
Total[1]	1 298 863	385 277	106 051	243 033	1 729 536	1 810 387	661 367	1 611 642	7 846 155

[1] Differences in totals are due to rounding.

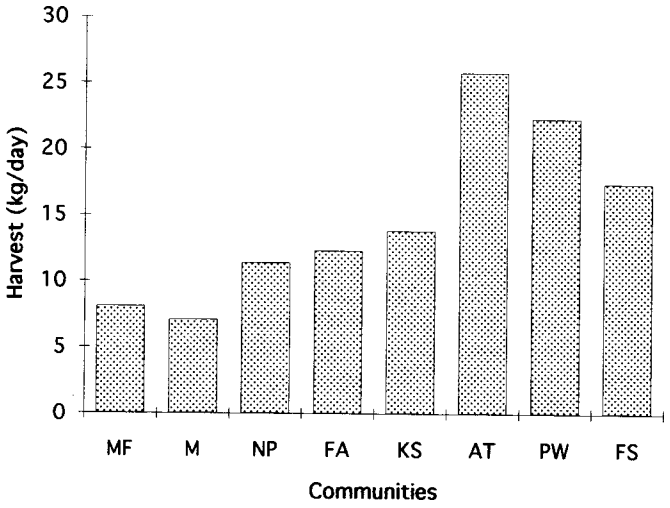

FIG. 3. Potential edible weights (kg) of bush food harvested per day.

The edible weights were converted to dollar values by using the replacement value or the gross imputed value approach (Usher, 1976; Berger, 1977; Quigley and McBride, 1987). Since bush harvests (except fur) have no cash or commercial value, their real economic importance can be deduced only by considering the value of meat that the hunter's family would otherwise have to purchase. Thus, the value of waterfowl harvests was calculated by considering poultry prices at the local store, and that of fur animals, big game and small game by considering red meat prices. To find the replacement value of bush food, a correction was made to account for higher prices in the more northerly communities. For example, the replacement value of waterfowl in 1990 was $8.14 per kg of edible weight in Moose Factory, but $11.40 in Peawanuck because of higher store prices (Berkes et al., 1992). Table 8 shows the results of the replacement value calculations by community and by species group. The replacement value of the bush food harvested in the region was about $7.8 million per year, in 1990 prices.

The land also provides berries, fuelwood and fur. Berry harvests were seasonally significant, although they had declined over the years. Cummins (1992) estimated that some 39% of Attawapiskat's households participated in berry-gathering, and the projected community total was some 300 gallons per year. At 8 pints per gallon and a conservative average price of $4 per pint of berries at the store, the imputed value based on a proportional projection of the Attawapiskat figure (the only estimate available) was $56 600 for the region as a whole.

The fuelwood harvest estimate was based on the number of households in the region and their fuelwood needs per household, taking into account that about half of the aboriginal households in Moosonee and Moose Factory and all of those in New Post had electrical heating, and that the newer houses in Moose Factory, Moosonee and Peawanuck were better insulated and about one-quarter more fuel efficient than the others. The annual fuelwood harvest of the region was estimated to be 16 000 face cords (Berkes et al., 1992). At $60 per face cord replacement value, the annual value of fuelwood was nearly $1 million in the region (Table 9).

The market value of fur was determined from the projected harvest (Table 2) and average prices at the Fur Harvesters Auction, April 1991 (and not from the actual sale). The total value of fur was about $538 000 in 1990. This estimate excludes polar bear, the harvest of which is controversial.

Table 9 summarizes the total economic value of the traditional economy including meat, fuelwood, berries and fur ($9 400 000). The average per capita value to the resident aboriginal population of the region was $1450, and the average per household value $8400.

TABLE 9. Summary of the value of the traditional economy in the region in 1990.

Meat	replacement value	$ 7 846 000
Fuelwood	replacement value	$ 956 000
Berries	replacement value	$ 57 000
Fur	estimated market value	$ 538 000
Total		$ 9 398 000
Value per capita (pop. 6470)		$ 1 450
Value per household (1116)		$ 8 400

MULTIPLE VALUES OF THE TRADITIONAL ECONOMY

The traditional economy provides meat, berries, fuelwood and income from fur. It also provides raw materials for handicrafts and for bush equipment such as snowshoes, building materials for bush camps, and medicinal plants; none of these were considered in the present study. The activities of procuring these materials are a source of cultural value and social well-being, which are more difficult to quantify than harvests. This section discusses the traditional economy in the context of the overall economy, the nutritional importance of bush food, and its social and cultural importance.

