THE USE OF FISH AND WILDLIFE RESOURCES BY RESIDENTS OF THE BRISTOL BAY BOROUGH, ALASKA

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ABSTRACT

This report describes contemporary harvest and use patterns of wild fish and game resources of Bristol Bay Borough residents. Located on the Alaska Peninsula, the three borough communities of King Salmon, Naknek, and South Naknek are situated on the banks of the Naknek River. In 1980 the population of the borough was 879, excluding 375 active duty military personnel stationed at the King Salmon Air Force Station. Approximately half of the borough residents were Alaska Natives, most whom consider themselves Aleut.

The extent of particpation and level of resource harvest and other socioeconomic data were collected by Division of Subsistence personnel. Data collection was conducted from May 1982 through April 1984. Research methods included participant-observation, mapping, literature review, and two systematic households surveys. Particular attention was focused on the local subsistence salmon fishery. Elements of the fishery, such as targarted species, harvest sites, processing and preservation methods, the composition of work groups and distribution networks were documented.

Survey data collected for 1983 showed that sampled borough residents reported a mean per capita harvest of 215 pounds. Caribou and salmon made up 84 percent of the total harvest. It was found that salmon were obtained through harvests with set gill net subsistence gear, sport fishing with rod and reel gear, and fish retained from commercial catches. Many harvesting activities occurred within the Naknek River drainage. Other important areas, particularly for caribou hunting, were located further south on the Alaska Peninsula.

The reportdescribes each community separately, and then discusses

the similarities and differences between them. Commercial fishermen lived mostly in Naknek and South Naknek. Government and transportation services dominated the employment scene in King Salmon. Data from the early 1980s showed that King Salmon consistently had the highest cash income levels. Wage earning opportunities were poorest in South Naknek. King Salmon had the greatest turnover in its year-round population; South Naknek had the least. Naknek exhibited a blending of the particular socioeconomic and sociocultural elements identified for King Salmon and South Naknek.

Study findings indicate that the socioeconomic system of the Bristol Bay Borough best fits the regional center model previously described for Nome in northwest Alaska. A regional center contains subpopulations differing in terms of ethnicity, income, educational levels, and geographic background. The community's economic system is based on a combination of wage employment and relatively high harvests of locally available renewable resources.

The three communities of the Bristol Bay Borough demonstrated these significant characteristics of a regional center. Subpopulations were identified by such variables as community residency, participation in the commercial salmon fishery, and ethnicity. Discrete resource harvest and use patterns could not be associated with any identified subpopulation in the borough. However, recognizing the characteristics of the regional center and the role resources play in the economic system of the Bristol Bay Borough will contribute to an understanding of fish, wildlife, and land use issues in Southwest Alaska.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

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CHAPTER ONE

INTRODUCTION

This report describes resource uses by residents of Ring Salmon, Naknek, and South Naknek, the three communities of the Bristol Bay Borough (Fig. 1). Research in these communities by the Division of Subsistence, Alaska Department of Fish and Game, began in 1982. The goal was to describe characteristics of the Naknek River subsistence salmon fishery and to contrast the patterns of use by borough residents with those of non-local subsistence fishermen (Morris 1982).

The current report contains results of research conducted in 1984 as an expansion of the 1982 study. Compiling a baseline profile of resource use by residents of the three communities was the major focus of the additional research. Characteristics of harvesting activities, including locations, harvest levels, and methods of transportation, were identified for selected species. Whenever possible, results of the study were compared to information from other published or unpublished sources. Socioeconomic characteristics of the communities were compiled in order to discuss natural resource use in its socioeconomic context.

This research project also sought to identify socioeconomic characteristics of borough residents associated with hunting and fishing activities and use of fish and game resources. The population of the borough is diverse, with a mixture of economic, social, educational, political, and ethnic characteristics. Some residents have resided in the area for their entire lives, as have their parents; others have been in the area for short while. Involvement in wage employment varies greatly. Some

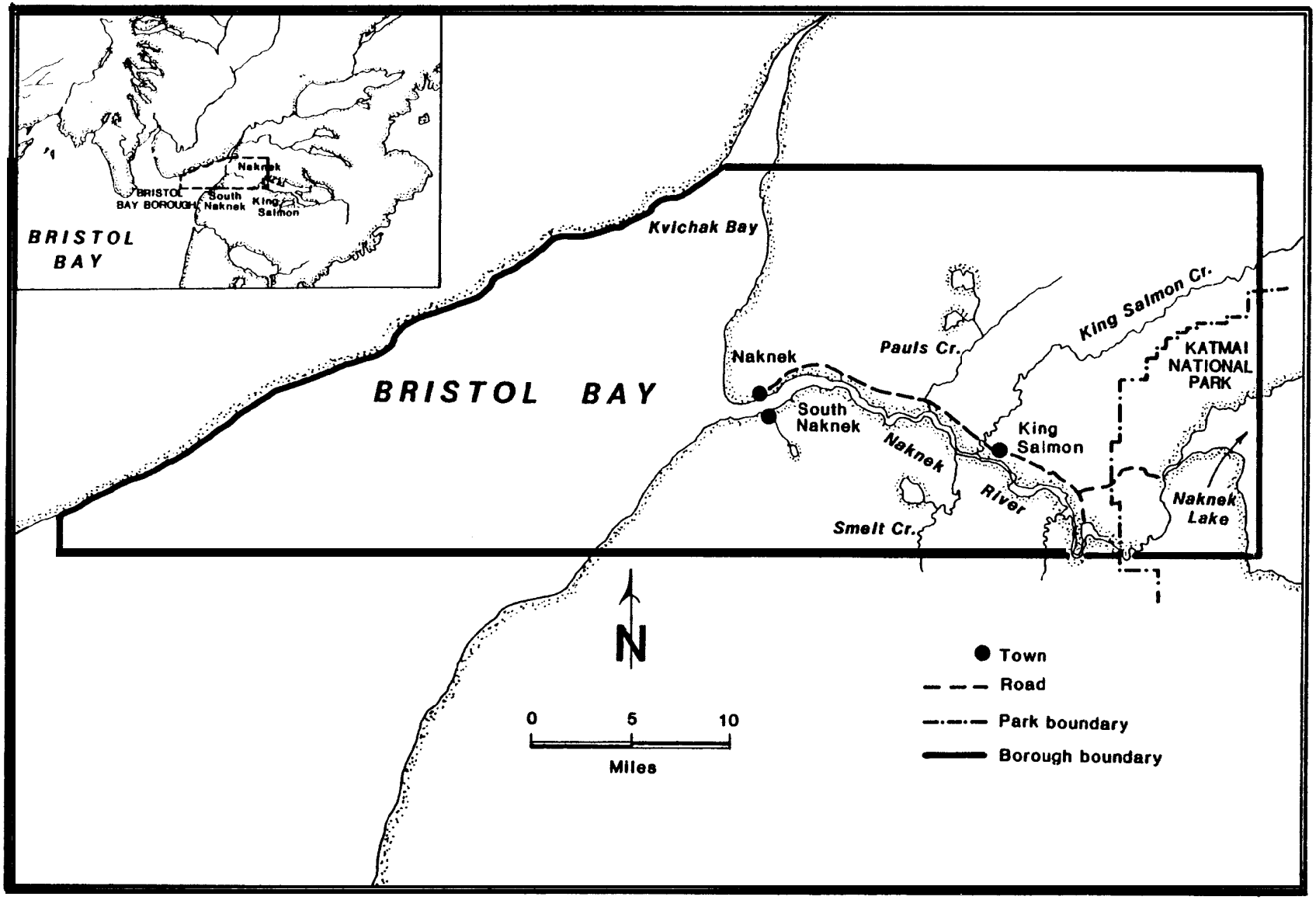

Figure 1. The Bristol Bay Borough, Alaska.

residents have steady, full-time wage employment, while others seasonally participate in a very productive sockeye salmon commercial fishery. Some residents are outside both the fishery and a reliable wage economy.

The Bristol Bay Borough presents a unique set of characteristics, a mixture of elements characteristic of urban and rural communities. Characteristic of an urban area, it has daily jet service, but like a rural area skiffs or small planes are often necessary for intracommunity travel. As might be expected in a rural Alaskan setting it is composed of a large and active native community, but like more urban areas, has a transient non-native population. Unlike many villages, there are often newer arrivals who intend to establish permanent homes in the borough. But unlike an urban area, there is little industrialization; the economic base is dependent on salmon harvesting.

Such socioeconomic characteristics raise several challenges for understanding the role of subsistence fishing and hunting in the economy and way of life of borough residents. Do newcomers integrate themselves into the local hunting and fishing system? Do they target the same species as those households with longer ties to the land and the community? Is there a single subsistence pattern in the area or has the community become diversified to the point where several resource use patterns are now in operation?

The 1982 Naknek River subsistence fishery study found that several distinct resource use patterns operated within the local subsistence fishery. Salmon distribution networks, the organization of work groups, and methods of preservation and preparation varied among households. Households appeared to fall into at least two categories based on their subsistence salmon processing and use characteristics. Length of

residency of household members in the Naknek drainage seemed to be a major factor influencing these patterns. In designing the second component of the project it was hypothesized that use patterns for resources other than salmon would reflect the same kinds of differences between groups based on length of residency in the borough.

Purpose of the Study

The purpose of this report is to describe the diversity and level of natural resource harvest and use by residents of the Bristol Bay Borough from spring of 1982 to April 1984. The study includes an analysis of a variety of socioeconomic factors and their relationship to patterns of resource use. Specific findings include:

1. Range of species used;
2. Estimated harvest quantities;
3. Transporation methods used in harvesting activities;
4. Seasonal round of resource utilization;
5. Harvest locations for selected species;
6. Description of the subsistence salmon complex; and
7. Associated socioeconomic traits and resource use patterns.

The focus of the study is the entire borough. Because there was found to be a great deal of overlap among activity patterns of the three Bristol Bay Borough communities, the report describes a single, general pattern for the Borough as a whole, as well as findings for the three communities of Ring Salmon, Naknek, and South Naknek. Factors such as employment

patterns, size of the household, participation in the commercial fishery, and length of residency were considered in the attempt to identify subpopulations within the Borough.

It is hoped that the information presented in this report will assist individuals and groups concerned with resource harvests in Bristol Bay Borough area. The Borough is the site of rapid development, and issues frequently arise in which questions about local resource use are addressed. For example, changes in caribou or moose bag limits or seasons raise questions about their effects on local subsistence uses. The impact of possible oil exploration leads to inquires about areas used by local residents to harvest resources. Major resource management changes, such as the potential of the state resuming marine mammal management, require information on subsistence uses. The results of the research may be used to address these types of regional and state-wide issues. The findings also add to the growing body of knowledge about local resource use systems in Alaska.

CHAPTER TWO

METHODOLOGY

GENERAL DESIGN

The study employed an ethnographic, field-based research approach. Three data collection methods were used: participant observation, in-depth interviews with knowledgeable individuals, and three surveys using formal survey instruments (Table 1). Data were collected from May 1982 through April 1984.

The study began in May 1982 with the commencement of salmon fishing in the Naknek River (c.f. Morris 1982), and concentrated of subsistence salmon fishing by residents of the Bristol Bay Borough. Interviews were conducted with 75 (34 percent) of the 215 subsistence fishing permitees. During the fall of 1982, a second survey instrument was developed and mailed to non-local subsistence fishermen who fished in the Naknek River in 1980. (From 1981 through 1984 non-Naknek River drainage residents were prohibited from participating in this fishery.) Survey forms were sent to all 167 non-local permitholders; 35 (21 percent) were returned. The results of a comparative analysis of the two groups are found in Naknek River Subsistence and Personal Use Fisheries – 1982 (Morris 1982).

The second study period was directed towards developing a fuller description of resource use by residents of the Naknek River area. During early 1984, a survey on subsistence activities was administered to a random sample of 116 households in the borough, representing 32 percent of all resident households. Results were coded and processed by the data management section of the Division of Subsistence.

TABLE 1. SURVEY SAMPLES 1982 and 1984

Year of Survey	Target Group	Total Number of Households/ Permittees	Sample Size	Percent
1982	Borough residents with Naknek River subsistence salmon permits, 1982	215	75	34
1982	Non-Borough residents who held Naknek River subsistence permits, 1980	167	35	21
1984	Borough residents	364[a]	116	32

[a] ADFG Division of Subsistence estimate, March 1984

RESEARCH PERSONNEL

The primary research personnel included the principal researcher, a resident of King Salmon since the fall of 1979, and two field assistants, both life-long residents of South Naknek. One assistant was hired to help administer the subsistence fishing survey in the summer of 1982. From January through March 1984, the second research assistant, hired with BIA funds administered through the Bristol Bay Native Association (BBNA), aided in designing sample selection and conducting the community-wide survey. The three researchers were familiar with local resources, socioeconomic issues, and residents of all three communities. Consequently, work began without the usual period of community familiarization. This familiarity also led, particularly with the field assistants, to significant insights about appropriate questions and issues to be addressed.

PROCEDURES

The 1982 subsistence fishery survey (Appendix B) were designed to address issues raised by changes in the regulation of the Naknek River fishery. In 1981 a change in regulations required that subsistence salmon permit holders be year-round residents domiciled in the Naknek/Kvichak drainage. The regulation change affected individuals who had participated in the fishery in the past who were not year-round residents of the drainage. Although non-local residents were permitted to fish under personal use regulations with reduced bag limits, some felt that their exclusion from the subsistence fishery was unjustified.

The 1982 and 1984 surveys treated the borough as a single area rather than as three separate communities for sampling. It was felt that to divide the borough into three distinct communities for sampling was arbitrary and unnecessary for statistical purposes. Residences on the north side of the river are constructed along the length of the road between King Salmon and Naknek, with no radical break. Further, many of the facilities, such as the school, police department, and air terminal, are shared by King Salmon and Naknek. The characteristics of the three communities which led to this decision are discussed in the following chapter. Through statistical analysis, differences between communities could be determined later, rather than apriori.

As stated above, a 35 percent sample of those households which applied for subsistence permits was desired for surveying in 1982. Permits were issued by ADF&G throughout the season from May into September. Consequently, in order to observe processing and net locations and to interview fishermen on site, it was necessary to contact fishermen on a rather opportunistic schedule during the fishery. To insure that no selection bias had occurred, at the end of the season, a random sample was selected using a table of random numbers from the complete list of 215 permit holders. Fishers in the random selection not already interviewed during the regular season were then interviewed until all those selected randomly had been contacted. The final sample of 75 permit holders (34 percent of the 215 total permits issued in 1982) represented this combined group.

Bristol Bay Borough residents were the focus of the questionnaire administered in March of 1984. Conducting the survey in late winter controlled the type of households that were contacted. By selecting a single month in mid-winter, only year-round residents were likely to be included in the survey. Military personnel stationed at the King Salmon Air Force Base were not

interviewed. As troops are stationed at the base for a one-year remote tour of duty, it was felt they do not become sufficiently integrated into the borough to contribute realistically to the study's goals. Further, most do not meet the residency requirement for resident hunting and fishing privileges. Three sources were used to obtain a comprehensive household list from which to select a random sample. The November 1983 list of electrical hook-ups and the 1984 Bristol Bay Telephone Cooperative listings were combined. This list was augmented by the personal knowledge of the research personnel. A 34 percent community sample was selected using a table of random numbers (Table 1). Any household which could not be contacted in two attempts between March 1 and March 31, 1984 was eliminated and the next household number on the list was used. Of the original group, 17 households could not be contacted. These households were replaced by the next 17 random numbers.

The survey was designed to collect quantitative and descriptive information on harvest levels and types of wild resources used by Naknek River residents. Among the types of data collected were which household members hunted, forms of transportation used, number of trips made, and success rate for moose and caribou hunters (Appendix C). For other resources, such as seal, walrus, hare, and belukha, the questions consisted solely of number of resources harvested or given to the household. More detail was asked about waterfowl and game bird use. Trapping information was sought on lynx, fox, mink, beaver, wolf, wolverine, and land otter. Note was made of any trapped animal which was also used for human consumption. Information on species such as clams, bird eggs, and fish other than salmon, was limited to general questions, though harvest locations were asked for fishing activities. Data related to obtaining, using, and sharing subsistence fishing

permits were collected. Also, household demographic and employment information was collected. Participation in commercial fishing was recorded. The data management staff of the Division of Subsistence entered and prepared a program for analyzing the survey material. Once patterns were described additional programs were written to test for relationships and identify factors associated with resource use among households. Appropriate tests were run using a significance level of .05.

In addition to the data generated by the research teams, information was collected from a number of secondary sources. Maps prepared in 1982 by Morris to provide information for the Bristol Bay Cooperative Management Plan (BBCMP) depict hunting and fishing locations. In situations where maps did not provide local place names, residents were consulted for additional details. No new mapping was undertaken. Published and unpublished sources were consulted to compile descriptions of the Prehistory and history of the area. Secondary sources also provided the basis of the natural history discussions. Background data on the social and economic infrastructure of the borough was taken from material prepared for the BBCMP and Bristol Bay Coastal Zone Management Plan.

CHAPTER THREE

THE BRISTOL BAY BOROUGH SETTING

BRISTOL BAY REGION

Named by the English Captain James Cook in 1778 in honor of the Admiral Earl of Bristol, Bristol Bay extends east 200 miles from the Bering Sea, marked by Cape Newenham on the north and the Alaska Peninsula and Unimak Island on the south. Encompassed within this area are several smaller bays and river systems with numerous human settlements (Fig. 2). For purposes of this study, the Bristol Bay region refers to the area draining into Bristol Bay from Togiak to Cold Bay. There are two regional centers in the Bristol Bay area: Dillingham, located on the Nushagak River, and the communities of the Bristol Bay Borough, on the Naknek River. Dillingham, with a population of 1,563 in 1980 (Table 2) serves the communities located in the Nushagak drainage and communities to the north of the Nushagak. King Salmon, Naknek, and South Naknek, with a total population of 1,250 persons, comprise the Bristol Bay Borough. These communities provide services for 16 communities located in the Naknek/Kvichak drainage and areas south on the Alaska Peninsula.

NAKNEK RIVER AREA

Regional History

Prehistoric Period

No records of human habitation in the Bristol Bay region prior to 9,000 years ago survived the last glaciation. For the period since the

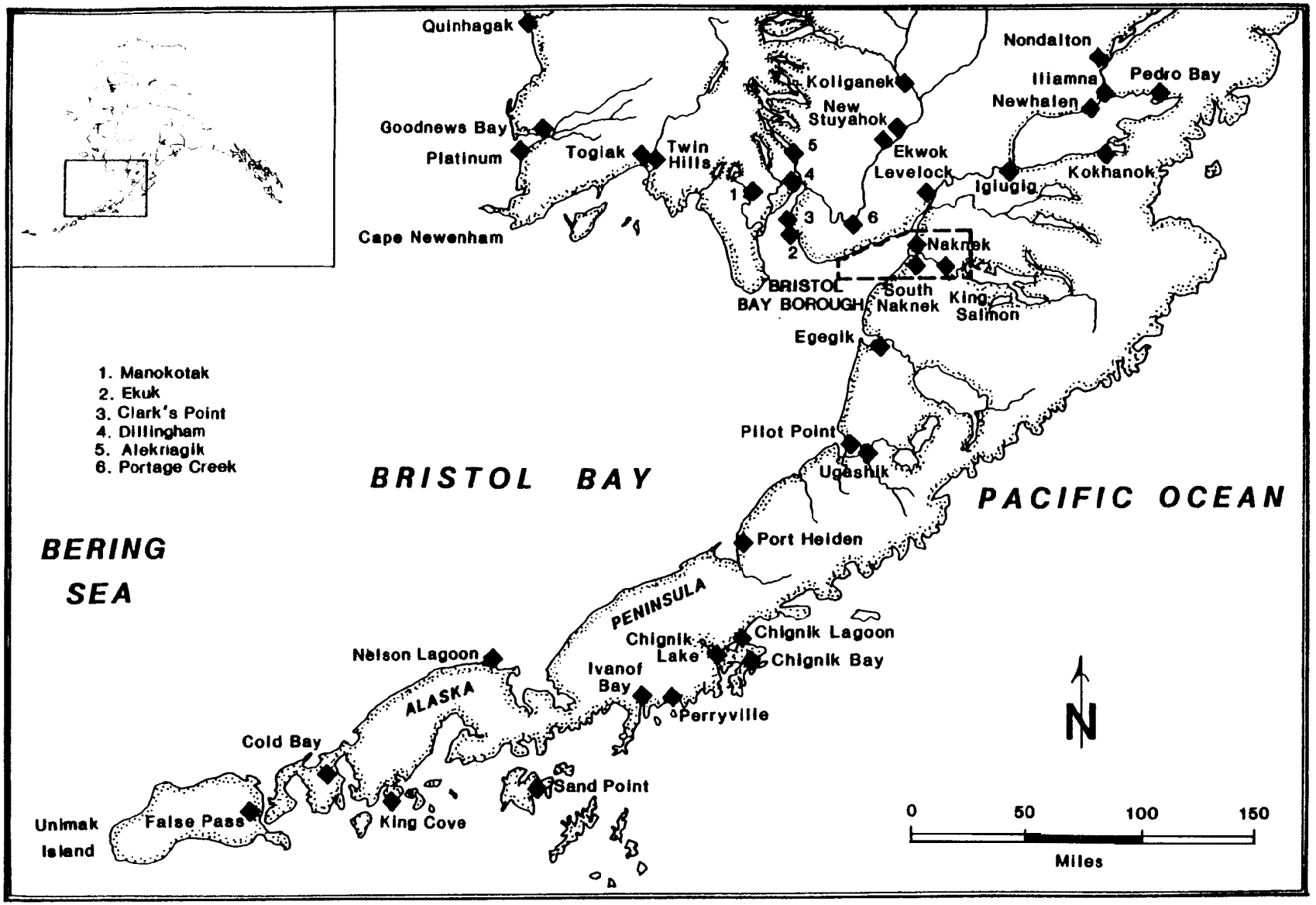

Figure 2. The Bristol Bay Region, Alaska.

TABLE 2. POPULATION FIGURES, BRISTOL BAY REGION, 1980

Togiak/Kuskokwim	Population
Togiak	470
Twin Hills	70
Manokotak	294
Remote population	16
Subregion Total	850
Nushagak River	
Aleknagik	154
Dillingham	1,563
Clark's Point	79
Ekuk	7
Portage Creek	48
Ekwok	77
New Stuyohok	331
Koliganek	117
Remote population	44
Subregion Total	2,420
Iliamna Lake	
Nondalton	173
Newhalen	87
Iliamna	94
Pedro Bay	33
Kokhanok	88
Igiugig	35
Levelock	74
Remote population	10
Subregion Total	594
Alaska Peninsula[a]	
Naknek[b]	369
King Salmon[b]	374
South Naknek[b]	136
Egegek	75
Pilot Point	66
Ugashik	13
Port Heiden	92
Nelson Lagoon	59
Cold Bay	228
Subregion Total	1,412
Total	5,276

[a] Does not include communities within the drainage of the Pacific Ocean.
[b] 1981 Bristol Bay Borough census, excludes 375 active military stationed at King Salmon.

Source: U.S. Bureau of Census 1980.

retreat of the glaciers 9,000 years ago, there is evidence, though not continuous, of human presence in the Naknek area. Near the Kvichak River about 8,000 years ago, people of the Paleo-Arctic tradition left campsites, perhaps used as part of seasonai camps for hunting caribou. The sites were situated on dunes suitable for observing the migrating herds.

