

## **8. SUBSISTENCE FISHERIES**

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### **8.1 Introduction**

Just as the physical and biological boundaries of the Alaska/Bering Sea region are merely constructs of convenience, the core of the region is inextricably linked to the world through social, cultural, and economic ties. The region produces nearly one-fifth of the world's fish and shellfish products, products that are largely harvested by distant-water fleets and marketed in North America, Japan, and Europe. Western and Interior Alaska, the Aleutian and Commander Islands, and Kamchatka and Russia's Bering Sea coast are, with the exception of a few pockets, among the least industrialized regions in the world. Consequently, the non-consumptive uses of the region's resource endowment and the continuation of the region's traditional cultures have international value.

### **8.2 Community Structure**

The 56 communities that border the Eastern Bering Sea are each unique and will be uniquely affected by climate induced changes to the ocean system (Table 8.1). Four of the communities (Kotzebue, Nome, Dillingham, and Unalaska) are regional hubs with populations over 2,000. The remaining communities all have populations of less than 1,000. Forty-two of the communities, including Kotzebue, are overwhelmingly (>70%) Native. Four of the communities are predominantly (>70%) non-Native. In addition to demographic differences, the communities differ in economic opportunity. Median family income varies from a low of \$11,339 in Savoonga to a high of \$66,548 in Chignik Lagoon. Some communities do not participate in commercial fishing. In other communities, commercial fishing provides millions of dollars in annual revenues to local residents and hundreds of millions in revenues to non-residents. The commercial fishery may be largely dependent on a single species of salmon or herring or may target a diversity of species. While subsistence fishing and hunting play important roles in each of the communities, the choice of target species varies considerably between the communities.

In addition to communities that directly border the Bering Sea, many other communities are linked to the region. Interior Alaska and Yukon Territory, Canada are linked to the region through kinship, trade, employment, and reliance on salmon. Residents of Kodiak, South-Central Alaska, Southeast Alaska, Washington, and Oregon are linked to the region by their participation in commercial fisheries. Each of these regions will be affected by changes to the region's ocean system.

Over the next few pages, we attempt to provide an illustration of the type of baseline analysis that will be required for an assessment of the human impacts of changes in the region's ocean system. We have restricted our description to the Northwest Arctic Borough. Sources that could be tapped for additional baseline information include: Braund et al. 1989; Impact Assessment Inc. 1990a,b, 1994; Knapp 1990a,b; Northern Economics et al. 1990; NPFMC 1994a-i; and Waring et al. 1992a-c.

## Implications of Global Change in Alaska and the Bering Sea Region

Table 8.1. Demographics and commercial fishing activity of BESIS region communities.