The average household income in the Mushkegowuk Region in 1990–91 was estimated to include some $10 000 in wage income (formal employment), $13 000 in income support (including transfer payments), and $2500 "other," for a total of $25 500. These figures are based on community and regional economic data, and are rough estimates (Farley, 1992). The imputed value of $8400 for the traditional economy was equal to 33% of this figure. If cash income and income-in-kind can be added, and some argue that they cannot (F. Hill, pers. comm., 1994), the traditional economy is 25% of the average total household income of $33 900.

The importance of traditional land-based activities is not fully accounted for by its in-kind values and percent contribution to the regional economy. Country food is crucially important for nutritional well-being, especially because it is a source of protein. The protein value of the Mushkegowuk harvest was 97 g per adult-equivalent per day, which is double the Nutrition Canada minimum adequate standard of 49 g protein per day for a 70 kg adult. It is only slightly lower than the value for the Eastern James Bay area, which was 114 g in 1976 (Berkes and Farkas, 1978). If fully used and equitably distributed, the bush harvest was enough to provide the protein needs of the entire Mushkegowuk region aboriginal population at the 1990 population levels.

The social and cultural value of country food consumption, according to the Omushkego Cree, are also very high. Aboriginal identity is partly defined in terms of access to and consumption of bush food. As Table 10 shows, more than 50% of the respondents (381 in winter and 405 in summer, out of 715) consumed bush food two to three times per week or more often. Less than 20% (140 in winter and 119 in summer) reported eating bush food less than once a week.

Wildlife harvesting is centrally important for core cultural values, such as sharing; this is true in the Mushkegowuk region, as it is elsewhere in aboriginal communities (Freeman, 1993). Sharing assures the equitable distribution of products of the land. The distribution of subsistence harvests to relations and neighbours remains a widespread practice in the Mushkegowuk region. About 50% of all respondents shared their food with three or more other families, but there were major differences among communities (Table 11). Sharing with more than six families was common in Moose Factory and in Attawapiskat (Cummins, 1992). Low rates of sharing were found in Fort Albany and Moosonee, in the former community likely because of relatively low rates of harvesting activity, and in the latter because most aboriginal residents had come from other James Bay communities and did not live in extended families.

THE MUSHKEGOWUK STUDY IN CONTEXT

The Cree communities of the Mushkegowuk region are not usually considered, by themselves or by others, as very active in terms of subsistence activities. Our findings challenge this impression. The traditional sector appears to be strong on the basis of several key indicators: wildlife harvesting effort, participation rates, magnitude of the harvest, frequency of bush food

TABLE 10. Frequency of bush food consumption (no. of respondents) per week.

	Winter					Summer				
Communities	Not every week	Once a week	2 or 3 times a week	3 to 5 times a week	Every day	Not every week	Once a week	2 or 3 times a week	3 to 5 times a week	Every day
Moose Factory	66	73	50	20	26	68	69	55	22	21
Moosonee	17	37	63	12	8	14	28	71	16	8
New Post	2	1	4	4	2	3	0	5	4	1
Fort Albany	49	28	11	2	0	30	39	20	1	0
Kashechewan	2	48	32	27	59	1	48	31	29	59
Peawanuck	2	3	15	12	12	2	3	16	12	11
Fort Severn	2	4	9	8	5	1	3	11	7	6
Total	140	194	184	85	112	119	190	209	91	106

TABLE 11. Frequency of sharing bush food (no. of respondents).

Communities	Number of families sharing respondents' harvest							
	0	1	2	3	4	5	6	>6
Moose Factory	19	26	29	42	33	30	11	45
Moosonee	6	45	24	17	12	12	8	13
New Post	2	1	1	1	0	0	3	5
Fort Albany	49	8	24	4	2	1	0	2
Kashechewan	5	15	26	43	45	12	15	7
Peawanuck	4	6	6	7	5	9	3	4
Fort Severn	1	2	7	8	5	2	0	4
Total	86	103	117	122	102	66	40	80

consumption, the degree of sharing, the replacement value of the harvest, and contribution of the traditional sector to the overall regional economy. A few of these indicators can be evaluated against findings from other studies in the Canadian North, including one earlier investigation from the same region.