Following the Paleo-Arctic tradition and a period with no recovered evidence of human activity in the Naknek area, two new cultural assemblages are represented on the Alaska Peninsula. The Northern Archaic tradition, virtually pan-Alaskan with the exception of the ice-free southern coastlines, is documented on the Alaska Peninsula. A second tradition, Ocean Bay, appeared along the ice-free coastline from the Aleutian Islands to south-eastern Alaska by 6,000 BP (Dumond 1980). During the Ocean Bay period a basic unity of culture was probably shared between the Kodiak and Aleutian regions. Later, separate Kodiak and Aleutian traditions developed. Sites in the Naknek area such as those along the Brooks River, are more closely aligned with the Kodiak branch. Inhabitants may have made seasonal use of caribou resources in the interior of the Upper Alaska Peninsula and the marine resources found along the Pacific coast. Katmai Pass may have served as a corridor between the two geographical areas, as it has in later times. Cultural elements of the Kodiak tradition include oil lamps, sea mammal hunting, and salmon fishing.

Around 1900 BC, the Arctic Small Tool tradition from the north exerted influence in the Naknek area. The Naknek region was but one part of the area occupied by the Arctic Small Tool culture which stretched along the coastal zone of North America from the Alaska Peninsula to Greenland. These ancestors of historic Eskimo populations were fishermen, caribou hunters, and, in some places, seal hunters. During this time

people living on the Pacific side of the Alaska Peninsula continued to adhere to the Kodiak cultural tradition and contact between the two sides of the peninsula appears to have been more restricted.

Following a break in cultural sequences, elements of the Norton tradition appear in the Naknek area (Table 3). By approximately 400 BC, people began residing year-round along the coast northern peninsula, though not necessarily in the immediate Naknek area (Dumond 1981:190). The first evidence of pottery dates to this general time period. At a Naknek River site called Smelt Creek, the amount of ceramic and stone artifacts recovered suggests year-round occupancy. Its residents were able to carry out a full array of domestic activities centered on resource harvesting within the surrounding environs. From the same time period comes probable evidence in the Naknek River of fishing activity using lines or nets. Notched pebbles, identified as sinkers, suggest technological advances allowing access to the salmon-rich Naknek River where deep swift water precluded wading as a means of reaching the fish. Seasonal movement within the drainage to take advantage of available resources is suggested, though evidence is scanty.

Thule, the last prehistoric cultural tradition identified in the Naknek area, was present by AD 1100. A complicated pattern of seasonal movements is indicated by the variety of dwelling types, some which appear to have been used year-round while others were used on a seasonal, but recurrent basis. Specialized tools for resource harvest were developed, perhaps resulting in more efficient hunting methods. The Thule tradition spread rapidly into the Naknek area. Evidently, people of the Thule tradition intermixed with inhabitants of the earlier Norton tradition (Dumond 1977:133).

TABLE 3. GENERALIZED PREHISTORIC CULTURAL TRADITIONS IN THE NAKNEK RIVER REGION.

Approximate Date (Radiocarbon years)	Tradition	Characteristics
AD 1100 to AD 1900	THULE	Cultural unity of recent Eskimo people including hunting for large sea mammals
AD 400 to AD 1100	NORTON	First users of pottery. First consistent coastal dwellers, economy balanced between land and sea.
1900 BC to AD 400	ARCTIC SMALL TOOL	Fishermen, hunters of caribou, frequently taken to be earliest recognizable ancestral Eskimos.
3000 BC to 1900 BC	NORTHERN ARCHAIC	Hunters, primarily of the interior, who inhabited zones of both expanding forest and of tundra throughout Alaska.
5500 BC to 3000 BC	(No information)	
6000 BC to 5500 BC	**PALEOARCT IC**	Hunters of relict mammal populations of the Pleistocene.

Source: Dumond 1977.

The appearance of Russian and other European trade items in the local artifact assemblage marks the last cultural phase of the Thule tradition, called Pavik (Dumond 1981:190). Artifacts of local manufacture from this time span, 1800–1900, follow closely those of earlier phases of the Thule tradition, although iron sometimes was substituted for stone in traditional tool forms (Dumond 1981:181). The fauna1 remains, as well as historic references, document Paugvik, at the site of the present-day Naknek and South Naknek, as a year-round settlement.

In the early 19th century, an influx of Yupik-speaking people from the Lower Kuskokwim called Aglegmiut into the Naknek area is documented by ethnohistoric accounts, although material evidence of this change is lacking (Dumond 1981:185). The former inhabitants of the peninsula coast, who were Sugpiaq speakers, resettled in Savonoski upriver from Naknek and at Ugashik. Thus, by the end of the 19th century two native groups occupied the Naknek drainage: in the upper portion were Sugpiaq-speaking Peninsula Eskimos while at the lower end, the site of contemporary Naknek, were primarily Central Yupik speaking Aglegmiut.

Historic Period

When the Russians and other Europeans began exploring Bristol Bay and the Bering Sea in the late 18th and 19th centuries, indigenous peoples lived along the Alaska Peninsula, moving seasonally to harvest natural resources. The inhabitants of the upper Naknek drainage traveled back and forth across the peninsula through Katmai Pass. Other groups might have been more sedentary, living on one side of the Aleutian mountain range or the other. The identification of historic ethnic groups residing in the

Naknek area is difficult for several reasons, including the mobility of the small bands, the displacement of established populations by Eskimos from the north at the time of outside contact, and the designation in initial Russian accounts of "Aleuts" to every native they encountered in the general vicinity of the Aleutian Islands.

Today, the local Bristol Bay Borough is populated by native peoples descended from original inhabitants of the Naknek drainage, people with Yupik Eskimo ancestors from the north, and more recent arrivals, such as Athabaskans from the Lake Clark area. Today almost all local native residents refer to themselves as Aleuts (Table 4).

The Russians found little they valued in the Bristol Bay area. In 1791, the Russian Botcharov travelled into the area and returned to Kodiak along Becharof Lake and a portage across the peninsula. In his report, Botcharov said there were few sea otters and only a poor showing of bear, marten, fox and other furs of inferior value in the region (Chevigny 1965). However, due to the depletion of supplies of furbearers in southeast Alaska, the Russians attemped to establish a permanent station on the Nushagak River in the early 1800s. By 1830 the area was well known to the Russians. Russian Orthodoxy was introduced into the region about this time.

Major changes in the area began when United States government purchased Alaska from the Russia in 1867. Commercial enterprises such as Alaska Commercial Company became active in the local fur market. In 1884 two Moravian missionaries passed through the area on their way to the Kuskokwim Valley. When gold was discovered in Nome at the turn of the the 20th century, Katmai Pass became an important short cut to the Arctic.

Neither gold, furs, nor religion matched the impact of the salmon fishing industry on the Bristol Bay region. The first commercial salmon

TABLE 4. ETHNIC COMPOSITION OF BRISTOL BAY COMMUNITIES, 1980.

Community	Total Population	Eskimo	Aleut	Indian	Non-Native	Percent Alaska Native
Naknek	318	25	130	6	157	50.6
South Naknek	145	7	115	2	21	85.5
King Salmon	631[a]	12	60	3	556	11.9
	256[b]	12	60	3	181	29.3

[a] Includes 375 military personnel.
[b] Excludes 375 military personnel.

Source: U.S. Census 1980.

sites in Alaska were established in Sitka and Klawock in 1878 and 1879. In Bristol Bay salmon were first processed commercially with the establishment of a saltery on the Nushagak in 1884 and another on the Naknek River in 1890. By 1898 there were 55 canneries in Alaska. The financial control and management of the salmon industry were centered in San Francisco and Seattle. There was fierce competition among the various canneries, with a high mortality rate among new canneries entering the market (Holthaus 1968:78). In western Alaska between 1884 and 1938, 51 canneries were built; 36 of these burned, were abandoned, or moved to other sites. Numerous operations were also consolidated and only fifteen plants were operating in western Alaska in 1950 (Holthaus 1968:79).

The management of the canneries and composition of the labor force were often in a state of flux. There was also a shortage of experienced commercial fishermen in the productive salmon areas. Canneries solved this problem by importing crews and fishermen from outside Alaska. Each spring in Seattle, San Francisco, and other west coast cities, fishermen and cannery workers were recruited by the individual companies. Their expenses to the fishing grounds were covered, with payment at the end of the season at their home port. Fishermen were not only provided with travel expenses, but also boats, gear, supplies, and housing. This arrangement allowed the canneries to maintain a great degree of control over the fishermen and crews. These practices also resulted in the lack of participation by local residents as fishermen in the fishery. The outbreak of World War II created a labor shortage and presented local residents an opportunity to enter the Bristol Bay salmon fishery.

The community of Naknek developed concurrently with the commercial fishing industry. Cannery construction brought people to the community, which to that time had been the central base for a group of indigenous residents moving to surrounding fishing and hunting grounds. In 1912 the volcano Novarupta erupted (normally referred to as the Katmai Eruption) and destroyed the village of Savonoski. The residents relocated to a site, New Savonoski, on the Naknek River. A major influenza epidemic decimated the native population in 1918-1919 (Holthaus 1968:89).

During the early 1900s the community of Naknek continued to experience significant changes. The inhabitants adapted and integrated these technological and cultural changes in their daily lives. In 1920 the first offical school was built with materials brought up by a local cannery. In 1929 an open-cockpit bi-plane, while on a medical mission, became the first aircraft to land in Naknek. By the 1930s and 1940s numerous bush pilots were making fairly regular flights into the area.

South Naknek, like Naknek, developed from a small native village to a year round, permanent community with the growth of the commercial fishing industry. King Salmon's growth stemmed from an isolated air navigation site built in the 1930s. Previously, a few trappers' cabins and a reindeer herd were all that were found at the contemporary site of King Salmon. In 1942, during World War II the King Salmon Air Force Station was built. In 1949 a road was constructed between Naknek and King Salmon. In 1984 the economic basis for the three communities continued to be commercial fishing and transportation services. Table 5 shows the historic growth patterns for all three communities.

TABLE 5. POPULATION, BRISTOL BAY BOROUGH AREA, 1880 1981

COMMUNITY	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1981[a]
Koggiung	133											
King Salmon									227	202	170	37[c]
Naknek (Naknek Village)			431		111	173	152	174	249	178	318	369
South Naknek (Paugwik)	192								142	15[c]	145	136
Air Force[b]											375	371
TOTAL[c]	352		431		111	173	152	17[c]	618	534	633	879

[a] 1981 Bristol Bay Borough Census, conducted December 12, 1981, submitted to the borough manager, January 13, 1982.

[b] Not included in borough census total.

[c] Excluding Air Force personnel.

Source: U.S. Bureau of Census 1980.

Bristol Bay Borough Communities

The Bristol Bay Borough includes the communities of King Salmon, Naknek, and South Naknek. Established in 1962, this second class borough is the oldest in Alaska. The borough is the main governing body for all three communities. Included in the powers of a second class borough are police and fire protection, health services, road building and maintenence, schools, and sewers. The borough assembly is compromised of six elected members including a non-voting mayor. The recurrent activities and capital projects of the borough are funded through monies obtained through state and federal grants and appropriations, and local property taxes, including a three percent raw fish tax.

Census data collected in the 1984 survey showed that among the sampled households individual borough communities exhibited similar demographic characteristics. During 1983 the number of persons 19 years of age and younger accounted for 30 percent of the surveyed population in Naknek and South Naknek and 40 percent of the King Salmon sample. In King Salmon and Naknek the number of males and females was nearly even, but in South Naknek, two-thirds of the age group were males. Approximately 40 percent of the surveyed group in each community fell between the ages of 20 through 40 years of age. In King Salmon and Naknek males accounted for approximately half of the group, while in South Naknek they made up 64 percent of the age classification. Relatively, the largest percentage of older persons, above 64 years, resided in South Naknek, 6.8 percent, and the least, 1.6 percent, in King Salmon.

The communities are tied together by their incorporation into a single political body, as well as through similar interests in commercial fishing, interwoven kinship networks, and a common resource base. The following sections describe in detail the characteristics of each of the three communities. This will be followed by a section describing some of the differences between them. The discussion illustrates some similarities and differences between the three communities. The discussion begins with Naknek, the community which represents a blending of characteristics found in the other two communities. Continuing with the description of the north side of the river, King Salmon is the second community discussed. South Naknek, the only community of the Borough located on the south side of the river, completes the descriptions.

Naknek

In many ways Naknek operates as the hub of the Bristol Bay Borough. At the turn of the century when commercial salmon fishing interests began to take hold in the area it was a stable village known as Pauqvik. Year-long residents lived in barabaras (semi-subterranean sod houses) while summer residents lived in tents pitched around the viliage site. The canning industry stimulated the growth of the community (Holthaus 1968:88). Naknek Packing Company opened a saltery in 1890 at Naknek, and the town has been a center for commercial salmon fishing ever since. It is the site of the borough offices, school facilities, and many of the commercial enterprises. In 1980 the U.S. Census recorded 318 persons residing in 103 households. The current community has been built around a core of old established structures which apparently were built on property owned by the Russian Orthodox Church on land it obtained under the Homestead Act (Holthaus 1968:90). This "core" corresponds with the western end of

the Naknek/King Salmon road (Fig. 3). Along the main road and assorted side streets are scattered homes, the borough offices (including the jail and court), a lumber yard, the post office, two churches, two bars, two bar/restaurant/hotels, one general store, and one auto repair shop. In the summer a fastfood business is also open.

Situated along the river's edge and proceeding towards the bay are a number of commercial fishing processors. A bulk fuel dock is located near the town center. Air taxi companies operate from the Naknek airport and facilities for float and ski planes are available on Naknek Lake adjacent to the runway. East of the town center, additional commercial and non-commercial structures are interwoven with private residences. These include a bakery, filling station, church, school, electric cooperative, health clinic, boat storage, food and general store and fastfood shop. On the road leading out of town is a sub-division consisting of 15 HUD houses. Just beyond them is the new public dock, which can service 200' vessels. The next area of development centers around Leader Creek, where again private residences are found interspersed with business facilities, mainly boat and gear storages and bunk houses.

The community stretches over a large area and the quality of the connecting road system varies considerably. The main road is paved and is usually well maintained. Side roads and driveways can be difficult to negotiate during mud and ice conditions. Three-wheelers are used extensively. As these vehicles are prohibited from public roads, unoffical tracks are found throughout the community and surrounding environs. A pedestrian walkway runs from the school to the center of town. The 1700' airfield, which is located on the northwestern edge of town has both east/west and north/south lighted runways. There are no FAA flight services at the airfield. Air traffic

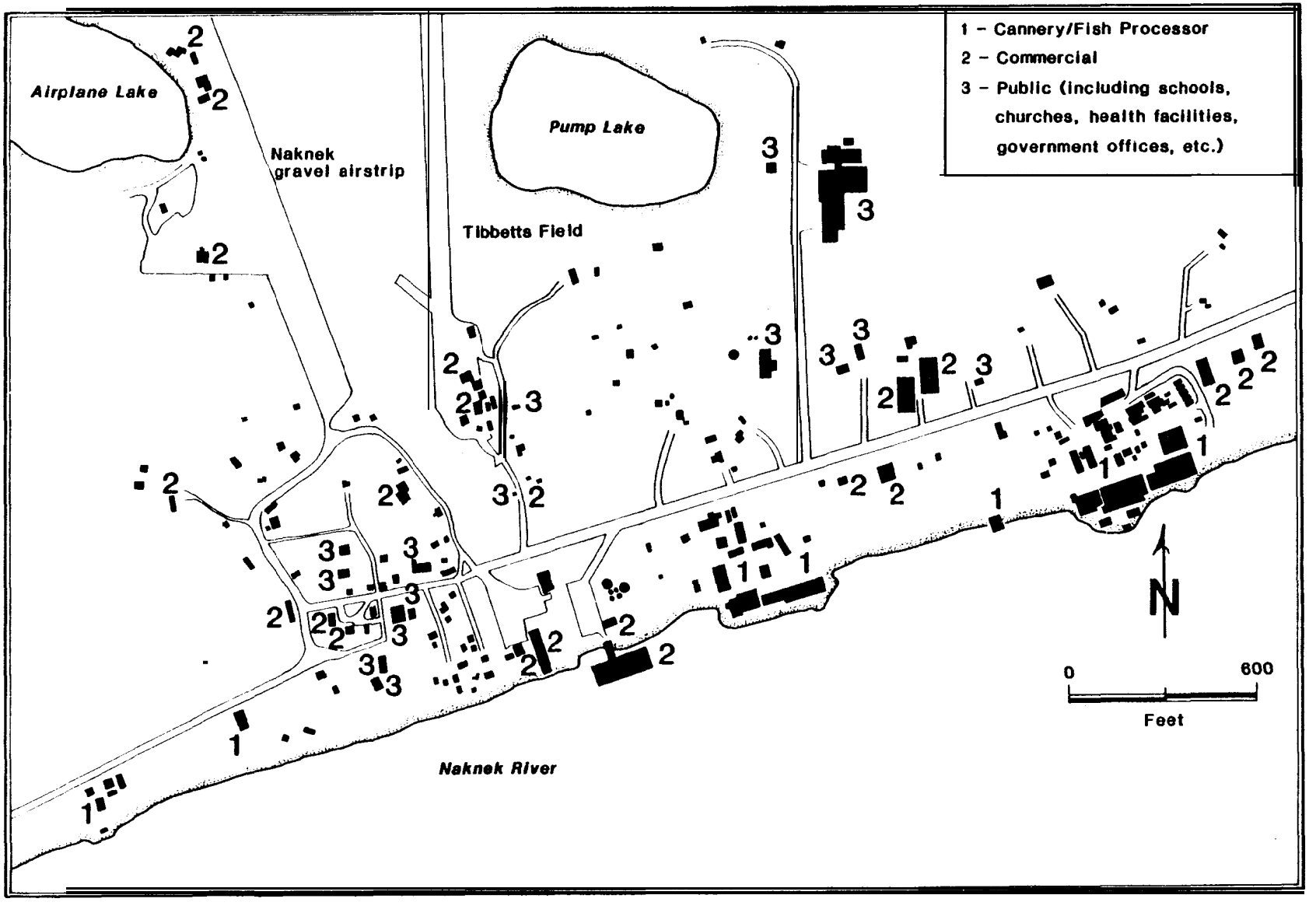

Figure 3, The Community of Naknek, 1979.

increases substantially during the commercial fishing season peak of June and July.

Much of the new building occurring in Naknek has taken place at the eastern edge of town. New housing continues to 'be constructed in selected areas between Naknek and King Salmon. Building has escalated during the last year as land has become available through the subdividing of BIA native claims and homesteads as well as the borough making 100 building sites available through a lottery system in 1983. Currently this area, which stretches along the Naknek-King Salmon road between the cemetery and Paul's Creek on the river side of the road, is rapidly being developed. Thus far the new housing is single family homes, mostly built of wood siding.

Naknek's cash economy is based on commercial salmon fishing. Fishing and fish processing plus the related services provide the majority of cash income in the community. Although much of the historic commercial fishing activity in Bristol Bay has been controlled by canneries, substantial changes toward more individual ownership has occurred in the fishing industry resulting from new technologies, the advent of Limited Entry permits, and fluctuating world markets. These and other factors have decreased the influence of the canneries and increased the flexibility of the individual fisherman and fishermen's organizations. One consequence of the loss of control over the fishermen and the fishermen's dependence on the canneries has been a decline in the goods and services which the canneries currently provide. This, in turn, has led to an increase and diversification of goods and services provided by the private and local government sectors including such services as boat storage, engine repair, bunk houses, medical services, docks, and eating establishments.

In 1984 there were a total of 122 commercial salmon fishing permits listed for persons with Naknek mailing addresses. Of this total, 44 were drift permits and 78 were set-net permits (Table 6). Approximately ten of the drift permits and 11 of the set-net permits were held by persons not living in the community year round. Counting households with permits (and only using year-round local residents), data from the 1981 Borough census indicate that 51 percent of the Naknek households had at least one Bristol Bay salmon permit in 1984. Data published by the Alaska Sea Grant program in 1981 reveal considerable differences between fishing a set-net permit and a drift permit in terms of gross and net income expectations (Table 7).

King Salmon

The most recently established of the three communities, King Salmon began with the development of an isolated air navigation site in the 1930s. In 1942 the Army leased land to construct what today is the King Salmon Air Force Station. The Army Corps of Engineers began constructing a road between Naknek and King Salmon in 1949. Before this time a dog and foot trail had connected the two areas. Growth of the community has been related to the expansion of transportation services along with an influx of state and federal agencies.

The 1980 U.S. Census listed 75 households with 170 residents in King Salmon. In 1981 the Bristol Bay Borough Census found that 375 persons resided in King Salmon. Another 371 Air Force personnel were stationed at the 'King Salmon station. The reason for differences between the censuses is uncertain. Before the early 1980s there was limited private

TABLE 6. LIMITED ENTRY SALMON GILL-NET PERMITS MAILED TO BRISTOL BAY BOROUGH ADDRESSES, 1984[a]

Community	Drift Permit	Set Permit	Total Permits
King Salmon	13	19	32
Naknek	44	78	122
South Naknek	18	30	48
Total	75	127	202

[a] As of 6/19/84, Limited Entry Commission.

TABLE 7. BRISTOL BAY BOROUGH SALMON FISHERMEN COSTS AND EARNINGS IN 1979

	Salmon Drift Gill-Net (252 Respondents)	Salmon Set-Net (120 Respondents)
Participation and Investment		
Time spent fishing	29 days	29 days
Fuel consumption	866 gallons	334 gallons
Crew size	2.6	3.9
Investment		
Vessel	$ 38,569	$ 11,709
Entry permit	107,721	30,996
Fishing gear	9,775	3,553
Fishing site	0	8,567
Costs and Returns		
Total fishery income	$ 71,968	$ 16,493
Operating expenses	30,289	5,243
Capital equipment expenses	11,329	4,416
Depreciation	11,079	1,585
Net Income		
Net cash available	$ 30,372	$ 6,833
Returns to labor and management	16,620	6,468
Range of Gross Income	$25,000 - $125,000	

Source: Kramer, Chin, and Mayo 1983.

residental housing in King Salmon. Much of the housing consisted of government quarters, owned by the State of Alaska, National Park Service, U.S. Weather Service, and the Federal Aviation Administration. A variety of apartment buildings, duplexes, trailers, and single family dwellings were built, with each agency clustering in a distinct complex. Privately owned housing was concentrated in the vicinity of King Salmon and Eskimo Creeks (Fig. 4).

Most land in King Salmon became available with the subdividing of homesteads originally staked in the late 1940s and 1950s. Other parcels had been obtained under a bid lease sale in the late 1950s under the auspices of the state. The new housing generally consists of single family units or units with individual family housing on one level and either one or two apartments located on a lower level. Most units are constructed of wood siding. Households occupying the multi-unit dwellings are rarely kinship-related. The owners of the new housing units tend to be employees of various state and federal agencies or associated with the transportation services operating out of King Salmon.