Population	(1990 Census)	Ethnic Diversity	% Native	Median Family Income	Value of Recent Commercial Catches
Western Alaska	Kotzebue	2,751	75.1	44,632	426,830
	Shishmaref	456	94.5	14,875	
	Diomede	178		14,375	
	Wales	79	88.8	19,063	
	Brevig Mission	198	92.4	18,333	
	Teller	151	86.8	16,750	
	Nome	3,500	52.1	49,491	130,408
	Golovin	127	92.9	17,500	32,537
	Elim	264	91.7	17,083	49,863
	Koyuk	231	94.8	18,750	1,956
	Shaktoolik	178	94.4	22,500	300,351
	Unalakleet	714	81.8	40,347	819,838
	Gambell	548		15,938	
	Savoonga	514		11,339	
	Stebbins	442	94.8	23,333	134,627
	St Michael	295	91.2	24,028	44,774
	Kotlik	461	97.0	22,083	814,345
	Emmonak	642	92.1	26,406	1,456,480
	Alakanuk	544	95.8	23,250	996,934
	Sheldon Pt.	109	92.7	19,375	243,365
	Scammon Bay	343	96.6	15,750	1,065,506
	Hooper Bay	845	96.0	18,125	77,085
	Newtok	207	93.2	15,000	186,911
	Tununak	316	96.2	22,708	18,519
	Mekoryuk	177	99.4	16,250	6,669
	Toksook Bay	420	95.5	23,125	692,017
	Nightmute	153	95.4	17,813	202,501
	Kwigillingok	278	95.0	15,000	131,567
	Quinhagak	501	93.8	17,969	739,849
	Goodnews Bay	241	95.9	13,958	359,298
	Platinum	64	92.2	16,250	110,748
	Togiak	613	87.3	15,781	355,494
	Dillingham	2,017	55.8	47,857	577,698
Clarks Point	60	88.3	26,042	516,183	
Naknek	575	41.0	56,195	318,373	
King Salmon	696	15.5	62,152	1,210,113	
Pribilof Islands	St. Paul	763	66.1	48,000	257,597
	St. George	138	94.9	26,000	77,061
Aleutian Islands	Akutan	589	13.6	31,875	32,529
	Atka	73	67.0	24,583	5,694
	Nikolski	35	82.9	17,250	
	Unalaska	3,089	8.4	61,927	6,182,037
	False Pass				1,252,110
	Cold Bay	148	5.4	51,539	314,283
	King Cove	451	39.2	63,419	13,547,542
	Sand Point	878	32.2	43,125	19,893,356
	Nelson Lagoon	83	80.7	51,254	3,556,800
	Ivanof Bay	35	94.3	21,500	
	Perryville	108	94.4	28,750	813,151
	Chignik	188	45.2	36,250	2,582,662
	Chignik Lake	122			535,304
Chignik Lagoon	53	56.6	66,548	3,921,284	
Port Heiden	119	72.3	16,875	395,789	
Pilot Point	27	84.9	39,250	27,803	

***Subsistence***

The harvest of wild foods plays a significant role in the diet of Alaska’s rural residents. Subsistence resources provide a major portion of the diet, especially in small communities where transportation costs make the purchase of store bought foods prohibitive. However, subsistence resources and the activities associated with the harvest of these resources provide more than food. Participation in family and community subsistence activities, whether it be clamming, processing fish at a fish camp, or seal hunting with a father or brother provide the most basic memories and values in an individual’s life. These activities define and establish the sense of family and community. These activities teach how a resource can be identified, methods of harvest, efficient and non-wasteful processing of the resource, and preparation of the resource as a variety of food items. The distribution of subsistence harvests establishes and promotes the most basic ethical values in Native and rural culture—generosity, respect for the knowledge and guidance of elders, self-esteem for the successful harvest of a resource, and family and public appreciation in the distribution of the harvest. No other set of activities provides a similar moral foundation for continuity between generations.

Climate change that may restrict access to subsistence resources, whether through changes in abundance or availability, will have profound implications for the cultural fabric of rural Alaska. Culture is learned; failure to transmit the knowledge and experience of subsistence activities between generations results in the loss of a cultural repertoire even should the resource again become available twenty years later. The preservation of subsistence as a valued cultural activity depends on the transmission of cultural information. Restoration of the resource will not automatically restore the behaviors and values associated with the harvest of that resource. For example, the current presence of buffalo on the great plains has in no way restored the profound constellation of behaviors, ethics, values, and beliefs associated with this resource in Cheyenne culture.