Overall results of the present study are comparable to the findings of Thompson and Hutchison's (1989) one-year recall study conducted over 1981–83, but suggest major shifts over the decade in the direction of the harvesting effort and catches. Compared to the earlier study, the present study found less harvesting effort per hunter for fur animals and waterfowl, but more for big game and small game. The present study found a lower participation rate for waterfowl hunting, 80% vs. 90% in Thompson and Hutchison (1989). A total of about 111 000 geese were taken by an aboriginal population of 6470 in the present study, compared to 106 000 (in 1981–82) and 92 000 (in 1982–83) taken by a population of 4700 (Indian status only) in Thompson and Hutchison (1989). For moose hunting, small game hunting and fishing, the participation rate in the present study was nearly double that of the earlier study; it was lower for trapping, presumably reflecting the deterioration of the fur market over the decade.

Converting Thompson and Hutchison's (1989) data, plus fur return numbers for beaver and muskrat, to potential edible weights using the same conversions as in the present study, a per capita value of 78 kg/yr (1981–83) is obtained. This is likely to be an underestimate because their survey excluded commercial fish; in 1990, all fish that were harvested in commercial nets were consumed locally. As well, the harvest of Fort Severn, which produced the highest per capita catch in the present study, was projected in their study from the catch of neighbouring Peawanuck. On the basis of information from community experts, there is no reason to assume that the actual yearly per capita harvests in the region were lower in 1981–83 than in 1990.

The potential edible weight of 106 kg/yr per capita in the present study may be compared to several other values in the literature. Gamble (1987) estimated a harvest of 895 298 kg of wild food in 1984–85 for 3999 native people (Inuit) in the Keewatin region, N.W.T., for a per capita value of 224 kg/yr. For the Northern Quebec Inuit, a harvest of 1 100 179 kg was estimated for a population of 3857, giving a per capita value of 285 kg/yr (NHR, 1988). For the James Bay Cree, NHR (1982) estimated 809 181 kg for 7022 people in 1978–79, for a per capita value of 115 kg/yr. Wagner's (1985) data for six non-agricultural communities (pop. 6808 in 1983–84) in Northern Manitoba, recalculated for harvested (rather than consumed) weights (355 529 kg), indicate a per capita value of 52 kg/yr. Thus, the overall results of the present study paint the picture of a subsistence economy which is less productive than in the Inuit areas in the Northwest Territories and Quebec, comparable to the Eastern James Bay Cree in Quebec, and more productive than the Cree and Ojibwa communities of Northern Manitoba.

This study estimates income-in-kind from bush meat in the Mushkegowuk region at $7030 per household (Table 9). This figure can be compared to other estimates in the literature. Quigley and McBride (1987) provided an estimate of $36 930 (1984) per household, three-quarters of which came from ringed seal meat. (This estimate was considered by the community as too high [L. Arragutainaq, pers. comm., 1993]). Usher (1989) estimated that the average Northwest Territories household head brought in fish and meat with an imputed value of $10 000 to $15 000 per year, consistent with Gamble's (1987) findings of about $11 000 to $12 000 (1981–85) per household in the Keewatin region. Scott (1982) estimated about $3500 (1975–77) per household in Wemindji, Quebec, based on the data of NHR (1982). For Northern Manitoba, the comparable regional estimate (1983–84) was $1167 per household (Wagner, 1985).

A number of studies also included data on both the traditional and the non-traditional economies, including transfer payments. As compared to the present study area (where it represents 25% of the total economy), the traditional economy was 58% of the total economy in Sanikiluaq in 1984–85 (Quigley and McBride, 1987); 35% in Pinehouse in 1983–84, half of this from commercial fisheries (Tobias and Kay, 1994); 27% in Waswanipi in 1982 (Feit, 1991); 22% in the Eastern James Bay region in 1981 (Salisbury, 1986); and 11%, excluding land-based commodities, in Northern Manitoba in 1985 (NMEDC, 1992).