Located in King Salmon proper is the main air terminal. Capable of handling jet aircraft, the King Salmon airport is not only the air traffic center for the Bristol Bay Borough, but also for much of the entire Alaska Peninsula. In addition to housing passenger and cargo facilities for commercial air carriers, the main terminal also houses a bank, gift shop, and the post office. There are two air taxi terminals, one general store, two bar/restaurants and two hotels in the King Salmon environs. The National Park Service administers Katmai National Park and Preserve and Aniakchak National Monument and Preserve from a headquarters situated across the road from the airport. The Alaska Department of Fish and Game, including

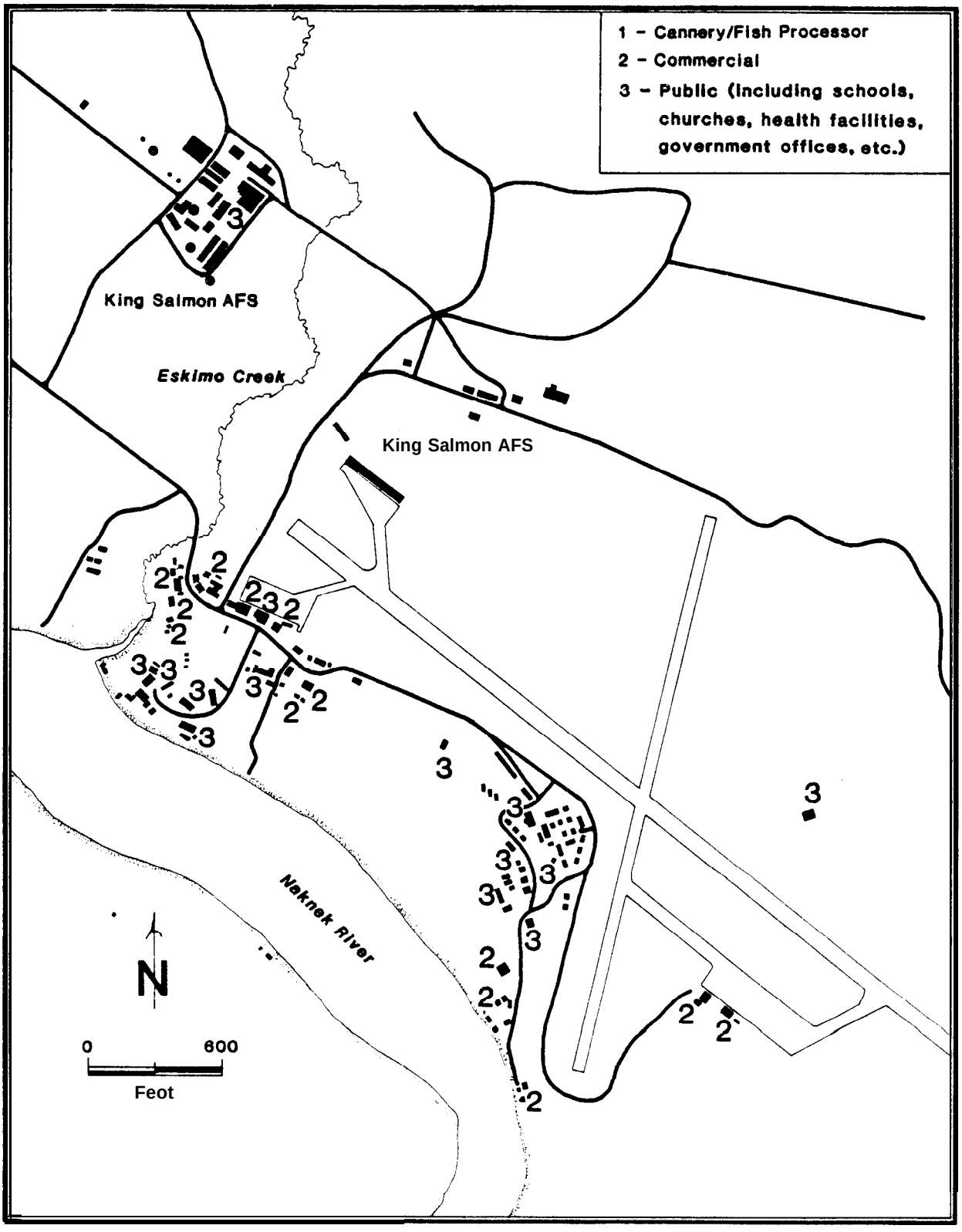

Figure 4. The Community of King Salmon, 1979.

offices of the state trooper and Fish and Wildlife Protection of the Department of Public Safety, has a complex approximately 1/8 mile south of the air terminal. In the same general area are the headquarters of the U.S. Fish and Wildlife Service which administers the Becharof and the Alaska Peninsula Wildlife refuges, and the King Salmon Fisheries Resource Station. The complex includes a number of office and warehouse buildings in addition to eight housing units. The Federal Aviation Administration operates a flight service station and staffs a control tower. The U.S. Weather Service personnel operate out of the flight service station and maintain a detached weather observation station. Along the dock area are two business establishments and a boat storage for 32' gill-netters. On the opposite end of town, at King Salmon Creek, is located a general construction contractor and a heavy equipment/transportation contractor. Finally, the Bristol Bay Telephone Cooperative and the Lake and Peninsula School District offices are located in King Salmon. Several seasonal fish and game guiding businesses are also based in King Salmon, frequently in facilities located along the river's edge.

The 15 mile paved road begins at the site of the King Salmon control tower and ends in Naknek. Officially called the "Alaska Peninsula Highway," it is locally referred to as the "Naknek/King Salmon road." Off of each side of the main road are a number of smaller dirt and gravel roads. The borough maintains certain side roads while the maintenance of the Naknek/King Salmon road and the runways are the responsibility of the State of Alaska.

Households located in King Salmon tend to have members with year-round wage incomes. The majority of state and federal jobs in the borough are located in King Salmon. Frequently they are positions to which individuals have been transferred as part of a longterm career in government service. It

is common for one household member to have steady wage employment, and often more than one member has employment. The combined salaries of these households undoubtedly account for the household income average (Table 8), the highest in Bristol Bay and one of the highest in the United States.

Direct involvement with the commercial fishing industry is less evident in the King Salmon community than in Naknek or South Naknek. There were 32 commercial salmon permits sent to King Salmon addresses in 1984 (Table 6). Addresses on permits give a limited amount of information, as they do not distinguish those persons only receiving mail in a community from those actually living there. Also, the small number of permits is not a reliable indicator of the influence of the commercial salmon fishery in King Salmon. The transportation services operating out of King Salmon do a high percentage of their business during the commercial fishing season. Fishermen, fishing crews, and cannery workers arrive at the King Salmon terminal. and many are transported to outlying areas by one of the air taxi services. In addition to air transport, land-based taxicabs, bars, restaurants, hotels and other businesses all depend on the commercial fishing season. The post office experiences a doubling of their revenue and incoming mail activity during the four and one half months of mid-April to late August, largely based on commercial fishing activity (J. Shawback: personal communication, 1984).

An additional effect of the commercial fishing industry is the number of cannery jobs filled by residents of the King Salmon community. One processing plant in Naknek has hired a number of high school students for several years, many of whom live in King Salmon. In addition to students, there are a number of Air Force personnel who work during the peak of the fishing season. The workers, who usually work 12-hour shifts, are provided bus transportation by the processor. As few of the children of Ying Salmon

TABLE 8. AVERAGE HOUSEHOLD INCOMES,
BRISTOL BAY BOROUGH COMMUNITIES, 1980.

Community	Total Community 1980 Personal Income ($ x 1000)	Number of Households	Average Household Income 1980 ($ /HH)
Naknek	$4,097.8	103	$ 39,784
King Salmon	4,665.3	75 (+ 9 Igiugig)[a]	55,540
South Naknek	570.7	43	13,272

[a] Igiugig was included with King Salmon by Nebesky et.al. in order to protect the confidentiality of the households.

Source: Nebesky et al. 1983

residents have access into commercial fishing, fish processing is one way to earn a summer income. Part-time employment often available to teens elsewhere, such as fast food restaurants, is lacking in King Salmon.

One characteristic of King Salmon which differs from the other two communities is the influx of yearly tourists. Sports fishing on the Naknek River is concentrated on the section most accessible from King Salmon, particularly the stretch between Naknek Lake to below King Salmon Creek. King Salmon also serves as the departure point to outlying lodges and camps. Approximately 4,000 visitors each summer spend at least one night at Brooks Camp in Katmai National Park. The great majority of these visitors pass through King Salmon. Hunting on the Alaska Peninsula for bear, caribou, and moose attracts people from around the world. Each year scores of hunters charter local air taxis to areas south of the Naknek River. One local air taxi estimated that the bulk of its revenues comes from hauling people and equipment for hunting, sport fishing, or commercial fishing during about nine months of the year. The most popular period for hunting trophy caribou and moose is September. Bear hunting occurs in the fall or spring, depending on the year's regulatory season.

South Naknek

Smallest of the three communities, South Nakenk had a population of 145 according to the 1980 U.S. Census (Table 5). A census taken in 1981 listed 136 persons residing in 46 households. This figure has remained relatively stable for the last three censuses, with 154 persons recorded in 1970 and 142 in 1960 (U.S. Census 1980).

South Naknek, like Naknek, has had a long history of occupation. Early records note a single village, with dwellings on both sides of the river. Separate census figures are available only since 1960. A number of the families currently living in South Naknek are descendants of people who moved from the village of Old Savonoski, located on the Ukak River. Granted permission by the leaders of Pauqvik (the original name of Naknek), the survivors settled in a new location aptly called New Savonoski, approximately seven miles upriver from South Naknek. Apparently there was regular contact between all the river communities once New Savonoski was established. After the flu epidemic of 1918-19, survivors of the epidemic remaining in New Savonoski evidently joined those in South Naknek and by 1954 only one family remained in New Savonoski (Holthaus 1968).

A variety of older wooden structures, along with 15 HUD houses constructed in 1979, comprise the physical layout of the village. The center of town runs along either side of a road leading from the airfield to Sealaska Cannery located on the river's edge. The school, teacher's quarters, Lutheran church, village council office, firehall, health clinic and bar/store are interwoven with individual homes along this route (Fig. 5). Side roads lead to additional homes, other cannery facilities, a Russian Orthodox church and the post office. It appears that the original village site was situated in proximity to the river with homes established relatively close to one another. New housing is being constructed further away from the center of the village. The spreading of the village can be attributed in part to the recent availability of improved transportation vehicles and construction equipment such as three-wheelers, automobiles, and cats, which allow for ease of mobility and transportation of goods and construction services.

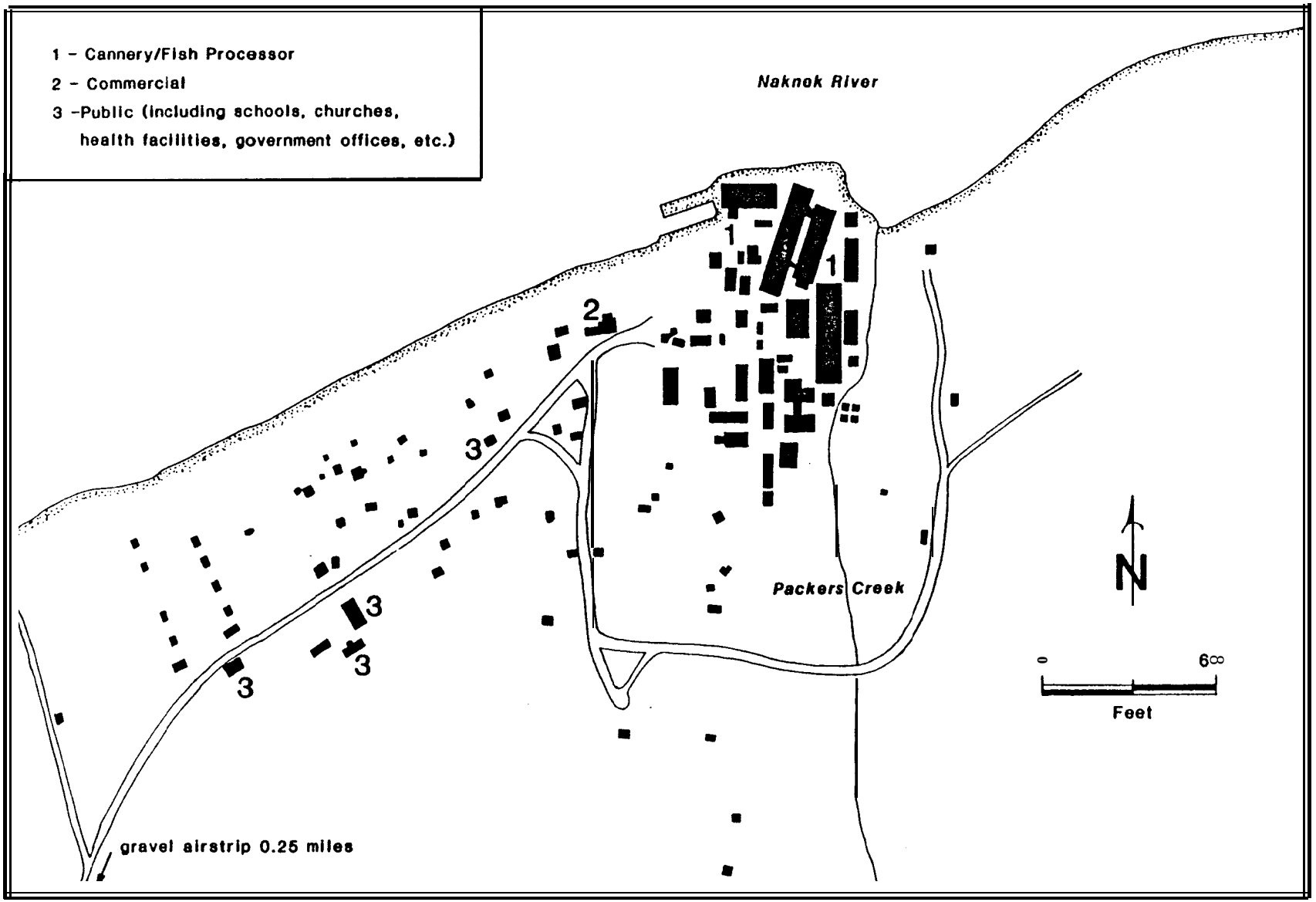

Figure 5, The Community of South Naknek, 1979.

A dirt road system connects the village and outlying households. Numerous three-wheeler tracks are also found throughout the village and the surrounding area. The beach is not used extensively for travel within the village but is used daily during fishing season. The village council listed upgrading the road system as the highest priority during the fiscal 1985 budget hearing. The majority of the households consist of single nuclear families, though there are instances in which an older person lives with grown children or grandchildren. Scattered among the houses are banyas (wood burning steambaths), smokehouses, and a variety of sheds and workships. Frequently a number of households share outbuildings. The sharing pattern occurs along kinship lines.

There is an influx of seasonal residents in South Naknek each fishing season. They arrive beginning in April and depart anywhere from July through October. Many of these summer residents are associated with the canneries or fishing vessels which have their home port in South Naknek but have no ties with residents of the village. A good number of individuals return, however, who have long established ties to the village. Frequently they have been raised in the village and now live elsewhere during the non-fishing months, but return to spend the fishing season with their grandparents and parents. Some of these seasonal residents hold year-round jobs and use their leave time to return 'home' to fish. Other returnees attend school, travel, or have part-time employment during the winters but continue to view South Naknek as their permanent home. Some of the seasonally vacant housing units are second homes for these returning residents. There are also a number of families who maintain two residences within the borough, one in South Naknek and the other on the north side of the river. Better employment opportunities and proximity to the high school are major reasons families live north of the

river during the fall and winter months and return to South Naknek during the summer. Commercial setnet sites for the households maintaining dual borough residency are located on the South Naknek beach.

There is no bridge connecting South Naknek with the communities and road system on the north side of the Naknek river. Private and chartered aircraft are the most common means of transportation from one side of the river to the other. Skiffs, often shared by several households, are used during open water. Fieldwork indicated that of the 51 South Naknek households occupied during July 1982, 18 had skiffs. When ice conditions permit, the frozen river provides a link to the north side of the river by motor vehicle. According to local residents, years ago dog sleds were used for crossing the river much as trucks and three-wheelers are today.

A 3000' gravel runway together with a 1350' crosswind runway serves aircraft needs for the community. In 1983 runway lights were installed. The' airfield is heavily used, with air taxi services from Naknek and King Salmon providing the majority of the flights. There is no locally owned air taxi in South Naknek. Approximately four or five residents own small private aircraft. They are used for travelling across the river and for hunting, berry gathering, and visiting friends and relatives in communities south of the local area. School children in the upper grades are flown daily to school in Naknek. For safety reasons the school plane schedule is adjusted to weather and light conditions which has a significant effect on the scheduling of school hours and extracurricular events. Until the 1983-84 school year, any student participating in after school activities was required to remain on the north side of the river in a boarding home during the school week. Beginning with the 1984 school year, efforts were made to return the students to their homes whenever weather and light conditions permited, thus eliminating

the need for boarding homes. In 1984, a round trip between Naknek and South Naknek cost between $40 and $60 seatfare from Naknek and $60 and $80 from King Salmon. The expense of getting across the river has a significant effect on the number of school and borough activities held on the north side of the river in which South Naknek residents particpate.

Wage earning opportunities for residents of South Naknek are more limited than for residents living in Naknek or King Salmon. Principal employers include the borough, the local school district and the village council (Tables 9 and 10). There is one store/bar which employs a limited number of people.

Community Differences

There are certain features which differentiate the communities of the Bristol Bay Borough. The transient nature of King Salmon residents is one differentiating feature and contrasts with the long-time residency patterns of South Naknek and to some extent, Naknek. Economic opportunities, transportation methods, land ownership, and housing availability also vary among the three Bristol Bay Borough communities.

One example of varying economic characteristrics among the three communities is illustrated in the comparison of average household income (Table 8). The 1980 income information correlates with 1981 and 1982 income tax information provided by the Alaska Department of Revenue (1985:44-51). King Salmon reported the highest income averages for all three years. Appriximately 200 returns reported an average taxable income of $24,087 in 1981 and $22,030 in 1982. South Naknek consistently had the lowest average incomes with $13,272

TABLE 9. FEDERAL, STATE, AND LOCAL GOVERNMENT EMPLOYMENT FOR BRISTOL BAY BOROUGH, 1984.

	No. of Year-Round Employees		
	King Salmon	Naknek	South Naknek
Federal Government			
U.S. Air Force	340	0	0
Federal Aviation Administration	33	0	0
U.S. Fish & Wildlife Service	10	0	0
National Park Service	7	0	0
National Weather Service	3	0	0
U.S. Post Office	3	3	3
Subtotals	396	3	3
State Government			
Department of Transportation	12	0	0
Public Health Office		2	0
Department of Fish & Game	7	0	0
Department of Public Safety	3	0	0
Lake & Peninsula School District, District Office	17	0	0
Court System		2	0
Health Aids (State & Federal funding)	1	1	1
Subtotals	40	5	1
Local Government			
Bristol Bay Borough	0	16	1
Bristol Bay School District	0	34	4
Martin Monsen Regional Library	0	1	0
Village Councils	0	3	1
Camai Medical Clinic	0	2	0
Subtotals	0	56	6
Total Government Employment	436	64	10

Source: Kramer, Chin, and Mayo 1983.
Update: ADF&G, Division of Subsistence 1984.

TABLE 10. LAND-BASED BUSINESSES IN BRISTOL BAY BOROUGH, 1984.

Type of Business	King Salmon	Naknek	South Naknek
Boat Storage	2	3	0
Banks		0	0
Dry Goods and Grocery Stores	1	3	1
Lumber	0	1	0
Bars and Restaurants	2	4	1
Air Services	4	4	0
Gas	2	2	0
Contractors	2	0	0
Rental Equipment	2	0	0
Repair, Automotive	2	0	0
Hotels	2	2	0
Total	20	19	2

Source: Kramer, Chin, and Mayo 1983.
Update: ADF&G Division of Subsistence 1984.

reported for an average household income in 1980, $15,309 for an average taxable income of 47 returns in 1981, and $11,747 for 35 returns in 1982.

Two factors contribute to the transient reputation associated with King Salmon by many borough residents. One factor is the presence of a military base and the second is the location of a relatively high number of government agencies staffed with personnel from outside the immediate area. Air Force troops stationed in King Salmon rotate on a staggered 12 months basis. The constant turnover contributes strongly to the transient image of King Salmon even though most residents do not consider the Air Force personnel as members of the Bristol Bay Borough community.

There are a variety of state and federal agencies present in King Salmon (Table 9). Most have a core of employees who transferred to their present positions as part of a long-term career trajectory. Many of the federal employees have come from the lower 48 and have few ties to other Alaskan areas. Among the federal agencies, the Federal Aviation Administration (FAA) with approximately 33 employees is the largest. No official "average" length of stay for this agency's personnel could be determined. Some employees have been in the area for more than 20 years and several others for ten or more years. Others transfer in and out within one or two years. As this report is being written internal changes in FAA in King Salmon will diminish the number of fulltime jobs to approximately 23.

The National Park Service (NPS) and U.S. Fish and Wildlife Service (USFWS) have administrative offices in King Salmon. A permanent NPS staff of seven is responsible for administering Katmai National Park and Preserve. The length of stay for the current staff varies from two to nine years in King Salmon. In 1979 one USFWS employee, responsible for

managing Becharof and Alaska Peninsula Wildlife refuges, was stationed in King Salmon. By 1985 the total number of USFWS staff had grown to thirteen. As both the NPS and USFWS staffs have added a number of new positions in the last five years, it is difficult to determine an average length of stay. Each of the three U.S. Postal service employees has been in the community for at least 15 years. Employees are selected locally. The Weather Service has three employees. The positions are recruited from outside the local area with an occasional change of employees. Housing in King Salmon is provided for many of the employees of these agencies. As the housing is clustered in distinct areas, employees are identified by others as belonging to a particular group.

Of the state agencies located in King Salmon in 1984, the administrative office of the Lake and Peninsula School District has the largest staff (Table 9). Personnel changes occur from time to time, normally during the summer. Housing is not provided and most employees find private housing in King Salmon. The Department of Transportation (DOT) hires a number of employees to maintain the road and runways. Many of the DOT staff have lived for many years in the local area. Housing is provided for two of the employees; remaining personnel are responsible for their own housing. Some live in Naknek, others in King Salmon. State Fish and Game employees, Fish and Wildlife Protection staff, and the state trooper share a single office. A total of ten employees work out of this office. Lengths of residency in King Salmon vary from one employee with 13 years, two with ten and three with three years in the King Salmon community. All of these employees live in King Salmon, most in state housing.

Each state and federal agency has a number of positions traditionally filled through local hire. These jobs are either officially classified as "local hire" which requires that they be advertised locally or are "de facto" positions, such as clerical and maintenance positions. These positions provide for a degree of local continuity within the agency. They also provide job opportunities for local residents.

South Naknek has few opportunities for an outsider with no personal connections to become established in the community (Table 9 and 10). Teaching positions have traditionally been filled by non-local staff. The turnover rate varies from those who have remained one or two terms to one teacher who remained in the position for approximately ten years. In addition to teaching, other employment possibilities which attract newcomers to the community include cannery or construction work. With the exception of cannery caretakers, locally called "wintermen," most work in these jobs is seasonal. Therefore, outsiders normally live in South Naknek for the duration of the individual job and move out of the community. Overall, newcomers who remain in the community for any length of time are connected through marriage to a household already established in the community.

Naknek as the local government and commercial center has, like King Salmon, attracted a steady influx of newcomers. Economic opportunities exist for salaried positions and self-employed or small business situations. The professional staffs of the Bristol Bay School District and the borough are often recruited state and nationwide. As in King Salmon, clerical and maintenance staffs are most frequently local residents. A relatively large number of the teaching staff originally recruited from outside the local area have remained for several years. Of the 1983-84 staff, eight of the 23 teachers on staff had been in the community for ten

years or more. Conversely, nine had been living in the area for three or less years. Within the administration in 1983-84, two positions were held by persons newly arrived in the area, both coming from outside the immediate locale. The remaining professional staff member had held his position for two years at the beginning of the academic year.