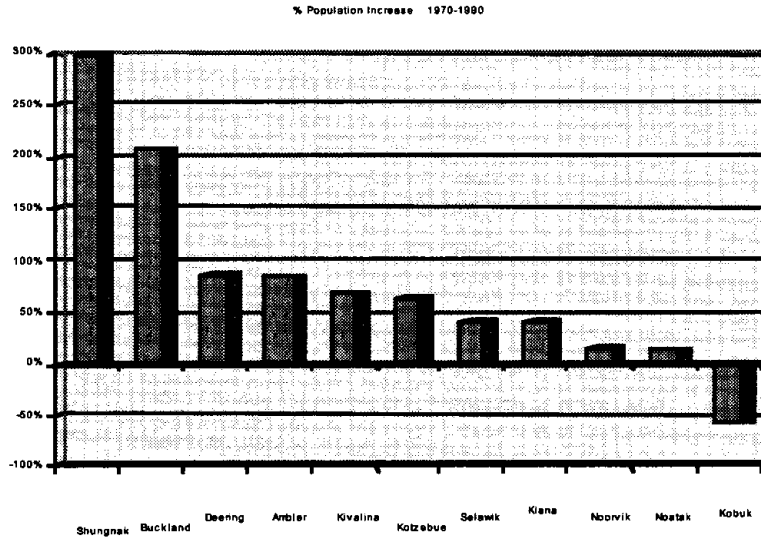
***Northwest Arctic Borough***

About 6,400 people live in the Northwest Arctic Borough, with about 85% of this total being Alaska Native, primarily Inupiat.

1996 Population Estimates (DOL)	
Ambler	298
Buckland	416
Deering	141
Kiana	394
Kivalina	349
Kobuk	78
Kotzebue	2,821
Noatak	413
Noorvik	575
Selawik	665
Shungnak	249
<b>Total</b>	<b>6,399</b>

Kotzebue, a hub that provides centralized transportation, commercial, and administrative services, is the largest community in the region. Regional demographic trends for the region during the period 1970 to 1990 indicate a substantial growth rate for the majority of communities.

Northwest Arctic Borough Communities Percent Population Growth 1970-1990.



Most of this growth is a product of natural increase, rather than migration. The one exception to this is the community of Kobuk, the smallest community in the region, which has a net loss of population during the last two decades. Very small communities often have difficulty sustaining their populations. In some cases, environmental factors such as erosion (by ocean or river) lead to the abandonment of a community. Other factors such as poor community infrastructure, especially the lack of running water, can also be major factors.

Half of the employment in the region is government-related (DCRA), with Maniilaq Association, the regional Native non-profit, being a major employer. The region's major private sector employer is the Red Dog Mine with about 15% of the region's employment but contributing about 30% of the region's payroll. Red Dog Mine extracts lead, silver, and zinc and produces about 6% of the world's lead ore.

In its January 1996 overview, the DCRA's Research & Analysis Section notes that:

- ◆ Commercial fishing of chum salmon and trout, and fish processing at Kotzebue Sound Area Fisheries, provide some seasonal employment. One hundred and eighty-one area residents hold commercial fishing permits.

In outlying communities, cash employment is limited to the schools, clinics, local government, Maniilaq Association and some small retail stores.... Seasonal employment occurs with fire fighting, construction, barge operations, and fish processing in Kotzebue. An expanding Native crafts industry produces birch baskets, jade, ivory and caribou hoof carvings, fur pelts, masks, mukluks, parkas, hats, and mittens for sale throughout the state.

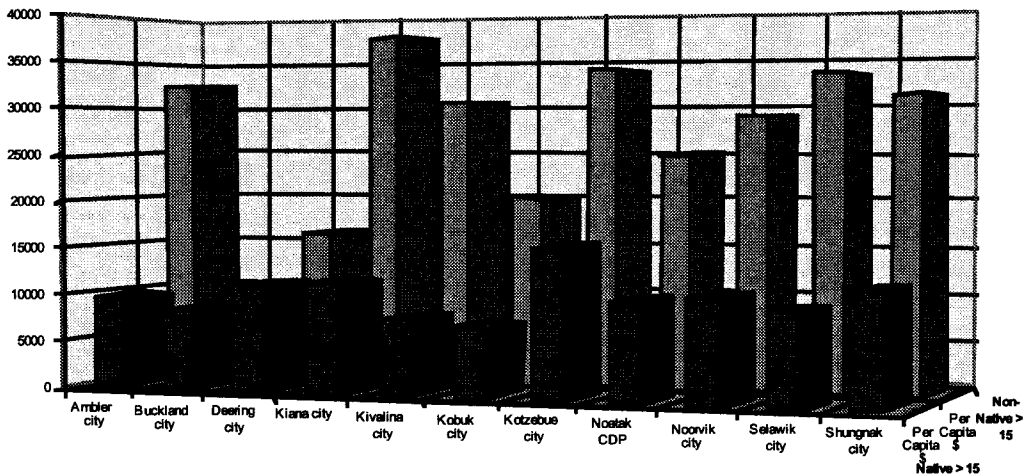
Reindeer herds are managed near Buckland and Deering providing some employment during harvesting. Often workers are paid in meat. **Most residents rely extensively on subsistence foods.** (emphasis added)