The above numbers may be considered indicative of the quantitative significance of the traditional economy in parts of the Canadian North, and a context for interpreting the findings of the present study, but they should be treated with caution. All of them, like the present study, are based largely on questionnaire studies and are subject to the various limitations of such studies (Usher and Wenzel, 1987). Despite these limitations, however, a number of conclusions can be drawn from the present study regarding cultural, economic and ecological sustainability. The traditional economy of the First Nations of the Mushkegowuk region appears to have remained alive and quantitatively significant. The value represented by bush harvests, $9.4 million for the region and $8400 per household per year, is in the order of one-third as large as the entire cash economy, easily exceeding the income from any other single source.

SUBSISTENCE ECONOMY AND CULTURAL SUSTAINABILITY

These findings are significant for sustainable development planning, but conventional economic approaches lack the ability to deal adequately with subsistence. Much of the value of the

traditional economy is "invisible" to conventional economic analysis. Hunting brings food to the table but very little cash. Since the products of hunting do not pass through the market, government statistics for Northern Ontario do not place any value on subsistence, and hunters are technically defined as "unemployed." It is also important to consider that harvesting has costs: capital and operating costs and perhaps also opportunity costs. However, there appears to be no agreement on the applicability of methodology for assessing the costs of subsistence harvesting. Costs of equipment such as snowmobiles and motor-canoes cannot simply be attributed to harvesting and subtracted from income-in-kind to produce a "net value." For example, the neighbouring communities of Fort Albany (pop. 625) and Kashechewan (pop. 1000) had a six-fold difference in the 1990 harvesting effort (Table 3) and a seven-fold difference in the actual harvest (Table 7). However, percentages of equipment ownership by heads of households in the two communities were almost identical, 86% to 85% (Berkes et al., 1992).

Conventional economic planning is also limited in its ability to deal with social and cultural well-being, even though this issue is integral to a comprehensive view of sustainable development in the study area and the North generally. As Freeman (pers. comm., 1994) has stated, "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."

At the core of the traditional northern perspective of the world is a practical and congenial system of ethics. Hunting ethics focus on the right conduct of relationships among people and between people and animals. Hunting, therefore, involves a great deal more than the material aspect of life; subsistence embodies cultural perspectives of relationships to places, people and animals.

Culture consists of a mental map or storehouse of knowledge for a people to guide their relationships and activities within their environment. Cree culture is based on land and hunting tradition (Honigmann, 1961; Preston, 1986). Among Algonquian peoples in general, knowledge is based on tacit understanding that people or families have a store of information, including ecological information, that is based on their life experiences and the life experiences of their ancestors who lived on the same land. "It is important to teach trapping and land skills, and the deep understanding that their ancestors' very lives depended on this" (speaker at Omushkegowuk Harvesters Association Annual Assembly, Attawapiskat, August 1990). Families have micro-cultural traditions based on their territories. Other families, having partially similar lands and life experiences, have similar but somewhat different micro-cultural traditions (Preston, 1982). A dominant theme in eastern Cree culture is that cultural unity is maintained not only by linguistic and ecological uniformity, but also by a distinctive kind of individualism based on life experiences and local knowledge of land and animals (Preston, 1975).

Much of the conceptual culture of the Cree is "unconsciously known and embodied in action" (Preston, 1975:262). It follows, therefore, that the loss of subsistence or hunting practice deprives the Cree of the experience with which culture can be transmitted. Among the Cree, as with many indigenous groups, the young learn by doing. Cree culture taught on the land includes not only bush skills, but also ethics and values such as the importance of sharing and reciprocity. Thus, it is of great importance to many Cree to revitalize the traditional Cree ethical perspective of the world, and to revitalize the morality of hunting. The morality of hunting may be found in the very direct relations between the hunter's activities and the goal of living well. "A trapper does not go out just to make the animals suffer, but to make the animals his own, for fur and for food, for his family" (speaker at Omushkegowuk Harvesters Association Annual Assembly, Attawapiskat, August 1990).

Integral to a comprehensive view of sustainable development is the concept of culturally sustainable development. We define this here as development that meets the material needs of the present without compromising the ability of future generations to retain their cultural identity, social relationships and values, and to allow for change to be guided in ways that are consistent with existing cultural principles of a people.

Measuring cultural sustainability will not be easy. Quantifying cultural attributes tends to trivialize them, and there seem to be no socioeconomic or other yardsticks that make sense to the Cree themselves. Some of the costs of cultural non-sustainability can perhaps be measured indirectly, by calculating the social costs (social service caseloads, welfare and medical costs) of social pathology of collapsed northern subsistence economies. Such a methodology, however, would fall short of valuing the positive attributes of cultural sustainability.