The business community of Naknek draws employees from both local and non-local areas. As many of the businesses are dependent on the commercial fishing industry, there are limited permanent year-round jobs. Some of the businesses close down entirely during the winter months while others operate with a mimimal staff. The canneries, and other fish related businesses frequently bring up summer crews from outside the local area. It is argued by some cannery personnel that due to nonreliability, local hiring can not be depended upon to meet the full season's processing needs.

Naknek stands as a blend between the "transient" residency label of King Salmon and the conservative residency character of South Naknek. The borough office and school, plus the variety of commercial and industrial enterprises, attract new persons each year. Some of these individuals eventually choose to remain in the community. Frequently these individuals or members of their families marry into local families, thus providing a kinship network for the newcomer. Economically, the greatest percentage of steady wage employment is found in Naknek and King Salmon. The highest level commercial fishing occurs in Naknek and South Naknek.

The residency status of an individual often depends on who is questioned. The variety of answers is indicative of the mixed feelings which exist among persons residing in the borough. Some residents feel

that long established kinship ties are necessary to consider one person a resident of Bristol Bay. Others feel that once belongings are unpacked, the newcomer becomes a Bristol Bay resident. What remains consistent is the reality that the greatest influx of new residents occurs on the north side of the river and those with the greatest potential of becoming fully integrated in the social structure of the borough tend to be located in Naknek.

The Native community is spread among all three locations. As Table 4 indicates, South Naknek has the highest percentage of Natives. Few Natives are reported to reside in King Salmon. The next census might report a change in numbers of Natives residing in King Salmon although the ratio of white to Native Alaskans will probably remain constant. As in so many aspects of the Borough, Naknek stands in the middle of the other two communities with approximately 50 percent of the population being Native.

It is easy to demonstrate differences between the three communities, but care must be taken not to overgeneralize. There are common elements running through the three communities. Kinship ties, a joint junior and senior high school, and a common interest in commercial fishing are examples of unifying factors. The geographic area is not so large that physical boundaries remain distinct. A number of King Salmon households have long standing ancestral ties to households in both Naknek and South Naknek. As new households become established, land and housing availability are prime considerations in choosing a place to live. Improved transportation and communication have removed physical proximity as a primary consideration in keeping social and kinship ties strong. This is less true when considering logistics of crossing the river from King

Salmon and Naknek to South Naknek. But should a bridge be built, as has been discussed from time to time, the distinguishing characteristics between the three communities will become even more blurred.

CHAPTER FOUR

THE NATURAL SETTING

LOCATION

Naknek, South Naknek, and King Salmon are located along the banks of the Naknek River (Fig. 1). The watershed for this river lies on the western side of the Aleutian Mountain Range at the base of the Alaska Peninsula and covers approximately 3600 square miles. King Salmon is located 58°41'30"N and 156°39'30"W. Naknek is situated approximately 15 miles down river at 58°43'40"N, 157°00'45"W. South Naknek is directly across the river at 58°41'N and 157°W. King Salmon, the main air transportation terminal for the area, is 290 air miles southwest of Anchorage.

A complex network of rivers and lakes empties into Naknek Lake, the fourth largest in Alaska. The Naknek River drains this lake, winding approximately 30 miles before emptying into Kvichak Bay. Much of the river is a tidal estuary. At the mouth the mean tidal range is 18.5 feet, the daily range of the tide is 22.6 feet and the extreme range is 28 feet. At King Salmon, midway up the river, the mean tidal range is 2.1 feet and the daily range is 3.2 feet. The tidal effect extends approximately six miles upstream from King Salmon. Feeding the Naknek River are four major tributaries. Two tributaries are located to the north of the river, Paul's Creek and King Salmon Creek. Smelt Creek and Big Creek both empty into the river from the south. Additionally there are numerous surface-fed streams which flow into Naknek River. The river, three-quarters of a mile wide at the mouth, has a narrow channel which may be travelled the length of the river. Using extreme high tides, 32' fishing boats have

travelled the entire distance to Naknek Lake. Most boats of this size, however, proceed no-further than King Salmon due to a stretch of rapids approximately eight miles upstream of the community.

Kvichak Bay forms the northeastern arm and headwaters of the larger Bristol Bay. The Kvichak River (the drainage for Lake Iliamna) and the Naknek River feed into this bay. The entire Bristol Bay is estuarine and is fed by major river systems, including the Naknek, Kvichak and Egegik Rivers. Mean salinity is 28.9 parts per thousand, and the mean temperature is 11.4 degrees centigrade for the inner bay. Wind speeds and direction are extrememly variable, and due to the shallowness of the water create steep, irregular waves. Sea and river ice is normally present from mid-November to mid-April, though due to the extreme tidal fluctations shore fast ice does not form. Along the coast line of the Kvichak Bay, low sea cliffs range from 25 to 75 feet. At the mouth of the Naknek river the cliffs occasionally reach upwards to 100 feet in height.

Geology

The entire Alaska Peninsula forms a part of the "ring of fire", a long semi-circular chain of volcanoes that extends around the Pacific rim. Historically, volcanoes located on the peninsula have been extemely active. At least 47 have erupted or issued steam since 1760. Table 11 documents recent eruptions in the Naknek River area.

In the immediate vicinity of the Naknek River communities, the surficial geology consists of moraine and glacial drift features plus some alluvial floodplain and glacial outwash deposits in the low-lying areas.

TABLE 11. LOCAL VOLCANIC ACTIVITY.

	Approximate Summit Height	Number of Eruptions Since 1700	Date of Last Eruption
Martin	6,050 ft.	0	--
	Remarks on Activity		
	Intermittent steaming since 1912.		
Megeik	7,295 ft.	4	1946
	Remarks on Activity		
	Ash eruption -- 1912, 1926, 1927, 1953; active -- 1929, 1946.		
Novarupta	2,760 ft.	1	1912
	Remarks on Activity		
	Vent breached during 1912 Katmai eruption. Main source for ash pumice flow deposits in Valley of 10,000 Smokes.		
Trident	6,830 ft.	3	1968
	Remarks on Activity		
	Steaming 1912 lava eruption--1953; explosive, ash-charged vapor column -- April 1963 and May 1964; Vent clearing explosions plus ash eruptions -- Dec. 1967 to Feb. 1968, Nov. 1968.		
Katmai	7,540 ft.	7	1931
	Remarks on Activity		
	Explosive eruption with vast pumice and ash deposits accompanied by caldera collapse caused extensive damage to buildings and crops on Kodiak Island and corrosive rains at Seward and Cordova -- 1912, steam -- 1931.		

Note: All aforementioned volcanoes are located within Katmai National Park.

Source: Kramer, Chin, and Mayo 1983

Low moraine hills and shallow lakes characterize the region. Coastal and river bluffs are composed of glacial drift and fluvial deposits which are unconsolidated and unstable. Winds, waves and tidal action can cause extreme erosion in these areas. The Arctic Environmental Information and Data Center (AEIDC) has generalized soil types for the southwest region. Much of the area around the Naknek River consists of poorly drained loamy soils with a peaty surface layer and a shallow permafrost table. More specifically, the Soil Conservation Service identified a soil series for a 40 square mile area within the Bristol Bay Borough. Four soil types were found to compromise 98 percent of the study area.,. Table 12 outlines the characteristics of these soils.

Climate

Due to the coastal setting, the Naknek drainage experiences a maritime climate, with relatively mild temperatures and moderate precipitation. Summers are cool with average temperatures ranging from 50 to 60 degrees Fahrenheit, though temperatures in the 80s have been recorded. Winter temperatures are generally moderate; average minimum temperatures range from 6°F to 20°F. Table 13 illustrates average daily temperatures for 1983 and compares them to a 21-year average established between 1942-1983. Average rainfall is 19.6 inches annually with an average snowfall of 44.7 inches.

Cloudy skies are common in the area. Cloud cover is to be expected approximately 80 percent of the time. Fog is frequent during the summer months. Winds are an important climatic feature of the Bristol Bay area. In the Naknek drainage, wind speeds throughout the year average approximately

TABLE 12. SOIL SERIES IDENTIFIED FOR THE BRISTOL BAY BOROUGH

Kvichak Series	A well-drained soil consisting of a layer of volcanic ash over strata of loam, sandy loam, and sand. It is a very acid soil, and is found on terraces bordering the Naknek River and adjacent tributaries, and on some hills.
Naknek Series	A poorly-drained perennially frozen soil consisting of a peaty surface mat, sphagnum moss and sedge, over mineral layers often consisting of volcanic ash.
Pustoi Series	A well-drained soil consisting of volcanic materials overlain by a silt-loam or loamy sand.
Tolsona Series	Soils which are sandy, generally poorly drained, with a shallow permafrost table.

Source: Kramer, Chin, and Mayo 1983.

TABLE 13. CLIMATIC DATA FOR KING SALMON, ALASKA.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Temperature[a] (F°)													
Mean since 1942	13.3	15.1	20.4	31.3	42.6	50.3	54.6	54.0	47.1	33.4	22.7	12.7	33.1
Max.	20.7	23.2	28.7	39.1	51.2	59.2	62.7	61.2	54.6	40.5	29.7	20.4	40.9
Min.	5.8	7.0	12.0	23.5	33.9	41.4	46.4	46.7	39.6	26.3	15.6	5.0	25.3
1983 Mean	11.9	18.7	33.2	36.5	46.6	53.8	57.4	54.1	45.5	28.8	30.1	27.2	37.0
Precipitation[a] (inches)													
Mean since 1943	1.03	0.91	1.22	0.98	1.14	1.58	2.13	3.18	2.85	2.10	1.38	1.19	19.59
1983 Mean	0.42	0.25	0.22	2.22	1.37	1.20	1.53	2.33	2.36	2.82	0.98	0.48	16.18
Snowfall[a] (inches)													
Mean since 1950	7.1	6.2	7.5	4.7	0.9	Trace	0.0	0.0	0.1	3.0	5.6	8.6	44.3
1983 Mean	4.0	2.0	Trace	6.0	0.1	0.0	0.0	0.0	Trace	9.9	2.3	2.8	27.1

[a] Record mean values above are means through the current year for the period beginning in 1942 for temperature, 1943 for precipitation, and 1950 for snowfall.

Source: National Oceanic and Atmospheric Administration, Local Climatological Data, 1983, King Salmon, Alaska.

nine knots. Winter brings prevailing easterly winds while summer months experience southwesterly winds. The easterly winds are normally strongest, averaging 13.1 knots. Extreme winds occur throughout the year, in the range of 40 to 70 knots with the strongest winds coming in the winter.

Vegetation

The area surrounding the Naknek River is classified as a transitional zone between subarctic forest and arctic tundra. Scattered spruce trees grow east and northeast of King Salmon, the area becoming treeless to the west and southwest of the community. Distribution of the spruce trees appears to be associated with soil conditions. Most trees in the Naknek region are shallow-rooted and are easily overturned by strong winds.

Various types of tundra communities are found in the Naknek drainage. Willow and alder dominated shrub communities are distributed widely, most prominently along creek and river drainages.

Fauna

The Naknek river drainage and areas both north and south support large and diverse populations of animals. Large terrestrial mammals include caribou, moose, and brown bear. Numerous species of valuable furbearing and smaller animals are also found, including the wolf, wolverine, lynx, arctic and tundra hare, porcupine, and beaver. Marine mammals present along the coast include belukha, walrus, and harbor seals. Waterfowl, seabirds, and raptors are also important fauna1 elements in the region.

The entire Bristol Bay region is a major staging area for migratory waterfowl, including Pacific black brant, Canada geese, pintail, mallard, teal, oldsquaw, eider, scoter, goldeneye, and scaup. The Kvichak River is a major migration route for whistling swans and sandhill cranes.

Saltwater, anadromous, and freshwater fish are among the most abundant and important resources found in the region. Species of notable importance include salmon, rainbow trout, Dolly Varden, grayling, and lake trout. Species of particular importance for consumptive uses by residents of the study area are discussed in greater detail in a later section of this report.

CHAPTER FIVE

RESOURCE USE

INTRODUCTION

A combination of riverine, marine, and terrestrial ecosystems provides varied habitat for a diversity of flora and fauna, many of which are utilized by residents of the Naknek River drainage. Appendices D and E provide a comprehensive list of flora and fauna found in the Bristol Bay Region. For the most part, information presented in this section includes current practices and use patterns and does not deal with resource use in an historical sense.

RANGE OF RESOURCES HARVESTED AND HARVEST QUANTITIES

Table 14 provides a list of resources used in the Naknek area during 1983, although due to a lack of data on plants, the information is incomplete. Table 15 presents the percentage of the sampled households that used, harvested, or received various resource categories during the study period. As might be expected, salmon (70 percent) and caribou (77 percent) percent) showed the highest level of use. Over half (54 percent) of the households harvested caribou while 70 percent harvested salmon. Other commonly used resources included birds (54 percent), clams (39 percent), and moose (31 percent). Eighty-six percent of the sample harvested freshwater fish, while 50 percent dug clams, and 8 percent took moose. Generally, the most commonly harvested or used resources were also the most widely shared. For example, 36 percent of the sample received caribou from

TABLE 14. WILD RESOURCES USED BY BRISTOL BAY BOROUGH RESIDENTS. 1983.

MAMMALS
- caribou
- moose
- arctic hare
- snowshoe hare
- beaver
- porcupine

- harbor seal
- belukha
- walrus

- lynx
- land otter
- marten
- mink
- red fox
- wolf
- wolverine

EGGS
- seagull
- tern

MARINE INVERTEBRATES
- razor clams
- butter clams

BIRDS[a]
- Ducks
  - green-winged teal
  - northern shoveler
  - northern pintail
  - gadwall
  - American wigeon
  - common goldeneye
  - Barrow's goldeneye
  - greater scaup
  - bufflehead
  - common merganser
  - mallard
  - canvasback

BIRDS, cont.
- Geese
  - white-fronted goose
  - emperor goose
  - Canada goose

- Other species
  - lesser sandhill crane
  - snipe
  - willow ptarmigan
  - spruce grouse

FISH
- Anadromous
  - red (sockeye) salmon
  - king (chinook) salmon
  - silver (coho) salmon
  - chum (dog) salmon
  - pink (humpback) salmon
  - rainbow smelt
  - arctic char[b]
  - Dolly Varden[b]

- Freshwater
  - arctic char[b]
  - Dolly Varden[b]
  - lake trout
  - rainbow trout
  - arctic grayling
  - northern pike
  - burbot
  - blackfish

FLORA
- crowberry
- blueberry
- lowbush cranberry
- highbush cranberry
- currents
- salmonberry

[a] Information on birds used by Bristol Bay Borough residents was provided by Richard Sellers and Mark McNay, ADF&G, pers. comm., 1984.

[b] Some are anadromous; some are not.

Source: ADF&G Division of Subsistence March 1984.

TABLE 15. PERCENTAGE OF BRISTOL BAY BOROUGH HOUSEHOLDS USING NATURAL RESOURCES, 1983.

Species	Percent of Households Using Resource	Percent of Households Harvesting Resource	Percent of Households Receiving from Friends	Percent of Households Receiving from Relatives
Moose	31%	8%	22%	4%
Caribou	77%	43%	35%	15%
Belukha	a	0	3%	0
Harbor Seal	a	3%	7%	b
Walrus	a	1%	3%	0
Tundra Hare	a	6%	3%	0
Snowshoe Hare	a	4%	1%	0
Porcupine	a	4%	2%	0
Birds	54%	50%	9%	5%
Tern eggs	6%	a	a	a
Seagull eggs	15%	a	a	a
Clams	39%	a	a	a
Salmon Subsistence	70%	a	16%	b
Freshwater fish	a	86%	a	a

[a] Specific information not included in data collection.
[b] "Received" was asked, but not as to relatives or friends.

Source: ADF&G Division of Subsistence March 1984.

relatives and 15 percent received caribou from friends. Many households also received moose either from relatives (22 percent) or friends (4 percent). Descriptions of these various resource categories and the particulars of use patterns are included in discussions on the specific species which follow seasonal round information.

Table 16 reports harvest quantities in numbers and in pounds dressed weight for the entire Bristol Bay Borough sample. No harvest data are available for waterfowl, game birds, clams, and plants. The mean household harvest during the study period was 646 pounds. Of this, about 47 percent (300.7 pounds) was salmon, 37 percent (234 pounds) was caribou, 8 percent (51 pounds) was moose, 7 percent was other fish, and less than one percent (3.9 pounds) was small game and harbor seal. The per capita harvest of these resources was 215 pounds for the entire borough sample.

The Bristol Bay Borough communities exhibited a number of similarities in wild resource harvest patterns. As illustrated in Table 17 and Figure 6, the mean household harvest of wild resources (excluding birds, clams, and plants) was 586 pounds in Naknek, 666 pounds in King Salmon, and 753 pounds in South Naknek. Caribou and salmon were the major resources harvested. None of the communities relied on freshwater fish or small game to a significant degree. In addition to household harvest levels being comparable, per capita levels were similar. The per capita harvest during the 12 month study period was 188 pounds in Naknek, 220 pounds in King Salmon, and 268 pounds in South Naknek.

While resource harvest levels were comparable among the three communities, the relative harvest of certain species varied. Caribou harvest is indicative of one of these differences (Fig. 6). Caribou contributed 55 percent of the harvest total in terms of edible pounds in South Naknek, 29 percent in Naknek

TABLE 16. HARVEST TOTALS OF NATURAL RESOURCES TAKEN FOR HOME USE BY SAMPLED BRISTOL BAY BOROUGH RESIDENTS, 1983.

Species	Total Edible pounds harvested by sampled households	Number of HHs harvesting species	Mean Household harvest among harvesters	Per Household harvest among sample group n=116	Per capita harvest among sample group n=348
Caribou	27,150	50	543.0 lbs.	234.0 lbs.	78.0 lbs.
Moose	5,940	9	660.0 lbs.	51.0 lbs.	17.0 lbs.
Harbor Seal	168	3	56.0 lbs.	1.4 lbs.	.5 lbs.
Tundra Hare	123	7	17.6 lbs.	1.1 lbs.	.4 lbs.
Snowshoe Hare	a4	5	16.8 lbs.	0.7 lbs.	.2 lbs.
Porcupine	80	5	16.0 lbs.	0.7 lbs.	.2 lbs.
Beaver	420	6	70.0 lbs.	3.6 lbs.	1.2 lbs.
King Salmon (a)	14,235	81	175.7 lbs.	123.0 lbs.	41.0 lbs.
Red Salmon (a)	15,721	61	257.7 lbs.	135.5 lbs.	45.0 lbs.
Coho Salmon (a)	3,727	56	66.6 lbs.	32.0 lbs.	11.0 lbs.
Chum Salmon (a)	963	11	87.1 lbs.	8.3 lbs.	2.8 lbs.
Pink Salmon (a)	228	4	57.0 lbs.	1.9 lbs.	.7 lbs.
Smelt	2,776	61	45.5 lbs.	23.9 lbs.	8.0 lbs.
Rainbow Trout	1,856	60	30.9 lbs.	16.0 lbs.	5.3 lbs.
Pike	330	13	25.4 lbs.	2.8 lbs.	1.0 lbs.
Dolly Varden	587	34	17.3 lbs.	5.1 lbs.	1.7 lbs.
Grayling	543	42	12.9 lbs.	4.7 lbs.	1.6 lbs.
Total	74,931			646.0 lbs.	215.3 lbs.

a. Includes all methods of harvest, rod and reel, subsistence gear, and commercial gear.

Source: ADF&G Division of Subsistence March 1984.

TABLE 17. HARVEST TOTALS OF NATURAL RESOURCES TAKEN FOR HOME USE BY SAMPLED BRISTOL BAY BOROUGH RESIDENTS, BY COMMUNITY, 1983

Species	KING SALMON N=43		NAKNEK N=52		SOUTH NAKNEK N-21	
	Percent Harvesting	Mean HH Harvest lb.	Percent Harvesting	Mean HH Harvest lb.	Percent Harvesting	Mean HH Harvest lb.
Caribou	44.2	223.3	36.5	170.2	57.1	414.3
Moose	9.4	75.3	5.8	31.2	9.5	51.4
Harbor Seal	0	0	5.8	3.2	0	0
Tundra Hare	4.7	0.9	3.8	1.1	14.3	1.3
Snowshoe Hare	4.7	0.7	5.8	1	0	0
Porcupine	0	0	3.8	0.5	14.3	2.7
Beaver	11.6	7.4	1.9	1.9	0	0
King Salmon	72.1	170.1	71.2	96.9	61.9	89.7
Red Salmon	39.5	100.1	57.7	177.6	67.7	103.8
Chum Salmon	4.7	5.1	11.5	11.2	14.3	7.6
Pink Salmon	2.3	2.9	3.8	1.1	4.8	2.3
Coho Salmon	44.2	32.0	48.1	32.4	57.1	31.7
Smelt	34.9	11.9	53.8	29.1	85.7	35.6
Rainbow Trout	60.5	20.7	55.8	16.1	23.8	6.3
Pike	14.0	3.1	9.6	3.2	9.5	1.5
Dolly Varden	44.2	6.8	21.2	4.4	19	3.2
Grayling	46.5	5.6	30.8	5.3	28.6	1.3
Total		665.9		586.4		752.7

Source: ADF&G Division of Subsistence March 1984.

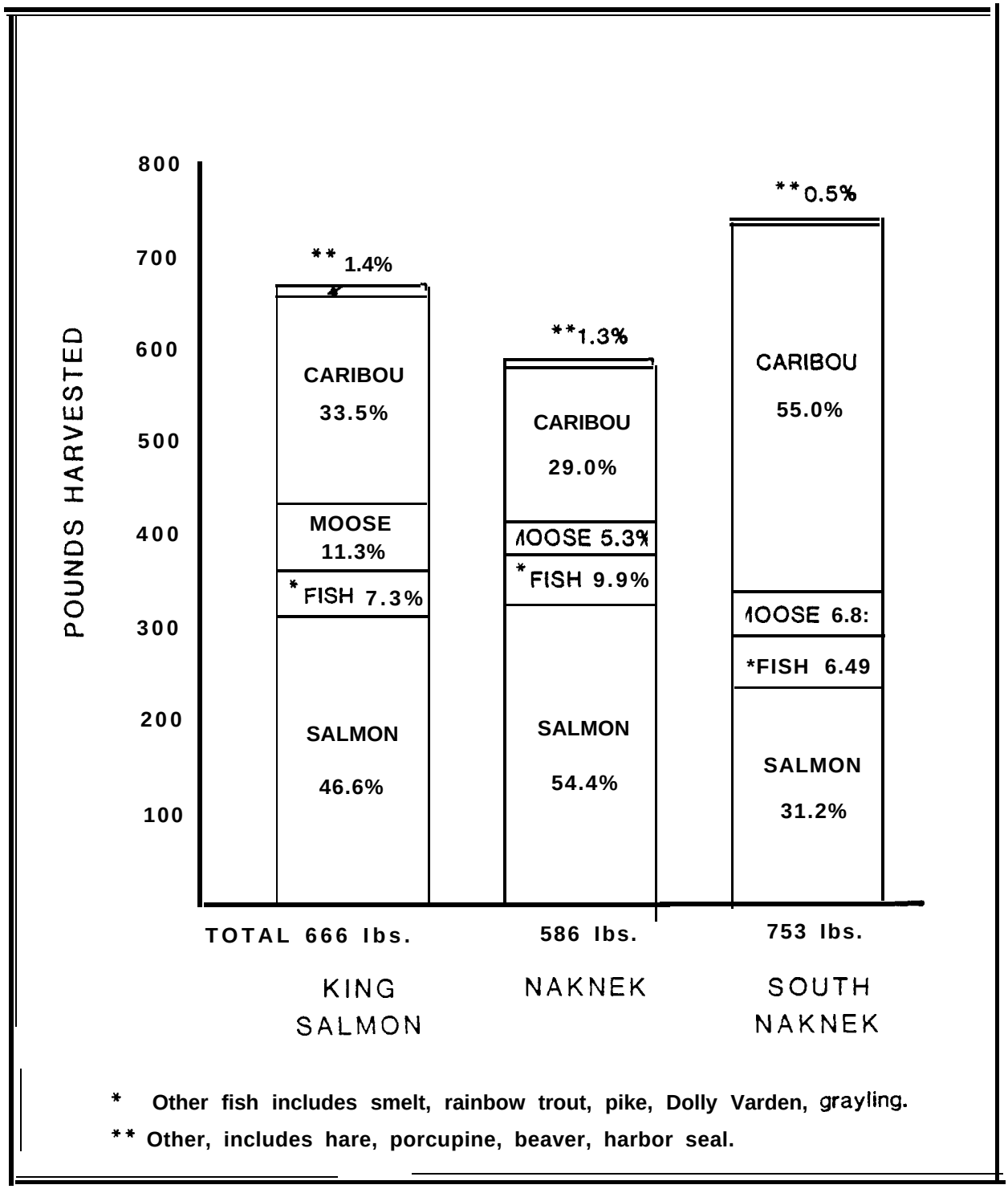

Fig. 6. Mean Household Harvest of Fish and Wildlife Resources: King Salmon, Naknek, and South Naknek, 1983.

and 34 percent in King Salmon. A difference of 244 and 191 pounds per household mean harvest level existed between Naknek and King Salmon respectively when compared with South Naknek's caribou use. Salmon harvest exemplifies another divergence in harvest patterns. King Salmon residents reported taking nearly twice as much king salmon as did South Naknek residents; further, 67 percent of the harvest was with rod and reel compared to South Naknek's rod and reel harvest of nine percent.