In 1994 the Northwest Arctic census region had about 16% of its workforce unemployed. This was the highest rate in the state and about triple the national (and Anchorage's) rate. Most significantly, 42% of the adults surveyed in the 1990 decennial U.S. Census were not in the workforce. This is double the rate for a typical community in the U.S. The dynamics of these differences are also crucial. Excluding urban inner cities, most adults are not in the workforce because of child raising responsibilities or because of physical disabilities limiting their participation. In contrast discouraged workers, those that have sought employment to no avail, contribute to the high proportion in this region.

The returns from wage employment are also skewed with respect to ethnicity. Non-Native individuals over the age of fifteen are almost all wage earners and tend to have come to the community because of available specialized employment opportunities. Non-Native adults tend to be professional or highly skilled and educated workers that have relocated to take advantage of the high salary structures created to attract skilled workers (e.g., high school teachers) to this difficult environment (with respect to climate and available amenities). These workers tend to emigrate from the region when their jobs are eliminated. In contrast, Native adults (>15 years of age) have few employment opportunities within the community. The high proportion of Native unemployed and discouraged workers bring their average per capita incomes down considerably. As indicated below, the average Native adult earns about one third of the income of his non-Native counterpart. It must be noted, however, that the average full time employed Native adult would have a per capita income much closer to that of non-Native adults.

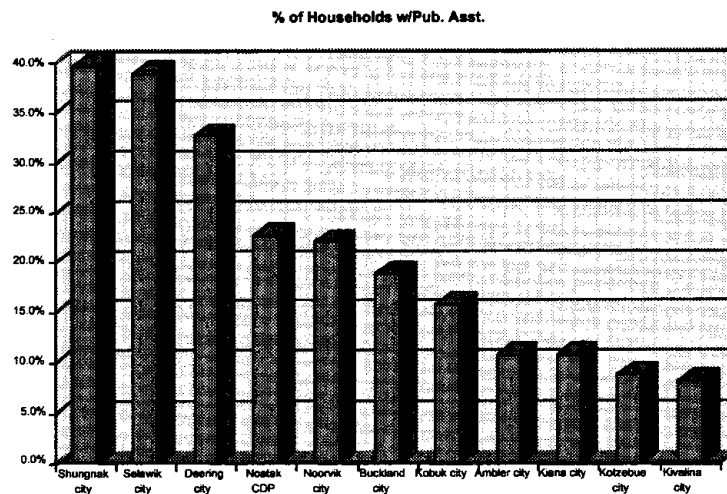
### NANA Region Per Capita Wage Income

NANA Region Per Capita Wage Income Native vs. Non-Natives > 15 yrs of Age.



Complementary to the lack of employment opportunities in the region is a high dependence on public assistance. Public assistance include a multitude of programs ranging from old age survivor's insurance, unemployment, supplemental security income (for individuals > 62 years of age without eligibility for regular social security benefits), food stamps, WIC, Aid to Families with Dependent Children (AFDC), housing programs, and energy credits. There is enormous dependence on these sources of government transfers for rural communities in the Northwest Arctic region.