ECOLOGICAL AND ECONOMIC SUSTAINABILITY

For comprehensive regional economic planning, cultural sustainability, ecological sustainability, and economic sustainability need to be considered together. The central defining characteristic of community economic viability is the sustainability of the resource base; in practical terms, this means keeping the stock of "natural capital" intact (Daly and Cobb, 1989; Jansson et al., 1994). The animal populations used in the hunting economy need to be conserved in such a way that the harvest does not exceed biological production. Natural capital also includes the goods and services provided by the biophysical environment (Jansson et al., 1994), for example, clean water, reliable river transportation, and replenishment of riverine productivity by the annual spring flood.

In the Mushkegowuk region, as perhaps elsewhere in the North, the major produce of the land is wildlife and fish protein. Biologically as well as culturally, it makes sense to utilize this renewable resource base. Aboriginal people have done this for millenia, and Cree hunting ethics include the notion that the "right conduct of hunting" increases the productivity of animal populations. With increasing development impacts and increasing population pressures, it may become more and more difficult to use animal resources within their rates of renewability. However, in the study region in 1990, there was no evidence that the rate of harvesting exceeded the rate of biological productiv-

ity. There is no evidence of extinctions from the area in the historical record, and no major wildlife populations are presently in danger (OMNR, 1985). Some wildlife subpopulations, such as Canada geese nesting on Akimiski Island, have declined (OMNR, Moosonee Region, pers. comm. 1991, 1992). But other populations, such as the lesser snow geese nesting in the area of Cape Henrietta Maria, have increased in recent decades (Prevett et al., 1983) despite continuing Cree harvests.

The Omushkegowuk Cree are concerned with enhancing the economic viability of their communities within a framework of social and cultural continuity. Economic activities and institutions that minimize the threat of dislocation to the traditional way of life or, better still, those which offer ways of increasing the complementarity of wage-income generation and traditional economic pursuits, are considered ideal. A common theme is to reduce external economic dependence, and to base growth to the extent possible on local markets and the use of local resources. It is notable in this regard that in 1991– 92, the Omushkego Cree very strongly rejected the Moose River basin hydroelectric development proposed by Ontario Hydro, with its promises of employment benefits and greater economic integration with the South.

Economic viability based on local resources and production for local and regional markets will not come easily. Expanding the economic base of Cree communities with due regard to Cree social and cultural priorities will undoubtedly require continued infusion of transfer funds in the foreseeable future. An emphasis on small-scale enterprises, compatible with living resources use and subsistence activities, will be one important component of the development strategy. Eco-tourism and outfitting are good examples of market opportunities. The continuing contribution of traditional harvesting activities to the stability of community income and employment is another developmental objective.

Integration with the economy of the South, and the replacement of the traditional sector by wage economy, as foreseen in the conventional view of development (e.g., Boldt, 1993: 228, 259), is not considered by the Cree as either feasible or desirable. Development tied to non-renewable resources (such as mining) runs the risk of dependency; development tied to large-scale development (such as dams) runs the risk of natural capital loss. However, development based on renewable resources alone risks a low-income equilibrium (George and Preston, 1992). The economy of the region already has major components of wage income and transfer payments. Our results support the alternative development view of Berger (1977), Wolfe and Walker (1987), Usher (1989) and others in favour of a mixed economy. We see a mixed economy not as a transition stage to the ideal of a wage economy, but as an arrangement which may persist in a culturally and environmentally sustainable manner. Thus, a viable development strategy for the region could involve conserving and utilizing renewable, land-based resources while investigating resource-based industries and local services. Such a strategy would protect the traditional economy, which our study identifies as a vital and culturally essential sector, as the cornerstone of a mixed economy towards sustainable development.