GEOGRAPHY OF HARVESTING AREAS

Over the period from the mid 1960s through the early 1980s, residents of the Bristol Bay Borough used a large, widely dispersed area for resource harvesting activities. Figure 7 illustrates these areas as identified by local residents (Alaska Department of Fish and Game 1985). Subunit boundaries of State Game Management Unit 9 in which local resource harvest occurs are shown in Figure 8. These and additional figures used in the report provide geographically detailed information with regards to specific species. Place name and location references are included in one or more of these figures.

One factor affecting land use patterns of borough residents is the proximity of Katmai National Park and Preserve (Fig. 7). Regulations limited harvesting activities to rod and reel fishing and berry picking throughout the park while hunting and trapping were allowed only in the preserve. Consequently, major resource harvesting was limited to the periphery of the Katmai boundary.

Resource harvesting took place on land, in and along creeks and rivers,

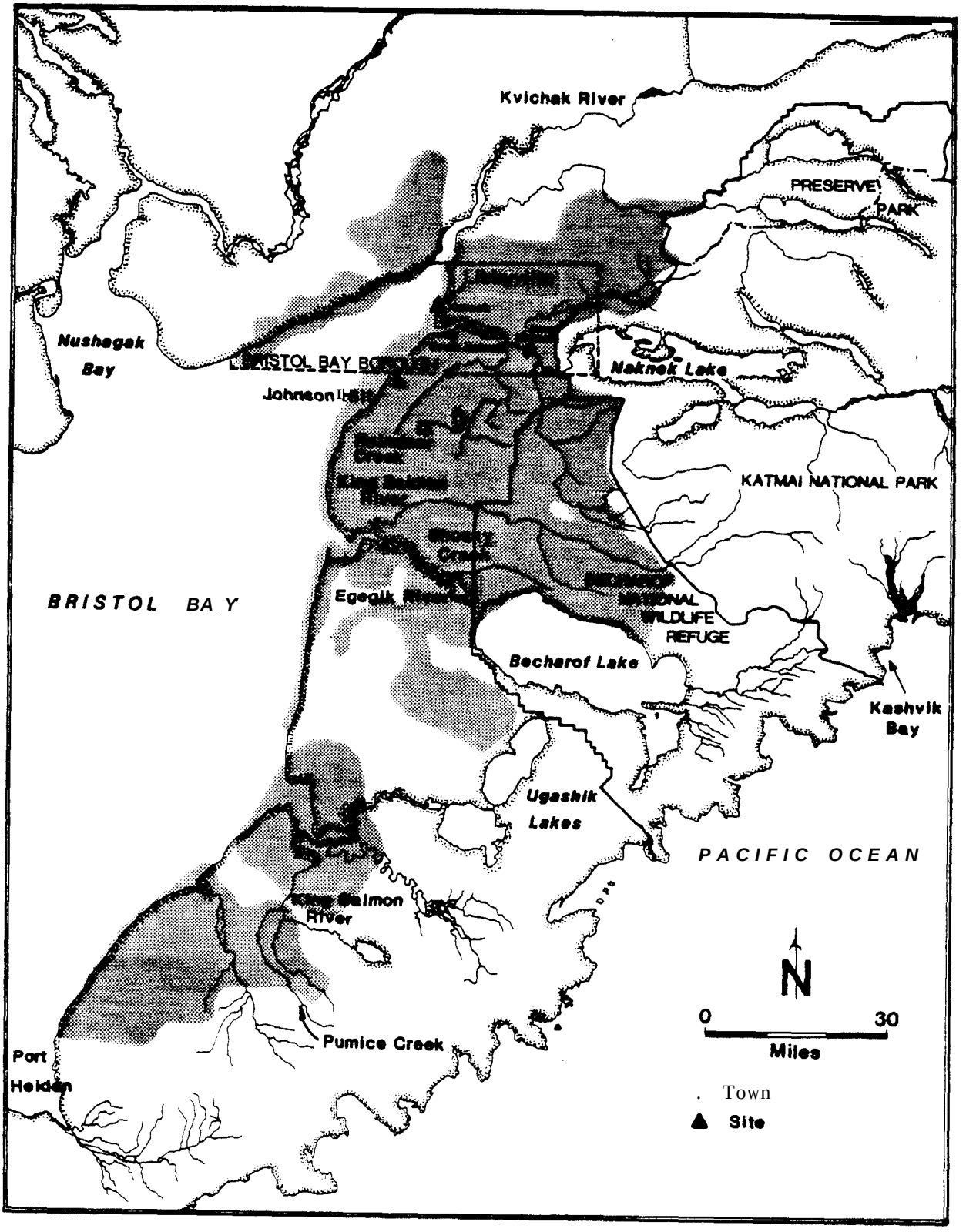

Fig. 7 Resource Harvest Areas, Bristol Bay Borough Communities, circa 1960-1983.

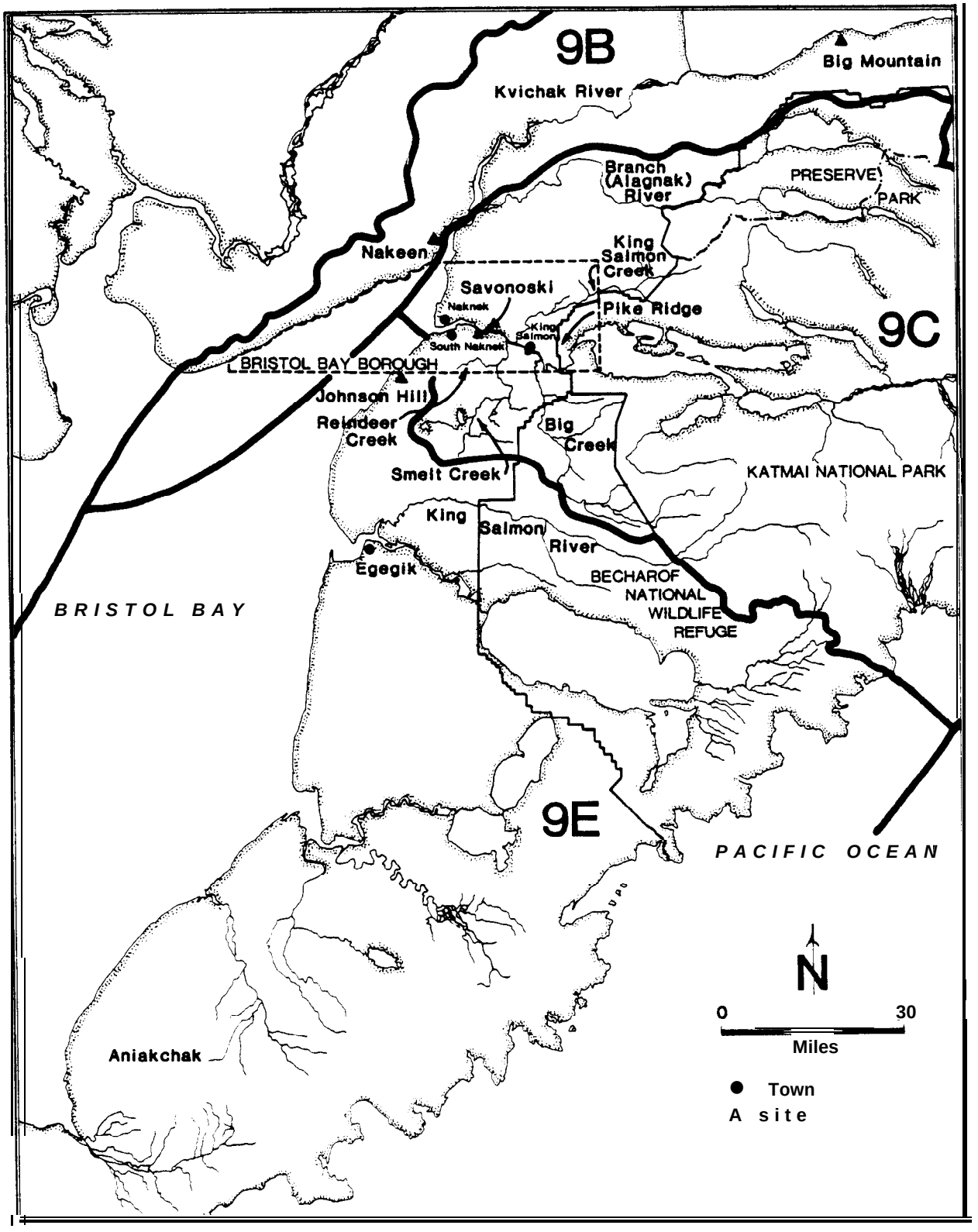

Figure 8. Game Management 9 Subunit Boundaries.

and in the intertidal zones. Intensive commercial salmon fishing takes place in Bristol Bay. Some of the commercial catch was retained for home use; however, as discussed later in the report, there was little other resource harvesting in the bay.

The major local waterway, the Naknek River (Fig. 9), was the focus for numerous resource activities involving a wide spectrum of travel modes and harvesting methods. Many local hunting and fishing areas were accessible by motorized vehicles such as skiffs and off-road vehicles. Many harvesting trips were a day or less in duration. Located near the outlet of Naknek Lake, Lake Camp is accessible by car from King Salmon and Naknek and was used throughout much of the year. It served both as a fishing destination and as a departure point for other fishing sites in the lake and river. Rainbow trout, king, red and coho salmon, along with lake trout and burbot were harvested in Naknek Lake and in the river adjacent to Lake Camp.

Downstream from Lake Camp is another popular fishing area, Rapids Camp. Situated on a wide shallow bend of the Naknek River, it offered good access to other areas of the river as well as being a productive fishing site. Fish species harvested in this location included rainbow trout, whitefish, burbot, salmon, grayling, and char.

Big Creek, still further downstream, was used for fishing and as access for reaching waterfowl, caribou, and moose hunting areas (Figs. 8 and 9). During periods of open water, skiffs could travel approximately 30 river miles into Becharof National Wildlife Refuge. Ducks were hunted within the confines of Big Creek and along the Naknek River downstream to approximately a half mile above King Salmon. The majority of the waterfowl hunting occurred on the south side of the river. During freeze-up the creek

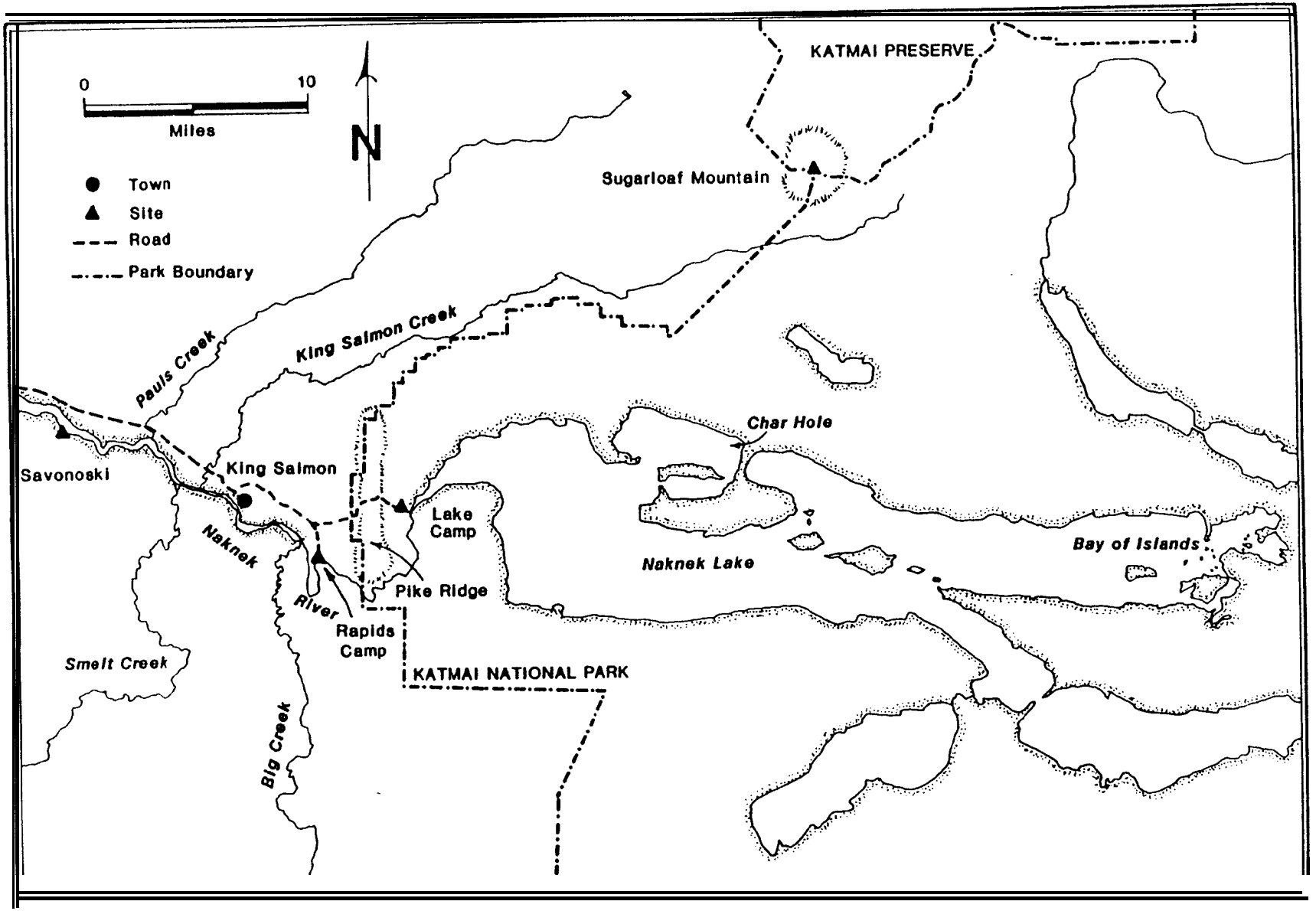

Figure 9. Portion of Naknek River Drainage.

was traveled using motorized vehicles, particularly three-wheelers and four-wheel drives, during harvesting activities.

The portion of Naknek River from approximately one mile east of King Salmon to below Paul's Creek (Fig. 9) was heavily used by rod and reel fishermen. It offered extremely productive king and coho salmon fishing. During the winter, smelt were taken by jigging through the ice. King Salmon Creek itself was closed to king salmon fishing, but was fished for Dolly Varden, grayling, coho and pink salmon, and rainbow trout.

Smelt Creek, which drains into the Naknek River from the south (Figs. 8 and 9) provided access for caribou, moose, and waterfowl hunting. Hunters traveled via motor boat as far south as Smelt Lake, approximately 60 river miles upstream. Trap lines were also run in the Smelt Creek drainage. Smelt Creek, when frozen, provided access via motorized vehicles for winter harvesting activities.

Paul's Creek (Fig. 9), emptying from the north into the Naknek River, offered both open water and ice fishing. King and coho salmon, rainbow trout, and grayling were available during the open water, and smelt in the winter months. Trap lines were run during the winter months.

Savonoski (Fig. 8), site of an abandoned village, marked the upriver limit of subsistence fishing sites on the Naknek River. Beaches on both sides of the river were used, the north side being the most heavily fished. Little or no rod and reel fishing was attempted in the section near Naknek and South Naknek. Dip netting for smelt occurred on the south side of the river mouth.

The intertidal area, north of Naknek to approximately Libbeyville and south towards Port Heiden (Fig. 7) was used principally for waterfowl hunting. Along the beach areas near Naknek and South Naknek, butter clams were dug. Three-wheelers were used to travel to local areas, while aircraft was used for locations further away.

Land areas not directly accessible via the Naknek River drainage system were also utilized by borough residents. To the northeast of King Salmon, areas around Pike Ridge and along King Salmon Creek are assessible by road and provided productive resource harvesting. Sugarloaf Mountain, reached by air is also a popular hunting destination. Hunting moose and game birds (ptarmigan and spruce grouse) and trapping furbearers, were actively pursued. Across the river around South Naknek, several sites provided harvest areas for waterfowl, caribou, and moose, as well as for running trap lines. Reindeer Creek, which drains into the Naknek River, along with Johnson Hill area, part of the Kvichak Bay drainage, were heavily ulilized harvest areas. Both locations were convenient to South Naknek hunters using three-wheelers.

In addition to sites located in the immediate vicinity which were accessible by day trips using skiffs or land vehicles, Naknek River residents used many other sites in a larger geographic region which required longer periods of travel to reach, and frequently necessitated the use of aircraft. To the north, the Kvichak River drainage (Fig. 8) provided habitat suitable for hunting moose and waterfowl. The Alagnak (Branch) River, a major tributary of the Kvichak, was a particularly favorite moose hunting area during the September season when water transportation could be used.

Areas to the south of the Naknek River provided destination points for various hunting activities (Figs. 7 and 8). Caribou were the primary resource sought down the peninsula. Most of the region utilized by borough residents is a part of the Becharof and Alaska Peninsula Wildlife refuges, including locations such as Shosky Creek and Whale Mountain. Aircraft usually provided access to the caibou, with Jensen's Strip a primary destination from which to begin a hunt. Alaska Peninsula freshwater river systems frequently used for moose hunting included King Salmon River (north of Egegik), Egegik River,

Pumice Creek, and King Salmon River (south of Pilot Point). The coastal area between Pilot Point and Port Heiden provided exceptional waterfowl hunting. Though not included in data compiled in 1982, waterfowl hunting in the Cold Bay area (Fig. 2) was occasionally mentioned by local hunters contacted in 1984.

It is difficult to document precise berry picking areas. General areas were found around each of the communities; some were small patches to which people returned year after year, while others were areas used spordically. The mouth of Big Creek and Pike Ridge were given as regularly productive berry areas, as was the area near Paul's Creek. While the tundra in and around each of the communities was combed for various berry crops, it was not unusual for groups of women to travel further afield, sometimes as far south as Ugashik or as far north as Iliamna (Fig. 2), in their gathering activities.

In summary, resource harvest areas utilized by Bristol Bay Borough residents focused on the Naknek River, fanning out to the north and south of the immediate vicinity. North, up to and including the Kvichak River, moose, waterfowl, berries and furbearers were taken. A larger harvest area was used south of the Naknek River. The extent of the southern area was partially dictated by the migratory patterns of the Peninsula Caribou herd (Fig. 10). The entire harvest corridor covered over 4,000 square miles of the Alaska Peninsula. The area included traditional harvest areas as well as adaptations resulting from changes in hunting techniques, transportation forms, and land classification.

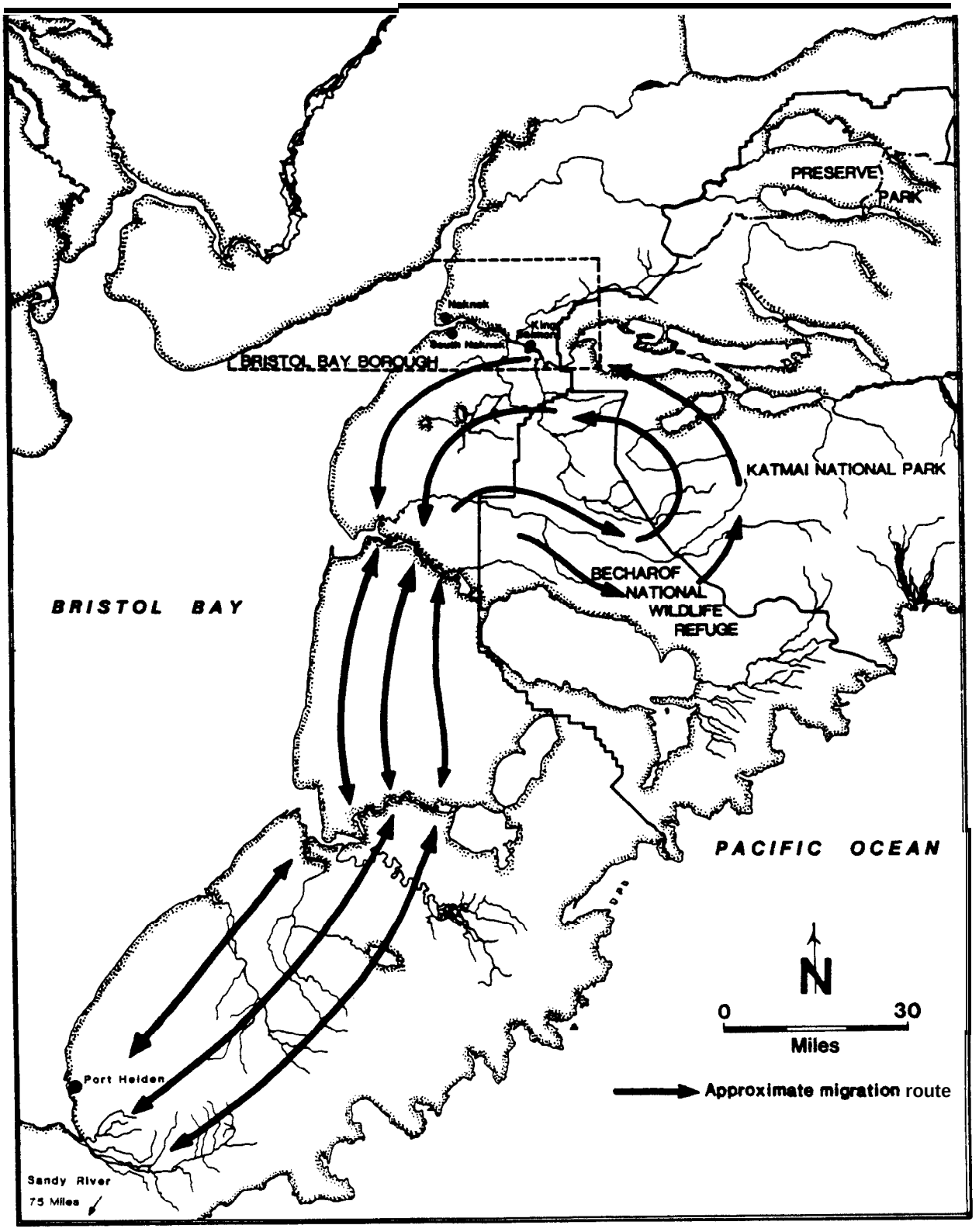

Figure 10. Migration Pattern of Northern Alaska Peninsula Caribou Herd.