### Percent of Households with Public Assistance



There are several key items that need to be kept in mind prior to an analysis of subsistence harvests. With the exception of Kotzebue communities in this region have:

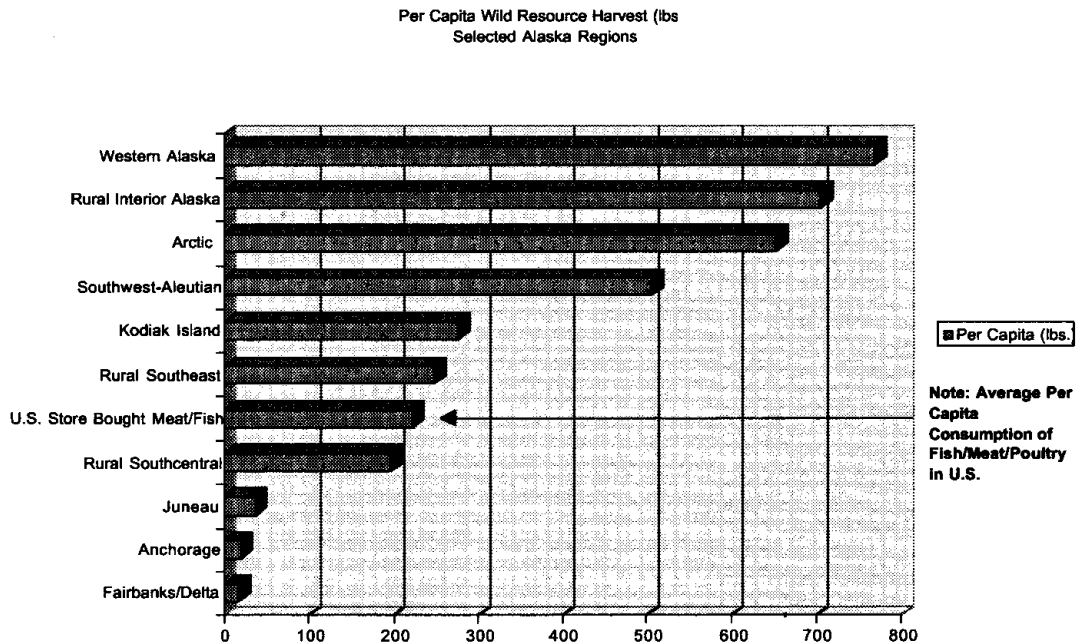
- ◆ high unemployment
- ◆ high proportions of discouraged workers
- ◆ few jobs available in the community
- ◆ over half the jobs are from the government sector
- ◆ high dependence on public assistance and transfer income
- ◆ modest infrastructures
- ◆ high reliance on subsistence harvests

**Harvest and Consumption of Wildlife Resources**

Unfortunately, we only have harvest surveys for four communities in the Northwest Arctic region. Surveys were conducted during the 1990's, and the sampling design indicates the results are representative for the communities in question. While there are some differences in resource dependence among the four communities, all communities rely on a tremendous amount of fish, marine and land mammals to sustain themselves. Kivalina, a coastal community, is more dependent on marine mammals than are the other three communities. In contrast, Noatak, an inland riparian community, is more dependent upon land mammals, primarily caribou, than are the other three communities.

Per Capita Harvest (in pounds) by Resource Category				
	Per Capita Pounds	Per Capita Pounds	Per Capita Pounds	Per Capita Pounds
	Kivalina	Deering	Kotzebue	Noatak
All Resources	761	672	593.0	461.0
Fish	253	228	238.0	179.0
Land Mammals	165	190	177.0	224.0
Marine Mammals	318	221	158.0	48.0
Birds and Eggs	11	24	3.5	4.5

**Per Capita Harvest of Wildlife Resources**



## Implications of Global Change in Alaska and the Bering Sea Region

The Arctic region annually averages about 650 pounds per capita in the consumption of wildlife resources. Rural Northwest Arctic communities are accessible only by air. Bulk items such as food are extremely expensive to transport. While Anchorage's food costs are about 25% greater than food costs for an average city in the U.S., food costs in the Northwest Arctic are about 300% above the national average.