ACKNOWLEDGEMENTS

We thank M.M.R. Freeman (U. Alberta), F. Hill (DIAND), L. Arragutainaq (Sanikiluaq), and three anonymous referees for their comments. In carrying out the study, we gratefully acknowledge the cooperation of the First Nations of the Mushkegowuk Council and Omushkegowuk Harvesters Association. We thank L. Bird, C. Matthews, M. Solomon, G. Sutherland, M. Sutherland, R. Turtle and P. Wesley for administering the interviews; M. Weiler for help with the questionnaire; D. Flack, J. Chernishenko and M. McDermott for data analysis; A. Haugh for tabulation; and H. Fast for computing data from other studies used in comparisons. A version of this paper was presented by P. George at the 28th Annual Meeting of the Canadian Economics Association (June 1994, Calgary). The project was supported by the Social Sciences and Humanities Research Council of Canada (SSHRC) research grant to Preston, George and Berkes, the principal investigators of TASO.

REFERENCES

BERGER, T.R. 1977. Northern frontier, northern homeland. Vol. II. Ottawa: Supply and Services Canada.

BERKES, F. 1983. Quantifying the harvest of native subsistence fisheries. In: Wein, R.W., Riewe, R.R., and Methven, L.R., eds. Resources and dynamics of the boreal zone. Ottawa: Association of Canadian Universities for Northern Studies. 346–363.

———. 1990. Native subsistence fisheries: A synthesis of harvest studies in Canada. Arctic 43:35–42.

BERKES, F., and FARKAS, C. 1978. Eastern James Bay Cree Indians: Changing patterns of wild food use and nutrition. Ecology of Food and Nutrition 7:155–172.

BERKES, F., GEORGE, P., and PRESTON, R.J. 1991. Co-management. Alternatives 18(2):12–18.

BERKES, F., GEORGE, P., PRESTON, R., TURNER, J., HUGHES, A., CUMMINS, B., and HAUGH, A. 1992. Wildlife harvests in the Mushkegowuk region. TASO Report, Second Series, No. 6. 68 p. Available from TASO, McMaster University, Hamilton, Ontario L8S 4M4, Canada.

BOLDT, M. 1993. Surviving as Indians. The challenge of self-government. Toronto: University of Toronto Press.

CUMMINS, B.D. 1992. Attawapiskat Cree land tenure and use. Ph.D. dissertation, McMaster University, Hamilton, Ontario.

DALY, H.E., and COBB, J.B., Jr. 1989. For the common good: Redirecting the economy toward community, the environment, and a sustainable future. Boston: Beacon Press.

FARLEY, R.M. 1992. The Mushkegowuk economy. 1992 Summary Report. Moose Factory: Mushkegowuk Council. 29 p. Available from Mushkegowuk Council, P.O. Box 370, Moose Factory, Ontario P0L 1W0, Canada.

FEIT, H.A. 1991. Gifts of the land: Hunting territories, guaranteed incomes and the construction of social relations in James Bay Cree society. In: Peterson, N. and Matsuyama, T., eds. Cash, commoditisation and changing foragers. Osaka: Senri Ethnological Studies 30: 223–268.

FLANNERY, R., and CHAMBERS, M.E. 1986. John M. Cooper's investigation of James Bay family hunting grounds, 1927–1934. Anthropologica NS 28:108–144.

FREEMAN, M.M.R. 1993. The International Whaling Commission, small-type whaling, and coming to terms with subsistence. Human Organization 52: 243–251.

GAMBLE, R.L. 1987. Native harvest of wildlife in the Keewatin region, Northwest Territories, for the period October 1984 to September 1985. Canadian Technical Report of Fisheries and Aquatic Sciences No. 1544. 59 p.

GEORGE, P. 1989. Native peoples and community economic development in northern Ontario. British Journal of Canadian Studies 4:58–73.

GEORGE, P., and PRESTON, R.J. 1987. "Going in between": The impact of European technology on the work patterns of the West Main Cree of northern Ontario. Journal of Economic History 47:447–460.

GEORGE, P., and PRESTON, R.J. 1992. The TASO research program: Retrospect and prospect. Anthropologica 34:51–70.

GEORGE, P., BERKES, F., and PRESTON, R.J. In press. Aboriginal harvesting in the Moose River basin: A historical and contemporary analysis. Canadian Review of Sociology and Anthropology.

HONIGMANN, J.J. 1961. Foodways in a muskeg community. An anthropological report on the Attawapiskat Indians. Ottawa: Department of Northern Affairs and Natural Resources. 214 p.

———. 1981. West Main Cree. In: Helm, J., ed. Subarctic, Handbook of North American Indians, vol. 6. Washington, D.C.: Smithsonian Institution. 217–230.