SEASONAL ROUND

Figure II depicts the seasonal round of harvest activities of borough residents during the 1982 to 1984 study period. It shows recurring events which are never duplicated exactly from one year to the next. Species availability, weather, and regulatory considerations effect the exact timing or occurance of harvests each season. Therefore, this "typical" portrayal incorporates the events of several years.

River break-up in March or April generally marked the end of winter activities during the study period. As the river opened up, belukha arrived and were occasionally hunted. Seals also were occasionally hunted in the bay. Razor clams were a popular resource harvested on the Pacific Coast side of the peninsula. Personal or chartered aircraft provided access to the clamming beaches. Butter clams were taken on the Naknek beaches.

Typically, the Naknek River becomes ice free sometime between March and May depending on the year's weather conditions. When the creeks and river opened, fishing for Dolly Varden and rainbow trout commenced. Rainbows were taken in the Naknek River, from Rapids Camp to Lake Camp. Dollys were fished from creeks such as King Salmon Creek, which drain into the river. During May or June, the king salmon began returning to the river. To harvest kings, some residents used set gill nets while others preferred rod and reel fishing.

Sockeye and chum salmon began to arrive in the Naknek River in mid June. These species were mainly taken with gill nets. The arrival of the sockeye also marked the intense commercial fishing period, on which many residents concentrated their efforts. Many of those not participating in the commercial fishery continued to fish for king and sockeye salmon along with freshwater fish, mainly grayling, lake trout, and rainbow trout.

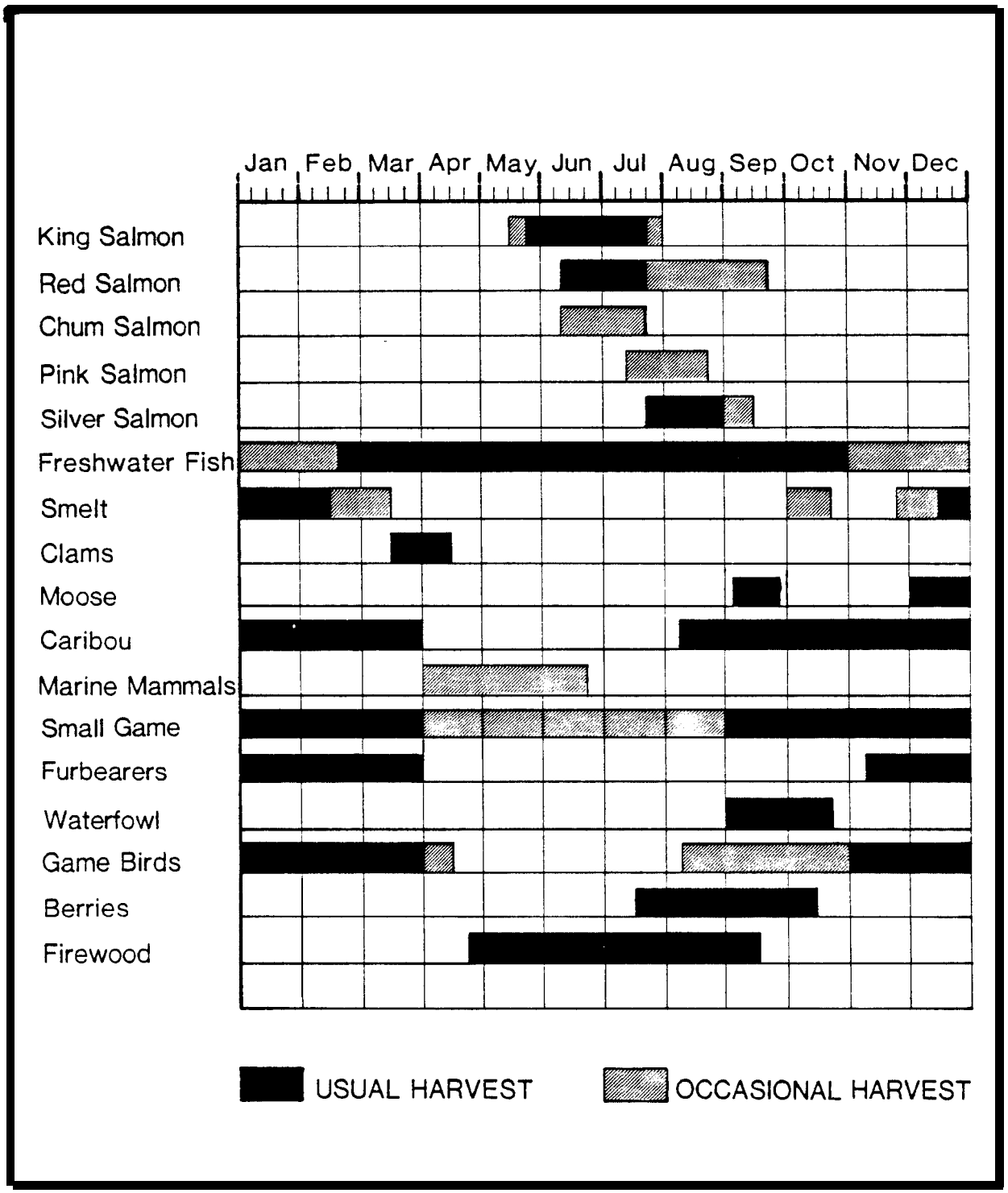

Figure 11. Seasonal Round of Wild Resource Harvest, Bristol Bay Borough, 1983.

During mid-July, sockeye salmon fishing slowed and the first of the year's berries began to ripen. Salmonberries, found in the swampy areas of the tundra, were gathered and used fresh or were frozen for later use. These berries were favored for making aqutaq ("Eskimo ice cream"). Silver (coho) salmon arrived in August. This species was fished like kings, either with nets or rod and reel. Blueberries began to ripen and were picked by many local local residents. Caribou season opened mid-August and hunters took advantage of open water by using skiffs to reach hunting locations.

A ten day moose season was open in the local area during the first part of September. Many local residents hunted during the fall season, though harvest numbers were relatively low. Blackberries and cranberries were gathered. Waterfowl hunting began as the season opened during this same period. As the salmon moved out of the river to the spawning grounds, rainbow trout fishing resumed as a productive activity.

Fall activities in October and November revolved around continued caribou and waterfowl hunting. Geese were harvested, with hunters frequently traveling down the peninsula to reach the higher concentrations of birds. Occasionally sandhill cranes and spruce grouse were available. Ptarmigan also were taken. At the mouth of the Naknek River, smelt were dip netted for a short period in September or October. Clams were dug along the bay beaches. As the weather turned colder and ice began forming in the waterways, waterfowl hunting declined and trapping effort increased. Several trapping seasons opened during the month of November and ran throughout the winter, ending in February or March.

During winter months, caribou and ptarmigan hunting continued. Hares and an occasional porcupine were taken opportunistically throughout the fall and winter months. Moose hunting occurred during December at which time cows could

be taken in the local drainages. A favorite winter activity for many residents was fishing for smelt through the ice. When ice conditions were favorable, Naknek River and Paul's Creek provided easy access for this activity.

LARGE LAND MAMMALS

Caribou and moose constituted a major portion of the resource harvest of Bristol Bay residents in 1983. Together, they provided 55 percent by weight of the mean household harvest. Due to this high level of use, moose and caribou, along with salmon, were of primary concern to local residents. Their status, including biological concerns and regulations governing harvest, was closely monitored by community members.

Caribou

Most caribou harvested by local residents were taken from the Northern Alaska Peninsula Caribou herd. The larger of two herds located on the Alaska Peninsula, it ranges from the Naknek River south to Port Mollar. The herd contained 20,000 animals in the 1940s, but this population declined to 2,000 by 1949. A census conducted in the spring of 1983 indicated that the herd has regained its former size, containing approximately 18,000 caribou (Sellers and McNay 1984).

Reported harvest for the Northern Peninsula caribou herd since 1977-78 through 1983-84 has varied from a high of 854 caribou (1977-78) to a low of 594 (1982-83). Local 9C residents accounted for an average of 5.7 percent of the harvest in the years 1980-81 through 1982-83. They averaged 1.8 caribou

per hunter, while other Alaskan hunters averaged 1.6, and non-residents averaged one caribou.

In relatively well-established migratory patterns, the caribou move up and down the peninsula, the majority staying west of the Aleutian range (Fig. 10). They calve primarily between Port Heiden and Sandy River to the south. Most caribou remain on or near the spring calving grounds along the Bering Sea flats for the summer. During the fall, the herd begins moving north to the wintering grounds between Becharof Lake and the Naknek River. As spring approaches, the herd returns south to the calving rounds.

Caribou hunting regulations in GMU 9C and 9E, the sub-units most heavily hunted by Bristol Bay Borough residents, have remained fairly stable since the late 1970s. Since 1977-78, the bag limit has been set at four, changing from an antlered-only restriction in 1980-81 to one which allowed any caribou to be harvested. In 1983-84 the bag limit continued to be four caribou, with no more than one allowed before November 1 (Table 18). The shortest open seasons occurred in 1976-77 when hunting was allowed between August 10 – October 15 and December 1 – March 31; in 1983-84 hunting was allowed from August 10 through through March 31 continuously. The regulation change which created the most controversy, and perhaps the biggest change in local hunting patterns, was the elimination of same day airborne hunting in 1977-78. For the previous three years same day airborne hunting had been allowed for caribou from January through March.

In 1983, caribou harvests provided an average of 234 pounds of wild food per sampled household (Table 16), by far the most of any game species. Results of the survey taken in March 1984, revealed that 77 percent of the sample (89 households) used caribou and 43 percent (50 households) harvested caribou during the previous year (Table 15). Twenty three percent of the households

TABLE 18. MOOSE AND CARIBOU HUNTING REGULATIONS 1983 REGULATORY YEAR
GMU 9C & 9E.

Species & Unit	Open Season	Bag Limits
Moose		
Unit 9, except the drainage of Naknek River	Sept. 5 – Sept. 25 Dec. 1 – Dec. 31	One moose: however anterless moose may be taken only from Dec. 1 – Dec. 31
Unit 9C, that portion draining into the Naknek River	Sept. 5 – Sept. 25 Dec. 1 – Dec. 31 (Subject to closure by Emergency Order.)	One moose; however, anterless moose may be taken by registration permit only. Permits are valid from Dec. 1 – Dec. 31.
Unit 9E	Sept. 10 – Sept 20 Dec. 1 – Dec. 31	One bull moose with an antler spread of at least 50 inches or at least three brow tines on at least one of the antlers.
Caribou		
Unit 9C & 9E	Aug. 20 – Mar. 31	Four caribou; however not more than one caribou may be taken from Aug 10 – Oct. 31.

Source: ADF&G 1983a.

reported using, but not harvesting, caribou meat.

Of the 50 households which attempted to harvest caribou during the first season, 41 were successful (Table 19). A total of 83 caribou were taken in the period from August 10 through October 31. An additional 98 caribou were taken during the second season, November 1 through March 31, by 34 households. Thirteen additional households reported being unsuccessful in attempts to harvest caribou during the second season. For the combined season, 50 successful households took an average of 3.6 caribou each. For the entire sample, the mean was 1.6 caribou used per household. 1982-83 harvest information contained in the 1984 Board Report prepared by the Game Division showed 26 hunters from GMU 9C. These hunters reported harvesting 49 animals for an average of 1.9 caribou per hunter (Sellers and McNay 1984).

Expanding the 1983 survey harvest information on a community wide basis (364 households) and using the success rate of 43 percent, it is estimated that 563 caribou were taken in 1983 by Naknek River residents, or, approximately 84,450 pounds of edible meat. The number of caribou hunters in a household ranged from none to four, with an average of .85 hunters per household. Thirty-six percent of the households had a single hunter while 46 percent had no hunter (Table 20).

During 1983, caribou were mainly harvested south of the Naknek River in GMLJ 9 which corresponds with the range of the Northern Peninsula caribou herd (Fig. 8). Information from the Game Division and data collected in this project indicated that the areas of Big Creek, Reindeer Creek, Smelt Creek, and the Johnson Hill vicinity were among the most popular caribou hunting areas for local residents. Table 21 lists the 1983 hunting locations of surveyed 'hunters. By and large, most areas are near the three communities and are assessible by skiff and land transportation. Table 22 lists transportation

TABLE 19. NUMBER OF CARIBOU HARVESTED, BRISTOL BAY BOROUGH HOUSEHOLDS, BY SEASON, 1983.

Number of Caribou Taken	# of Households Harvesting First Season (Aug. 10 – Oct 31)	Second Season (Nov 1 – Mar 31)	Total Caribou Harvested
0	9	13	0
1	23	8	31
2	4	7	22
3	8	9	51
4	4	4	32
5	0	3	15
6	2	3	30
# of Caribou taken	83	98	181
# of HH Attempting (n=63[a])	50	47	
# of HH Successful (n=50[a])	41	34	

[a] Total does not equal number of households for each season due to some households hunting both seasons.

Source: ADF&G Division of Subsistence March 1984.

TABLE 20. NUMBER OF CARIBOU HUNTERS AND MOOSE HUNTERS PER HOUSEHOLD, OF SAMPLED HOUSEHOLDS (n = 116), 1983.

Hunters per Household	CARIBOU HUNTING		MOOSE HUNTING	
	Households	Percent	Households	Percent
No. Hunter	53	46	79	68
1	42	36	23	20
2	11	10	9	8
3	5	4	2	2
4	5	4	1	1
Number Missing	0	0	2	2
Total	116		116	
Mean Hunters per Household	.85		.44	

Source: ADF&G, Division of Subsistence March 1984.

TABLE 21. CARIBOU HUNTING LOCATIONS USED BY BRISTOL BAY BOROUGH HOUSEHOLDS, 1983.

Location	Number of Households Reporting Use of the Area[a]	
	First Season (Aug 10 - Sept 10) n = 51	Second Season (Nov 1 - Mar 31) n = 49
Big Creek	14	20
Johnson Hill	8	5
Smelt Creek	7	10
Reindeer Creek	5	7
Becharof	3	2
Middle Bluff	2	2
Peninsula Area	2	0
Egegik	4	0
Jensen's Strip	2	0
Savonoski	2	1
Pike's Ridge	1	0
King Salmon River	2	1
South Side Naknek	1	1
Rapids Camp	1	2
Pike's Lake	1	0
Pilot Point	0	1
Cases Missing	8	'7
Total	63	61

[a] The total of locations is higher than the number of hunting households because some households indicated more than one hunting location.

Source: ADF&G Division of Subsistence March 1984.

TABLE 22. TRANSPORTATION METHODS USED FOR CARIBOU HUNTING, BRISTOL BAY BOROUGH HOUSEHOLDS, 1983.

Mode of Transportation	Number of Households Reporting Use[a] First Season (Aug 10 – Oct 31) n = 51	Second Season (Nov 1 – Mar 31) n = 49
Skiff	22	1
Airplane	15	6
3-Wheeler	13	24
Automobile, Truck	3	16
On Foot	0	2
Cases Missing	6	5

[a] The total of number of modes of transportation is higher than the number of hunting households because some households reporting more than one mode of transportation.

Source: ADF&G Division of Subsistence March 1984.

forms used in 1983 by surveyed hunters. During the first season, skiffs, airplanes, and three-wheelers were commonly used, with skiffs used by 43 percent of all hunters. In the second season, three-wheelers, automobiles/trucks were commonly used with three-wheelers used by 48 percent of hunters. Occasionally skiffs were used during winter hunts, though ice conditions generally prohibited their use. The transportation factor correlated closely with the number of overnight trips reported. As no same day airborne hunting was allowed, local hunters tended to plan trips using ground transport which allowed them to return home the same evening. In winter when there was less light and colder temperatures, hunters preferred to hunt in areas closer to the communities then in the fall. During the early season, 51 percent of the hunters reported spending one or more nights out. During the second season only 17 percent spent one or more night out.

Moose

Unlike caribou, there is no evidence of prehistoric use of moose on the Alaska Peninsula. While moose were apparently present by the turn of the century on the northern portion of the Alaska Peninsula, their numbers were very limited. During the 1930s through the mid-60s the moose population increased, but by the late 1970s that trend had reversed. Currently the moose herd is declining (Sellers and McNay 1984:31). An expansion of the 1983 moose census indicates a population of approximately 2,500 animals in GMU 9E and an estimated additional 2,500 animals throughout the rest of Unit 9 with the exception of 9D, which has very few moose.

Results of the survey revealed that use of moose for human consumption by borough residents was less widespread during the study period than use of

caribou. Thirty-one percent of sampled households hunted moose, eight percent, or nine households, were successful. Thirty-one percent of the survey group reported using moose meat in 1983 (Table 15).

The majority of households who hunted moose had only one hunter (Table 20). Nine households had two hunters each, two households had three hunters and one household had four hunters participating in moose hunting. Hunting effort was similar between fall and winter, with 26 and 21 households hunting in each respectively (Table 23). Eight moose, 73 percent of the moose harvest, were taken in the fall, while three animals were harvested in December. Taking both seasons into account, the average total harvest among all hunting households was .31 moose per household. The average moose harvest was 51 pounds for all sampled households, and 167 pounds for households reporting using moose. Expanded throughout the entire community, the 364 households harvested approximately 35 moose, or 18,900 pounds of meat. Division of Game data for the same time periods showed a reported moose harvest in GMU 9 of 22 animals by local Bristol Bay Borough residents.

Table 18 outlines the moose hunting regulations applicable for Game Unit 9 for the 1983-1984 regulatory year. There were two distinct hunting seasons, September and December. The September season allowed for taking bulls only. During the December season the taking of antlerless moose was allowed in certain portions of GMU 9. A registration hunt in the Naknek drainage GMU 9C required a hunters to obtain a permit from the Fish and Game office in King Salmon. Hunters who harvested a cow had to report to the office within 48 hours. They were also required to bring in the lower jaw for use in determining the age of the animal. Of the 81 permits in 1983, 71 were issued to local 9C residents.

TABLE 23. NUMBER OF MOOSE HARVESTED, BRISTOL BAY BOROUGH HOUSEHOLDS, BY SEASON, 1983. (n = 116)

Number of Moose Taken	Number of Households First Season (September)	Second Season (December)	Total Moose Harvested
0	19	18	0
1	6	3	9
2	1	0	2
# of Moose Taken	8	3	11
# of HH Attempting (n=36[a])	26	21	
# of HH Successful	7	3	

a Total does not equal number of hunters for each season due to number of households hunting both seasons.

Source: ADF&G Division of Subsistence March 1984.

There was a relatively low level of moose harvest and use among local residents in 1983. The majority of moose hunters in GMU 9 came from outside of the local area, including many hunters from outside the state. Information provided by the Division of Game (ADF&G King Salmon) indicates that since 1973, Unit 9 residents have taken an annual average of 20 percent of the reported harvest, other Alaskan residents 35 percent and nonresidents 43 percent (Sellers and McNay 1984:32). The highest level of moose harvest reported by local residents for 1981 and 1982 occurred in 9C where half of the reported harvest was by local residents (Sellers and McNay 1984:40).

During the September season, moose hunters used skiffs, ground transport, and airplanes about equally (Table 24). As moose feed in riparian zones, much local hunting occurred within the drainage systems of the Naknek, Kvichak, or Egegik rivers. Areas located closest to the communities, which were also the most intensively hunted, were generally accessible with motorized vehicles. During the fall season of 1983, these areas included King Salmon Creek, Johnson Hills, the King Salmon area, Reindeer Creek, and Pike Ridge (Table 25) Skiffs or airplanes were the normal means of transportation for multi-day hunts. To the north, Big Mountain and the Kvichak River drainages have proved to be good moose hunting areas; to the south, the Egegik River drainage and Becharof Wildlife Refuge were hunted.

Winter hunting locations were generally similar to those used in the fall, but use of skiffs and airplanes decreased, determined in part by ice conditions on the waterways (Table 24). The geographic range accessible by motorized vehicles is extended during years of good freezing conditions. However, during the winter season of 1983, ice and travel conditions were poor (Dick Sellers pers. comm., 1984). In addition to poor freezing conditions, there was insufficient snow in 1983 to enable hunters to use snowmachines.

TABLE 24. TRANSPORTATION METHODS USED FOR MOOSE HUNTING, BRISTOL BAY BOROUGH HOUSEHOLDS, 1983. (n = 116)

Mode of transportation	Number of Households reporting use[a]	
	September Season n = 26	December Season n = 21
Skiff	7	0
3-Wheeler	8	9
Automobile, Truck	8	10
Airplane	5	3
Cases Missing	1	4
	29	26

[a] The total of number of modes of transportation is higher than the number of households reporting use due to a number of households reporting more than one mode of transportation.

Source: ADF&G Division of Subsistence March 1984.

TABLE 25. MOOSE HUNTING LOCATIONS USED BY BRISTOL BAY BOROUGH HOUSEHOLDS, 1983. (n = 116)

Location	Number of Households Reporting Use of the Area[a]	
	September n = 26	December n = 21
King Salmon Creek	6	7
Branch River	3	0
Johnson Hill	3	1
Big Creek	3	0
Big Mountain	2	0
King Salmon River	1	1
King Salmon area	1	0
Reindeer Creek	1	4
Pike Ridge	2	5
Becharof	1	0
Kvichak River	1	0
Egegik	1	0
Savonoski	2	1
Smelt Creek	2	1
Aniakchak	0	1
Nakeen	0	1
Cases missing	3	1
	32	23

[a] The total of locations is higher than the number of hunting households reporting due to some households indicating more than one hunting location.

Source: ADF&G Division of Subsistence March 1984.

MARINE MAMMALS

Archaeological evidence indicates that early Naknek River residents hunted seal, walrus, and whale (Dumond 1981). Information on current use of harbor seal, belukha, sea lion, and walrus was sought during this study. The results indicate there was a low level of marine mammal use in 1983.

Harbor seals are resident in southwestern Bering Sea coastal waters throughout the year. No major concentration or rookeries occur in the immediate Naknek River area, but Port Heiden, Port Moller, Cinder River, Ilinik, and Ugashik have major concentrations. Salmon is a major food for harbor seals and in Bristol Bay seals are often seen in association with schools of fish. In the summer of 1983 seals were hauled out on an island in Naknek Lake. It is not known if this is a newly established group or an isolated incident.

Though there are no major haulouts or rookeries between Cold Bay and Round Island, walrus and sea lions are found in Bristol Bay. Walrus have been sighted on the west side of the Kvichak Bay and occasionally wash up on the Naknek beach.

The belukha whale population of the western Arctic ranges throughout the Bering, Chukchi, and Beaufort Seas. Belukha spend winters in drifting ice in the Bering Sea and spend summers scattered along the coast from Bristol Bay to the Mackenzie River delta. One major concentration occurs in the Kvichak Bay. Belukha ascend the Naknek River in April or May, feeding on smelt and salmon smolt. During summer months they feed on adult salmon in Kvichak Bay, usually leaving the area by the first of September. An older resident recalled events when he was a young man participating in belukha hunts. According to him,

groups of men using small boats drove belukha into shallow areas where they were stranded as the tide ebbed. More than one animal was often harvested during a hunt. The current hunting method involves partners in one skiff shooting a single whale.