For the Arctic Region (which includes the Northwest Arctic, North Slope, and Calista regions), estimate an annual harvest of 10.5 million pounds of wildlife products per year. They point out that:

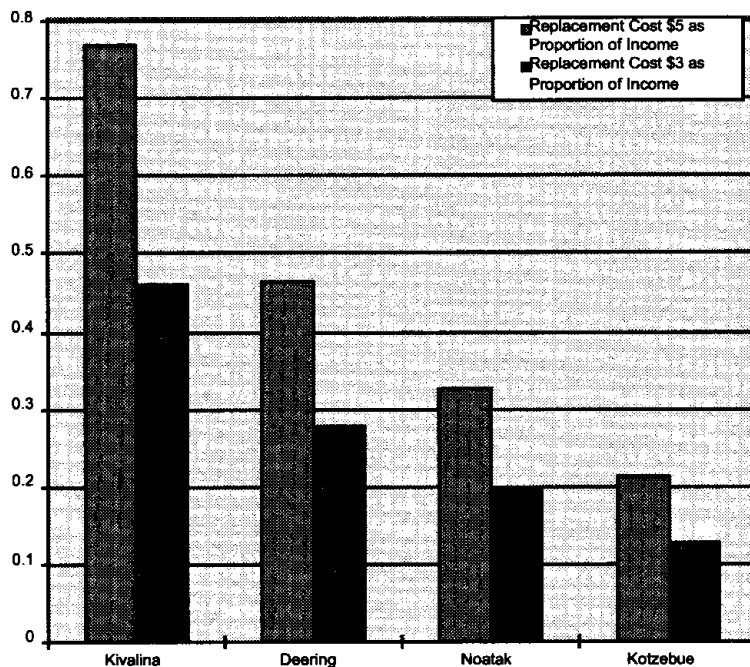
Attaching a dollar value to subsistence uses is difficult, as subsistence products generally do not circulate in markets. However, if families did not have subsistence foods, substitutes would have to be imported and purchased. If one assumes a replacement expense of \$3-5 per pound, the simple replacement costs of the wild food harvests are:

Replacement Cost of Subsistence Products @ \$3 & \$5/lb

	Kotzebue	Deering	Noatak	Kivalina
Per Capita Income - 1990 Census	\$13,906	\$7,272	\$7,089	\$4,968
Replacement Cost \$3/lb	\$1,779	\$2,016	\$1,383	\$2,283
Replacement Cost \$5/lb	\$2,965	\$3,360	\$2,305	\$3,805

### Percent of Income Required to Replace Subsistence Products

Replacement Cost of Subsistence Products as Proportion of Per Capita Income





With per capita incomes ranging from \$5,000 to \$14,000 the total replacement cost of wildlife resources, in the four communities that have detailed harvest data, range from 13% to 77% of the **total income for that community**.

### 8.3 Additional Research Needed

Additional information that would contribute to improved decision making includes:

- ◆ comprehensive investigations of the vulnerability of the region's subsistence, commercial and recreational fisheries sectors to climate variability and change, where "vulnerability" is defined as a combination of sensitivity to change and flexibility to adapt and/or mitigate;
- ◆ improved understanding of the impact of sea level rise and other climate change impacts on fishing ports, coastal ecosystems, coastal communities, and related infrastructure;
- ◆ better information on demographics of subsistence communities, especially patterns of migration and the factors affecting it;
- ◆ consistent time series (historic and continuing) of multiple species surveys — especially important for subsistence considerations as well as understanding interspecific competition;
- ◆ investigations of the influence of emerging multinational investment strategies and business initiatives on fisheries in the region, particularly in the context of either ameliorating or exacerbating the impacts of climate change; and
- ◆ analysis of the consequences of changing state, national, and international legal frameworks and management institutions in either increasing or decreasing the region's vulnerability to the impacts of climate change on important species of fisheries, marine mammals, and sea birds.

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