HOPPER, M., and POWER, G. 1991. The fisheries of an Ojibwa community in Northern Ontario. Arctic 44:267–274.

HUGHES, A., BERKES, F., GEORGE, P., PRESTON, R., TURNER, J., CHERNISHENKO, J., and CUMMINS, B. 1993. Mapping wildlife harvest areas in the Mushkegowuk region. TASO Report, Second Series, No. 10. 33 p. + 43 maps. Available from TASO, McMaster University, Hamilton, Ontario L8S 4M4, Canada.

JANSSON, A.M., HAMMER, M., FOLKE, C., and COSTANZA, R., eds. 1994. Investing in natural capital. The ecological economics approach to sustainability. Washington, D.C.: Island Press.

NATIVE HARVESTING RESEARCH (NHR). 1982. The wealth of the land. Wildlife harvests by the James Bay Cree 1972–73 to 1978–79. Quebec: James Bay and Northern Quebec Native Harvesting Research Committee. 811 p.

———. 1988. Final report. Research to establish present levels of harvesting for the Inuit of Northern Quebec 1976–1980. Quebec: James Bay and Northern Quebec Native Harvesting Research Committee. 170 p.

NORTHERN MANITOBA ECONOMIC DEVELOPMENT COMMISSION (NMEDC). 1992. Northern Manitoba: A benchmark report. Winnipeg: NMEDC. 88 p.

ONTARIO MINISTRY OF NATURAL RESOURCES (OMNR). 1985. Moosonee District background information. Toronto: OMNR. 167 p.

PRESTON, R.J. 1975. Cree narrative: Expressing the personal meanings of events. Mercury Series, Canadian Ethnology Service Papers, No. 30. Ottawa: National Museum of Man. 308 p.

———. 1982. Towards a general statement on the Eastern Cree structures of knowledge. Proceedings of the 13th Conference on Algonquian Studies. 299–306.

———. 1986. Twentieth century transformations of the west coast Cree. Actes du Dix-Septième Congrès des Algonquinistes. 239–251.

PREVETT, J.P., LUMSDEN, H.G., and JOHNSON, F.C. 1983. Waterfowl kill by Cree hunters of the Hudson Bay Lowland, Ontario. Arctic 36:185–192.

QUIGLEY, N.C., and McBRIDE, N.J. 1987. The structure of an arctic microeconomy: The traditional sector in community economic development. Arctic 40:204–210.

SALISBURY, R.F. 1986. A homeland for the Cree: Regional development in James Bay 1971–1981. Kingston and Montreal: McGill-Queen's University Press. 172 p.

SCOTT, C.H. 1982. Production and exchange among Wemindji Cree: Egalitarian ideology and economic base. Culture 2(3):51–64.

THOMPSON, J.E., and HUTCHISON, W.A. 1989. Resource use by Native and non-Native hunters of the Ontario Hudson Bay lowland. Toronto: Ontario Ministry of Natural Resources. 150 p.

TOBIAS, T. 1993. Stereotyped village economies and the Pinehouse harvest research. In: Inglis, J.T., ed. Traditional ecological knowledge: Concepts and cases. Ottawa: Canadian Museum of Nature/International Development Research Centre. 87–98.

TOBIAS, T., and KAY, J.J. 1994. The bush harvest in Pinehouse, Saskatchewan, Canada. Arctic 47:207–221.

USHER, P.J. 1976. The evaluation of country food in the northern native economy. Arctic 29:105–120.

———. 1989. Towards a strategy for supporting the domestic economy of the Northwest Territories. Yellowknife: Background study prepared for the NWT Legislative Assembly's Special Committee on the Northern Economy. 66 p.

USHER, P.J., and WENZEL, G. 1987. Native harvest surveys and statistics: A critique of their construction and use. Arctic 40: 145–160.

WAGNER, M.W. 1985. TARR Centre domestic harvesting survey. Winnipeg: Treaty and Aboriginal Rights Research Centre. 113 p. Available from TARR Centre, 300–153 Lombard Avenue, Winnipeg, Manitoba R3B 0T4, Canada.

WOLFE, R.J., and WALKER, R.J. 1987. Subsistence economies in Alaska: Productivity, geography and development impacts. Arctic Anthropology 24:56–81.