With the passage of the Marine Mammal Protection Act (MMPA) in 1972, the federal government assumed management authority over marine mammals. During 1983, the harvest of marine mammals was permitted only by Alaska Natives living on the coast of the North Pacific and Arctic Oceans. No permits were required for subsistence hunting. The animals could be used for human consumption or made into handicrafts which could then be sold. Raw fur and ivory could only be sold to another Native.

Of the four species systematically included in the 1984 survey (seal, walrus, belukha, sea lion), only the harbor seal was utilized by a few households on a regular basis. Of the 116 households interviewed, three reported taking seal and eight reported receiving it from other households. Seal fat was put into jars and the oil allowed to drip out. The oil was used to flavor food, particularly dried fish. Seal oil was generously distributed and shared among households whose members continued to use it. The remaining three marine mammal species, sea lion, walrus, and belukha, had low to no recorded use levels for the study period. Three households received belukha meat, probably from a whale taken by a Levelock household, a community on the Kvichak River. In 1983, a belukha was harvested and distributed from this community to others in the Bristol Bay area (Morris fieldnotes 1983). Harvest of one walrus was reported, but walrus products were not widely distributed. There was no reported use or harvest of sea lions.

BIRDS

There are numerous types of marsh and water birds, shorebirds, raptors, and passerines in the Bristol Bay region. Of surveyed households, 54 percent reported using birds during 1983 (Table 15). Close to the same percent participated in bird hunting during the year. A list of species locally available is provided in Table 14. Specific hunting locations (Table 26 and Figure 12) are also provided, but harvest levels and detailed information was not collected for individual species.

Waterfowl

The entire Bristol Bay region forms a major staging area for migratory waterfowl. The Naknek River drainage does not have the high concentrations of birds in the fall that are found in other areas of the Alaska Peninsula such as Pilot Point, Ugashik, and Port Heiden. Ducks frequent the local area in greater numbers than geese during the fall season begining in mid-September. In addition, the Naknek River is an important spring staging area for ducks, shorebirds, and geese.

Tundra swans and sandhill cranes also migrate through the Naknek River area. Swans use the river as a spring and fall staging area and nest in ponds scattered throughout the tundra. Cranes pass through in the spring, occasionally staging on tidal areas in the lower section of the Naknek River. They again pass through the area in the fall on their way south.

Regulations for 1983 provided a waterfowl season from September 1 through December 16. There has been no spring hunting season since 1916.

TABLE 26. BIRD HUNTING LOCATIONS USED BY BRISTOL BAY BOROUGH HOUSEHOLDS, 1983. (n = 116)

	Number of Households Reporting Use of the Area[a]		
	Ducks	Geese	Ptarmigan
King Salmon Vicinity			
King Salmon area	2	0	6
FAA Rock	6	0	0
Naknek River	3	0	0
Smelt Creek	2	0	2
Big Creek	4	1	3
Pike Ridge	0	0	2
Pike Lake	0	0	1
Lake Camp	0	0	4
	17	1	18
South Naknek Vicinity			
South Naknek	0	0	11
Savonoski	2	2	0
Johnson Flats	6	6	0
	8	8	11
Naknek Vicinity			
Naknek Area	2	1	11
Paul's Creek	0	0	1
Libbyville	6	2	0
	8	3	12
Lower Kvichak River			
Cut Bank	1	1	0
Branch River	1	1	0
Kvichak River	1	0	0
South of Kvichak Bay			
Middle Bluff	1	1	0
King Salmon River	1	0	1
Egegik	1	1	1
Jensen's Strip	0	0	1
Pilot Point	3	3	0
Ugashik	1	2	0
Aniakchak	0	0	1
Cinder River	3	2	0
Cold Bay	3	4	1
Peninsula area	0	0	1
Total	13	13	6
Hunting Households	37	23	39

[a] The number of reported areas is greater than the number of hunting household used multiple locations.

[b] Households were asked where bird hunting occurred. Some of the information was given in generalized terms, such as peninsula area, while other gave precise locations, e.g. FFA Rock. The results have been grouped in general location categories. The first three groups are those locations most accessible to each of the three communities: King Salmon, South Naknek, and Naknek.

Source: ADF&G Division of Subsistence, March 1984.

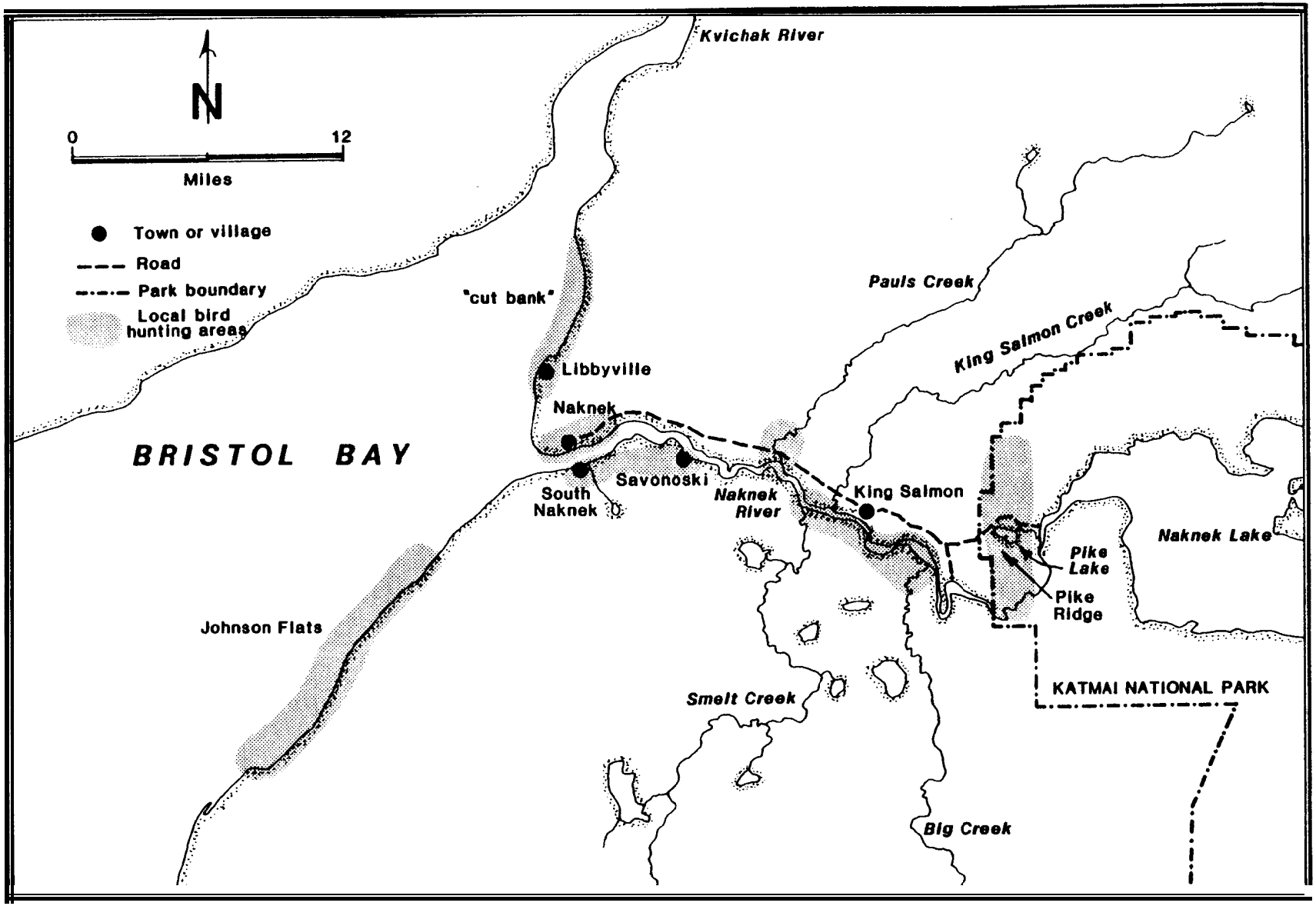

Figure 12. Resource Harvest Area Map: Game Birds and Waterfowl, Bristol Bay Borough Households, circa 1960-1983. Additional areas not illustrated.

In 1983, the daily bag limit for ducks was eight and the possession limit was 24. There were lower bag and possession limits for geese. Due to a decline in the population of cackling Canada geese, the daily bag limit was two and the possesion limit was four. For brants, the daily bag limit was four, with eight the possession limit; for emperors there was a daily bag limit of six and possession limit of 12. Hunting ended by mid-October (McNay/Sellers, personal communication 1984).

Ducks are the primary birds hunted in the Naknek drainage. In 1983, 36 households in the sample group (31 percent) reported duck hunting (Table 27). Of 49 duck hunting locations reported, 67 percent were in the local area (Table 26). Figure 12 shows waterfowl hunting locations in the immediate area. All these areas may be reached with a skiff or three-wheeler from Bristol Bay Borough communities. Sixty-nine percent of the contacted duck hunters used skiffs, 20 percent aircraft, and 22 percent three-wheelers (Table 28). One hunter traveled north to the Kvichak River for duck hunting, while seven others reported hunting in non-local areas to the south.

Twenty percent of surveyed households hunted geese. Unlike ducks, hunting locations split almost evenly between sites in the immediate area and sites further south (Table 26). Local hunting areas were.reported for the Naknek River and Kvichak Bay coast (Table 26). Egegik, Pilot Point, Ugashik, Cinder River, and Cold Bay were specific Alaska Peninsula locations listed by Bristol Bay Borough goose hunters. Among these hunters, aircraft was the primary method of transportation (Table 28).

TABLE 27. PARTICIPATION OF BRISTOL BAY BOROUGH SAMPLED HOUSEHOLDS IN BIRD HUNTING, BY SPECIES, 1983.
N = 116

Species	Hunting Households	Percent
Ducks	36	31
Geese	23	20
Ptarmigan	38	33
Spruce Grouse	5	4
Any bird species	58	50

Source: ADF&G Division of Subsistence March 1984.

TABLE 28. TRANSPORTATION METHODS USED FOR BIRD HUNTING, SAMPLED BRISTOL BAY BOROUGH RESIDENTS, 1983. (N = 116)

Species	Method of Transportation	Percent of Use By Households Hunting Each Species
Duck	Skiff	69
n=36	3-wheeler	22
	On-foot	3
	Aircraft	28
	Automobile/truck	6
Geese		
n=23	Aircraft	52
	Skiff	35
	3-wheeler	26
Ptarmigan		
n-38	Automobile/truck	32
	Snowmachine	18
	Skiff	5
	3-wheeler	45
	Airplane	13
	On-foot	13

Source: ADF&G Division of Subsistence March 1984.

Game Birds

The two upland game birds used locally are the spruce grouse (Canachites canadensis) and the willow ptarmigan (Lagopus lagopus). Rock ptarmigan which frequent higher elevations are occasionally seen. The spruce grouse is a forest dweller, preferring spruce-birch forest with an understory of mountain cranberry, blueberry, crowberry, and spiraea growing on the thick carpet of moss (Ellison 1984). Ptarmigan prefer brushy willow and tundra areas. Ptarmigan populations are thought by many people to exhibit cyclic fluctations, though such cycles have not been actually documented in Alaska. Survey interviewees generally remarked on the low number of ptarmigan found on the Alaska Peninsula in the past few years.

Bag and possession limits for ptarmigan have remained fairly consistent over the past 20 years. In 1983 the season for ptarmigan was August 10 through April 30. The bag limit was 15 and the possession limit 30. Thirty-three percent of the interviewed sample hunted ptarmigan, mainly in the fall and winter months (Table 27). Among these ptarmigan hunters, 84 percent hunted only in the winter. The most common means of transportation was the three--wheeler, followed by an automobile or truck, and snowmachine (Table 28). Frequently ptarmigan are taken while hunting other species, such as caribou or moose. A survey conducted by the Division of Game indicated that many hunters took ptarmigan during brown bear hunts in 1983; 203 ptarmigan were harvested by 48 Alaskan residents and 253 ptarmigan by 124 non-Alaska residents while hunting brown bears (Sellers and McNay 1984:53).

Only four percent of surveyed households reported hunting spruce grouse (Table 27). Of these, three hunted in the winter, two in the fall, and one in the spring. Three of the hunting locations listed were in the general King Salmon area, where good spruce grouse habitat occurs.

SMALL MAMMALS

Several small terrestrial mammals found in the area were used by the residents of the Naknek River communities. Discussion of these mammals will be divided into two groups. One group consists of furbearers which are normally trapped for their fur, although the meat of some is occasionally used. The second group consists of animals which are hunted or snared primarily for their meat and secondarily for their fur.

Furbearers

Furbearers which were harvested by local trappers during the study period included beaver, wolf, land otter, wolverine, mink, red fox, and lynx. All were available in the immediate area, and only one respondent indicated trapping a considerable distance from the Naknek River. Red fox are abundant, and live near human communities with apparent ease. Beaver also are found frequently in the streams and ponds adjacent to all the Naknek River communities. Lynx are dependent on snowshoe hare for most of their diet. They inhabit spruce forests, subalpine forests, and marshes where their preferred food source is available. Amphibious members of the family Mustelidae, land otter and mink are found near water. They are trapped solely for their fur; no one reported using the meat for human consumption.

Wolves are found throughout the Alaska Peninsula. They are adaptable animals and exist in a wide variety of habitats. Highly mobile predators, wolves prey on numerous species. They are frequently found in association with caribou, but also take smaller species including voles, ground squirrels, snowshoe hares, and beaver. Wolves are trapped or shot by local residents.

Most of the small harvest of wolves in the local area was near King Salmon Creek and Pike Ridge.

The wolverine is the largest North American member of the family Mustelidae. They are found in a variety of habitats, including open country. Wolverines depend most heavily on snowshoe hares and carrion for their principal food supply. Wolverine fur has long been considered a valuable pelt. The fur is used as trim on parkas and hoods as the guard hairs will not accumulate frost. Wolverine pelts continue to bring high prices. In the local area they are most frequently trapped in the King Salmon Creek and Pike Ridge area.

Fifteen percent (18) of the sampled households participated in trapping activities. Successful trappers reported harvesting 21 beaver, 3 wolves, 15 land otter, 2 wolverine, 16 mink, and 67 red fox. Among the surveyed households, beaver, wolverine, and red fox were the species most frequently trapped (Table 29). Amount of effort expended was not calculated and it is probable that only successful trapping was reported. A profile of the trappers indicated that 86 percent were males, who ranged in age between 5 and 57 years old.

The majority of the trapping areas were accessible within easy distance of the local residents. Three-wheelers were listed as the most common form of access, though planes were used by 22 percent (4) of the trapping households. Two of the 17 trapping households reported trapping on the peninsula. The remaining 15 households gave generalized locations in the immediate Naknek River area for their trap lines.

Hare, Porcupine, and Squirrel

Along with the furbearers, other small land mammals were used by residents of the local area. Two types of hare, arctic or tundra (Lepus othus)

TABLE 29. NUMBER OF BRISTOL BAY BOROUGH SAMPLED HOUSEHOLDS WHO SUCCESSFULLY TRAPPED FURBEARERS, 1983
(N = 116)

Species	Households harvesting known numbers of animals				Total Number of Successful Households
	Data Missing[a]	1 - 3	4 - 6	7+	
Beaver	1	4	1	1	7
Wolf	1	1	0	0	2
Land Otter	2	4	2	0	8
Wolverine	1	2	0	0	3
Mink	2	1	0	0	3
Red fox	4	3	1	1	9

a. These households indicated successful trapping for specific species, but did not give harvest levels.

Source: ADF&G Subsistence Division March 1984.

and snowshoe (Lepus americanus) were found locally. The snowshoe hare inhabits mixed spruce forest, wooded swamps, and brushy areas. The Arctic hare prefers upland tundra and windswept rocky slopes. While both are found in the local area, the snowshoe hare is more common (Dick Sellers pers. comm., 1985). Tundra hares were harvested by seven (6 percent) of the 116 surveyed households. Twenty-two animals were taken by these households. Additionally, in three instances households were given tundra hare by other households. A total of 43 snowshoe hare were harvested by five households, 4 percent of the survey sample. Only one household reported receiving snowshoe hare.

A third small mammal used as a food source by some households was porcupine. Porcupines travel slowly and climb trees with slow deliberate movements and are easily killed with clubs or shotguns. Among the households surveyed in 1984, five reported harvesting a total of 16 porcupines.

Former use of parka (ground) squirrels was sometimes mentioned by interviewed households, but there was no use reported for 1983. Parka squirrels were formerly used by local residents for clothing and occasionally interest was expressed in trapping some for use in skin sewing.

CHAPTER 6

FISH

Numerous species of anadromous and freshwater fish are present in the Naknek drainage (Appendix E). A number of these are harvested commercially and non-commercially by borough residents. A variety of gear was used, with some type of fish harvest feasible throughout the year.

FRESHWATER FISH

The Bristol Bay watershed is a rich producer of freshwater fish. In addition to attracting fishing enthusiasts from around the world, the fishery resource is also used by local residents. While occasional trips were made to other systems, such as the Kvichak River or Ugashik Lakes, the majority of freshwater fishing took place within the Naknek drainage (Fig. 9).

The four freshwater species that were included in the 1984 systematic survey were rainbow trout, pike, Dolly Varden, and grayling. Additionally, burbot, whitefish, blackfish, lake trout, ling cod, and suckers were also harvested. The freshwater species are found in lakes, streams, and rivers. Timing and location of harvest within the watershed depends on the life cycle of the individual species as well as other factors, such as weather conditions.

Both anadromous and non-andromous populations of arctic char and Dolly Varden (these two closely related species of the subfamily Salamonidae will be collectively referred to as Dolly Varden) are found locally. They are most available either in the spring, when some migrate to sea, or in mid-summer, when large schools concentrate at river mouths to feed on outmigrating salmon fry and smolt. Their edible weight averaged 1.5 pounds per fish.

Rainbow trout in the Bristol Bay drainage are well known for their large size. They are most easily caught in late summer and early fall. During late August, rainbow trout leave the lake environment and feeding streams to feed on salmon eggs and decaying salmon. Edible weight for rainbow trout was estimated at 1.5 pounds.

Pike and arctic grayling are found in Naknek Lake, Naknek River and its tributaries. Pike are also found in some tundra lakes surrounding the communities. The most popular pike-fishing location for local residents is Pike Lake (Fig. 13). The size of pike can vary dramatically. The estimated edible weight of locally harvested pike was 2.8 pounds per fish. Arctic grayling are caught in King Salmon Creek and other Naknek Lake tributaries. One of the most productive sites is at Lake Camp in early spring. Grayling are also available throught the summer at Rapids Camp. Adult grayling in the Bristol drainage can range in length from 12 to 20 inches or more. Usable weight averaged one pound.

Freshwater Fishing – Commercial

No commercial harvesting of freshwater fish occurred during the study period. During the late 1960s there was an effort to commercially harvest freshwater fish in Naknek Lake. From 1965 through 1968 gill nets (4 1/2 inch mesh) were set under the ice at a location approximately seven miles into the lake from Lake Camp. A number of Naknek residents were involved in the project, harvesting lake trout, char, whitefish, ling, and burbot. The project was not continued for a variety of reasons, the lack of a reliable market being paramount.

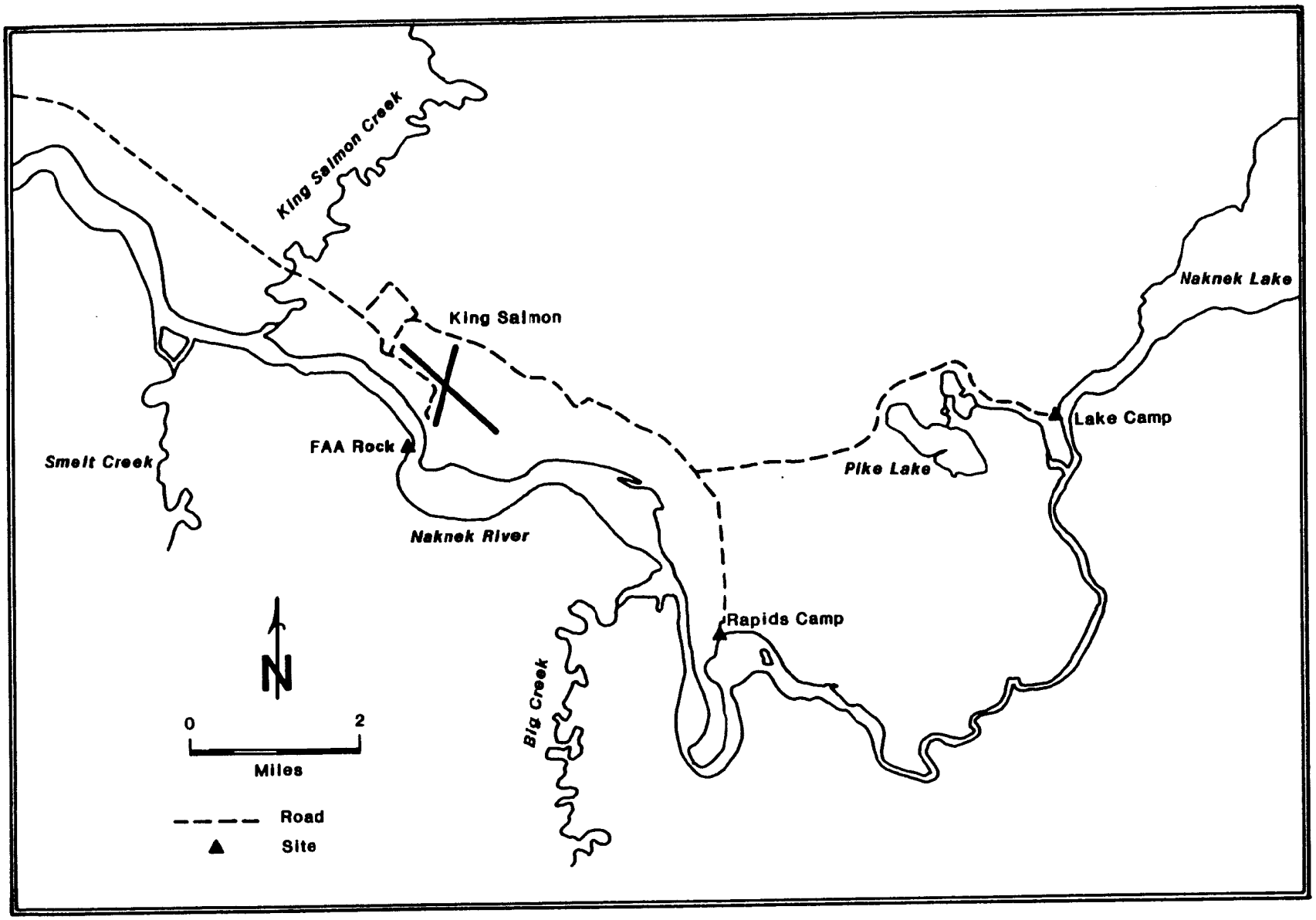

Figure 13. Resource Harvest Area Map: Freshwater Fishing, Bristol Bay Borough Households, circa 1960-1983. Other Locations used outside this area are illustrated elsewhere.

Freshwater Fishing – Gill Nets

Fishing for freshwater fish with gill nets did not occur during the study period. Gill nets are not allowed above Savonoski on the Naknek River. This limits their usefulness in terms of harvesting freshwater fish, as freshwater fish are rarely harvested that far down the river.

During the late 1960s and into the 1970s permits were issued for using gill nets to fish freshwater fish near the outlet of Naknek Lake. Permits were issued for the harvest of whitefish, Dolly Varden/arctic char, and lake trout. A maximum of 50 fathoms of 4 1/2 inch mesh gill net was allowed. Records on harvest success are unavailable. Four permits were issued in 1978, the last year any permits were issued.

At the time the permits were first issued, Katmai National Monument did not include the portion of Naknek Lake used for gill net ice fishing. A boundary expansion in 1969 included the entire lake within Katmai. Further in 1980, the status of the area was changed from a national monument to a national park. No type of gill net is currently allowed within the Katmai National Park boundaries.

Jigging through the ice for freshwater fish is considered a subsistence activity in the Bristol Bay area. A nominal amount of this activity took place during the study period. Harvest totals are included in Table 30 for the surveyed population.

Freshwater Fish – Rod and Reel

By far the greatest amount of harvest of all types of freshwater fish was with rod and reel gear (Table 30). 1983 sport fishing regulations are

TABLE 30. HARVEST LEVELS FOR FISH, EXCLUDING SALMON TAKEN BY NETS, BRISTOL BAY BOROUGH HOUSEHOLDS, 1983.

Species and Gear Type	Number of Households Harvesting n = 116	Total Harvest in Numbers of Fish	Average Harvest per Harvesting Household	Average Harvest for Entire Sample
Smelt, jigging through ice	41	7546	184	65.1
Smelt dip net	24	3559	148	30.7
Rainbow trout, jigging through ice	3	17	6	0.1
Rainbow trout, rod and reel	59	1220	21	10.5
Pike, jigging through ice	2	31	16	0.3
Pike, rod and reel	11	a7	a	0.8
Dolly Varden/Char jigging through ice	0	0	0	0.0
Dolly Varden/Char rod and reel	34	391	12	3.4
Grayling, jigging through ice	1	1	1	a
Grayling, rod and reel	41	542	13	4.7
Ring Salmon rod and reel	48	475	10	4.1
Sockeye salmon rod and reel	11	192	17	1.7
Coho salmon rod and reel	39	622	16	5.4

a. Less than .1

Source: ADF&G Subsistence Division, March 1984.

presented in Table 31. Rainbow trout were harvested by 59 households: 34 households took Dolly Varden, 11 took pike, and 41 harvested grayling. A total of 1220 rainbow were reportedly taken by the surveyed group, far more than any other species harvested with rod and reel gear.

Rod and reel fishing took place in Naknek Lake, in Naknek River, and in the tributaries emptying into the river, Big Creek, Smelt Creek, Ring Salmon Creek, and Paul's Creek. Figures 9 and 13 include some of the key fishing locations used by local residents during 1983. Open water, and therefore potential rod and reel fishing, is most consistently found year-round at the outlet of Naknek Lake, adjacent to Lake Camp. In other places, rod and reel fishing commenced as soon as the water was ice-free and continued into the fall months.

Skiffs were the common means of transportation for open-water fishing. Floating docks and ramps near the freshwater fishing areas are located at the end of the King Salmon runway, at Lake Camp and at Rapids Camp. Skiff owners normally put their docks into the water in May and leave them in through the end of September or early October, though this varies from year to year.

Anadromous Fish

Rainbow (boreal) smelt and five species of Pacific salmon enter the Naknek River and its tributaries for a portion of their life cycle. Salmon are harvested commercially and non-commercially with gill nets. They are also taken with rod and reel gear under sports-fishing regulations. Smelt are taken non-commercially using dip nets, beach seines, or by jigging through the ice.

There are anadromous Dolly Varden and arctic char populations in the

TABLE 31. SPORT FISHING REGULATIONS FOR THE NAKNEK RIVER, 1983.

	King Salmon	Other Salmon	Rainbow Trout	Other Fish
Between department markers placed 1/2 Mile east of Rapids Camp to department markers placed east of Trefon's cabin	5 per day 5 in possession. Only 2 over 28" June 8 – April 9	same as remainder of drainage	5 per day, 5 in possession, only one over 20" June 8 – April 9	Char – 10 per day, 10 in possession, no size limit. Grayling- 5 per day, 5 in possession, no size limit. Other-No bag, possession or size limit. June B-April 9
Remainder of drainage	same as above, except season open all year	same as remainder of drainage	same as above except season open all year	same as above, except season open all year
King Salmon Creek (tributary to Naknek River)	Closed	Same as remainder of drainage	same as above except season open all year	same as above except season open all year

Notice: Notwithstanding the bag and possession limits set out above, the total aggregrate bag and posssession limit of salmon, trout, char, and grayling may not exceed 10 fish per day.

Source: Alaska Department of Fish and Game 1983b

Naknek River drainage; however, as it is difficult to differentiate between them and the resident population, all were included in the freshwater fish discussion.

Smelt

Rainbow (boreal) smelt return to the Naknek River system each year to spawn. The smelt appear in the river during the second half of October or early November and remain until April or May. There is no definitive information about the size of runs or life history of smelt in the Naknek River. A small fish, their edible weight averaged 0.25 pound.

Smelt fishing occurred principally at two times during the year. As the fish moved into the river system in the fall, they were taken with dip-nets or small beach seines. Of these two methods, dip-netting was used most frequently. According to survey results, Diamond 0, a former cannery located in South Naknek (Fig. 14) was the most popular smelt dip-netting location. Nineteen of the 24 households using dip-nets used this site. Fishing through the ice for smelt with jigging gear was popular in the months of January, February, and March. Thirty-five percent of surveyed households participated in this activity. Paul's Creek (Fig. 11) and FAA Rock near Ring Salmon were the most heavily used areas for winter smelt fishing (Fig. 12). A total of 32 households fished one of these two areas, 25 at Paul's Creek and 7 near King Salmon.

THE SALMON RESOURCE OF THE NAKNEK RIVER

Five species of Pacific salmon enter the Naknek River drainage. Each species has a unique life cycle, spawning in specific locations within the drainage and running at different times and in different numbers. Also, each species has different values to local user groups.

Sockeye are the most abundant salmon species entering the Naknek River. Historically, sockeye tend to run in large numbers for a short time. The twenty year average escapement for sockeye in the Naknek is 1,136,000; in 1983 it was 888,000. The round weight for sockeye in 1983 was five to seven pounds (Division of Commercial Fisheries 1984). The peak of the run occurs around the fourth of July.

King salmon (chinook) have traditionally been a highly valued species in the Bristol Bay area. They are sought for commercial, subsistence, and sport uses. Kings arrive early, usually by mid-May and peak in early July. An average king weighs between twenty and thirty-five pounds. Jack kings (immature males) weigh about eight pounds. The king salmon life cycle is four to six years.

Chum salmon begin to return to the Naknek River with the sockeyes, approximately the third week of June. They are a medium-sized fish, averaging approximately six to ten pounds. They do not figure importantly in the subsistence fishery.

Pink salmon return strongly to the Naknek River in even numbered years, arriving in the river in the latter part of July. They weigh an average of four to five pounds, with a life cycle of two years. They are

soft-bodied fish, not traditionally highly prized in the local commercial or subsistence fisheries.

Coho (silver salmon) are the last of the salmon to arrive in the Naknek River, usually appearing in early August. Cohos average eight to nine pounds and are targeted by all user groups.

Salmon - Commercial Fishing

Commercial salmon fishing is the most important economic industry in the Bristol Bay Borough. A total of 37,277,029 (preliminary total) sockeye were harvested in the Bristol Bay commercial district in 1983 by 1,821 drift and 960 set gill net limited-entry permit holders. Although sockeye provide the bulk of the commercial harvest, other species are also harvested by the commercial sector. Table 32 presents the commercial salmon catch for the Naknek/Kvichak district from 1964 through 1983.

The commercial season runs from June into September. King salmon are fished commercially in early to mid-June; the sockeye salmon run is from late June until approximately the third week of July, and coho salmon are fished commercially from mid-August into September. River systems within the Bristol Bay vary as to the productivity of the individual species; the Naknek/Kvichak run is focused on sockeye salmon. The Bristol Bay commercial fishery is managed locally in Alaska Department of Fish and Game offices located in Dillingham and King Salmon.

TABLE 32. COMMERCIAL SALMON CATCH, NAKNEK/KVICHAK DISTRICT, 1964 – 1983.

Year	Number of Fish				
	Sockeye	King	Chum	Pink	Coho
1964	2,243,701	12,902	153,644	49,127	3,133
1965	19,139,567	9,793	45,430	514	3,053
1966	5,397 538	5,456	57,273	142,221	4,096
1967	2,337,226	3,705	49,606	20	1,175
1968	1,216,858	6,398	43,187	218,732	7,357
1969	4,655,072	19,016	42,535	205	17
1970	17,803,805	19,037	120,279	28,301	53
1971	5,857,378	10,254	151,465	2	89
1972	1,102,365	2,262	115,737	57,074	402
1973	168,249	951	123,610	109	255
1974	538,163	480	41,347	508,534	916
1975	3,085,416	964	79,740	6	43
1976	2,547,276	4,064	317,550	264,631	1,195
1977	2,167,214	4,373	340,228	19	2,883
1978	5,123,668	6,930	185,451	734,880	913
1979	14,991,826	10,415	196,398	134	12,355
1980	15,120,457	7,517	204,515	288,363	7,802
1981	10,992,809	11,048	355,943	194	1,229
1982a	4,987,922	12,503	194,256	125,869	9,111
1983a	21,314,327	9,942	325,884	15	82
20 year total	140,790,837	158,010	3,144,078	2,417,732b	56,159
20 year average	7,039,542	7,901	157,204	241,773b	2,808

a preliminary data
b even years only

Source: Alaska Department of Fish and Game 1984

Salmon - Rod and Reel

Two salmon species were heavily harvested with rod and reel gear. In fact, rod and reel gear harvest substantially outnumbered commercially caught king and coho salmon kept for home use as well as subsistence harvests of the two species (Table 33).

Locations for harvesting king and coho salmon are in the same general area as was previously discussed for freshwater rod and reel fishing. The area immediately adjacent to King Salmon down to Paul's Creek is a particular favorite with salmon rod and reel fishermen, though depending on the time of the run, fishing continues into the spawning streams emptying into Naknek Lake.

The variety of rod and reel fishing exhibited among borough communities can be attributed for the most part to two factors: time of the runs and proximity to productive rod and reel fishing locations. Those households involved in commercial salmon fishing tend to be tied up with preparation for and actual commercial fishing during the peak of the rod and reel king salmon fishing season. Time is limited for these households, which makes the second factor, proximity, more relevant. For rod and reel fishermen residing in King Salmon, access is quick and easy to rod and reel fishing locations. However, for fishermen from South Naknek or Naknek, either a skiff must be run approximately ten miles upriver, or the distance must be driven in a motor vehicle. Either method of transportation adds considerable time to a rod and reel fishing trip. By the time the coho salmon arrive in the river, the peak of the commercial salmon season is over for most fishermen and time is not the crucial factor it had been earlier in the season. Further, the

TABLE 33. NUMBER OF SALMON HARVESTED, BY FISHERY TYPE, OF SURVEYED HOUSEHOLDS, BRISTOL BAY BOROUGH, 1983 (N = 116)

Species	Fishery						Total
	Subsistence		Rod & Reel		Commercial		
	Number	Percent	Number	Percent	Number	Percent	
Sockeye	3057	76%	192	5%	782	19%	4031
King	206	21%	475	48%	294	30%	975
Pink	91		na		na		na
Chum	198		na		26		na
Coho	166	18%	622	68%	121	13%	909

na = data were not collected for these categories.

Source: ADF&G Division of Subsistence, March 1984.

limit of ten coho, weighing approximately four pounds, allowed on a subsistence permit did not make the work of setting a gill net worthwhile to some residents. The ten fish quota on subsistence permits did not seem to be a limiting factor for the larger king salmon.

Salmon – Subsistence

The information in this section focuses on the large and consistent harvest of salmon taken with gill nets for home use. Residents of the Bristol Bay Borough used several methods to obtain salmon for home consumption, including keeping fish from commercial harvest, fishing with subsistence set gill nets, or using rod and reel gear under sports-fishing regulations. Commercial fishermen often kept salmon for their family's use, and when discussing subsistence salmon use did not distinguish between the original sources of the product. However, most people differentiated between salmon caught in gill nets and those taken with rod and reel. Rod and reel fishing for salmon was very popular; however the bag limits for rod and reel salmon were small (Table 31), which encouraged freezing the fish rather than the canning, drying, and smoking processes used for large harvest with gill nets. Because of the small catches of salmon with rod and reel, distribution patterns may also be dissimilar to those of the subsistence salmon complex.

Table 34 compares the numbers of king, sockeye, and coho salmon taken under rod and reel, subsistence, and commercial fishing categories. Pink and chum salmon were not included as was determined that their harvest numbers from rod and reel and those kept from commercial harvests would not be sign.ificant. The subsistence fishing area is shown in Figure 14.

TABLE 34. PERCENTAGE OF FISHING HOUSEHOLDS BY COMMUNITY EMPLOYING SPECIFIC SALMON HARVEST METHODS FOR HOME CONSUMPTION, BRISTOL BY BOROUGH, 1983.

Species/Method	Community							
	Naknek (n=52)		King Salmon (n-43)		South Naknek (n=21)		Total (n=21)	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
King:								
Commercial	23	44%	4	9%	9	9%	36	31%
Rod & Reel	17	33%	29	67%	2	10%	48	41%
Subsistence	19	36%	7	16%	8	38%	34	29%
Sockeye:								
Commercial	14	27%	2	5%	9	43%	25	22%
Rod & Reel	3	6%	6	14%	2	10%	11	9%
Subsistence	21	40%	11	26%	8	38%	40	34%
Chum:								
Commercial	1	2%	0	0%	2	10%	3	3%
Rod & Reel	0	-	0	-	0	-	0	0%
Subsistence	5	10%	2	5%	1	5%	8	7%
Coho:								
Commercial	6	11%	1	2%	6	29%	13	11%
Rod & Reel	16	31%	18	42%	5	24%	39	34%
Subsistence	6	10%	1	2%	5	24%	12	10%

Source: ADF&G Division of Subsistence, 1984.

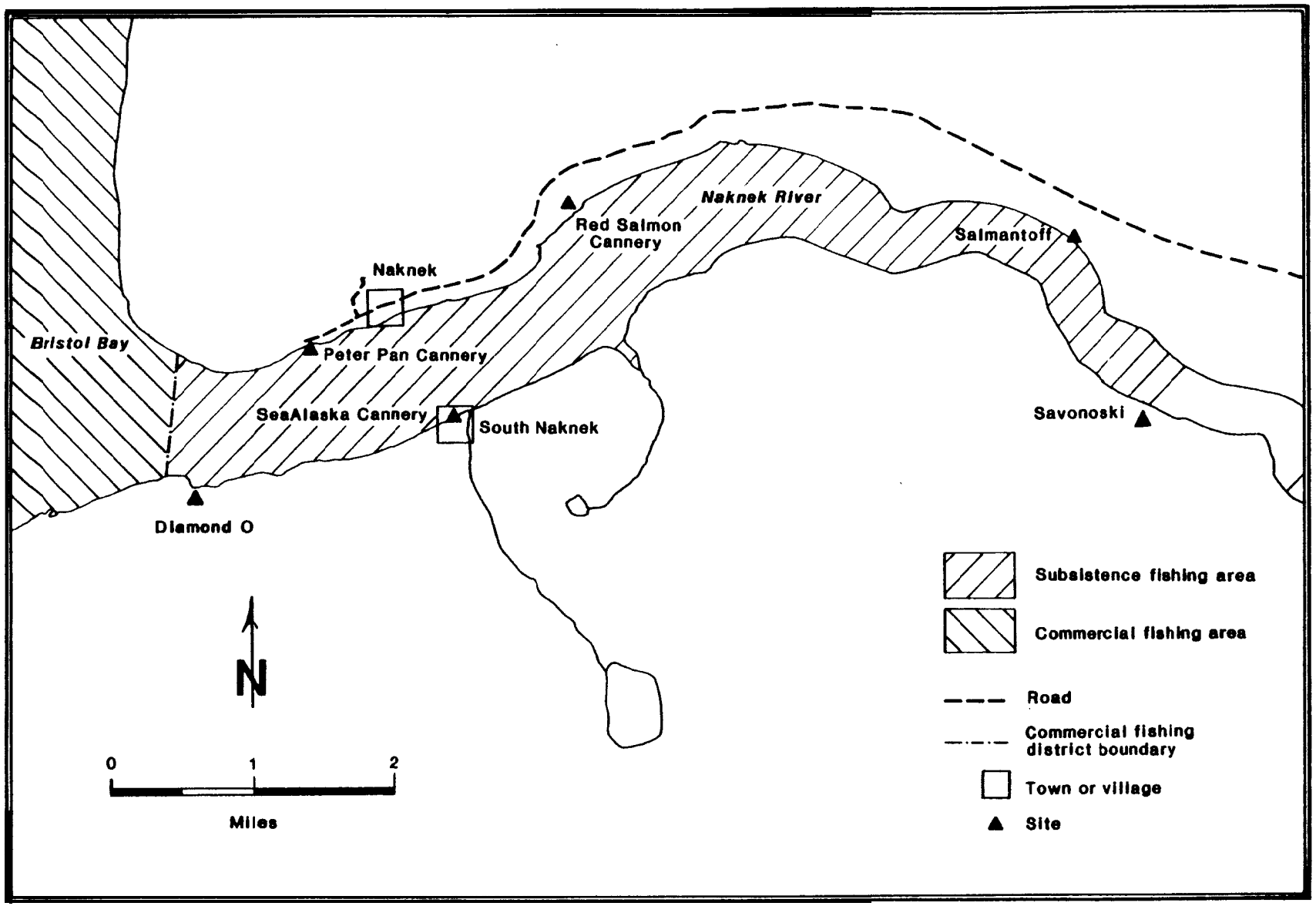

Figure 14. Resource Harvest Area; Subsistence Salmon Fishing Area, Naknek River, 1983.

Subsistence Fishing Regulations

Charged with the responsibility of managing fisheries on a sustained yield basis, the Department of Fish and Game and the Board of Fisheries have played a major role in shaping characteristics of the subsistence fishery, including the legal fishing gear, harvest limits, and open fishing periods. The following history of subsistence fishing regulations for the Naknek River illustrates how these actions have affected the local subsistence fishing system (Table 35).

In general, regulations for subsistence fishing on the Naknek River in 1982 were as follows. Only persons domiciled in the Naknek/Kvichak drainage were eligible for a permit; only one permit was issued per household; ten fathoms of red, king, or pink gear could be used, set gill net only; nets could be set only below Savonoski; and during the commercial fishing emergency order period (June 23 to July 17) subsistence fishing was allowed from 9:00 a.m. Tuesday to 9:00 a.m. Wednesday and the same time period Saturday to Sunday. The management of the subsistence fishery is under the jurisdiction of the Division of Commercial Fisheries.

For the period immediately prior to statehood, the commercial fisheries of Alaska were managed by the U.S. Department of Interior, Fish and Wildlife Service, The first evidence of recognition of a non-commercial fishery was in 1949 when a "Personal Use" fishing category was defined as "the taking or attempting to take of any species of fish or shellfish for ultimate consumption by the taker and his family" (USFWS 1949:14). There were no specific regulations for the Bristol Bay Area.

In 1951 the definition was revised. The revision included the taking of a species for purposes other than for sale or barter, including dog food

TABLE 35. HISTORY OF SUBSISTENCE FISHING REGULATIONS ON THE NAKNEK RIVER SINCE STATEHOOD, 1960-1984.

Year	Permit Required	Gear	Open Season	Restrictions
1960	To take salmon less than 12 miles upstream from waters open to commercial fishing. Application for a permit may be made to local representative and cause must be shown why said permit should be granted	Set gill nets not to exceed 50 fathoms in length. All gear while in operation, shall be plainly marked with the name of the operator.	Anytime except within the defined commercial fishing districts (see (a)).	(a) Within defined commercial fishing districts, salmon for subsistence purposed may be taken during open fishing periods.
1961 same as 1960 except	(a) within the defined commercial fishing districts by individuals not licensed as commercial fishermen.			
1962 same as 1961				
1963 same as 1962 except		Within a commercial district subsistence salmon may be taken with legal commercial fishing gear. Outside the commercial fishing districts set gill nets are not to exceed 50 fathoms in length.		(a) Numbers of salmon taken for subsistence purposes may be limited under terms of a permit. (b) In places of inadequate numbers of spawners present, and a subsistence fishery has an injurious effect on the resource, the taking of salmon for subsistence may be restricted by a field announcement.
1964 same as 1962 except	(a) In Naknek River above the commercial fishing area. (b) Just cause not required for permit. (c) Permit shall be issued if compatible with proper utilization of the salmon stocks.			(a) Salmon for subsistence purposes may not be taken within a commercial fishing district during closed fishing periods.

TABLE 35. HISTORY OF SUBSISTENCE FISHING REGULATIONS ON THE NAKNEK RIVER SINCE STATEHOOD, 1960 - 1984.

(continued, Page 2)

Year	Permit Required	Gear	Open Season	Restrictions
1965 same as 1964 except	For salmon for subsistence purposes.			(a) Waters within 300 feet of any stream mouth utilized by salmon are closed to all subsistence fishing. (b) No nets may obstruct more than one-half the width of any stream. (c) The minimum distance between nets in a stream shall be 300 feet.
1966 same as 1965				
1967 same as 1966 except	Trout and char added to salmon for subsistence purposes may be taken under the authority of a permit which may be obtained from one local representative of the Department.			Salmon for subsistence purposes may not be taken upriver from Savonoski of the Naknek River.
1968 same as 1967 except		All set gill nets shall be staked and buoyed.		
1969 same as 1968 except		In the Naknek River net gill nets shall not exceed 10 fathoms in length.	In the Naknek River from 9:00 am Saturday to 9:00 am Sunday of each week. The balance of each week is closed to subsistence fishing.	

TABLE 35. HISTORY OF SUBSISTENCE FISHING REGULATIONS ON THE NAKNEK RIVER SINCE STATEHOOD, 1960 - 1984.

(continued, Page 3)

Year	Gear	Open Season	
1970 same as 1969			
1971, same as 1970 except		Repeal Saturday only fishing, Naknek River closed during emergency order period (9am June 23 to 9am July 17).	
1972, & 1973, 1974 same as 1971			
1975 same as 1971 except		During June 23-9am thru 9am July 17 subsistence salmon may be taken in the Naknek River during the following periods - 9am Tues to 9am Wed & 9am Sat. to 9am Sun.	
1976 same as 1975 except	Repealed necessity to identify gear (became covered under state wide provisions).		
1977 same as 1976 except			No person may operate or assist in operating subsistence salmon net gear simultaneously while operating or assisting in operating commercial salmon gear.

TABLE 35. HISTORY OF SUBSISTENCE FISHING REGULATIONS ON THE NAKNEK RIVER SINCE STATEHOOD, 1960 - 1984.
(continued, Page 4)

rm	
1978, 1979 same as 1977	
1980 same as 1979 except	Only one subsistence permit may be issued to each household per year.
1981, same as 1980 except	Subsistence salmon fishing permits for the Naknek River drainage will be issued only to those persons domiciled in the Naknek & Kvichak River drainages. Naknek River drainage subsistence salmon fishing permits will be issued only thru the department's King Salmon office.
1982, 1983 & 1984 same as 1981	

(USFWS 1951:16). In the Bristol Bay Area a personal use fisherman was required to provide notification of intention to take salmon in closed waters or during closed commercial periods. The notice was to include the identity of the fisherman, area to be fished, time such fishing would be done, approximate number of fish to be taken, and the intended disposition of the catch. How closely the letter of the law was followed in issuing permits is not known. Personal use fishing regulations continued to become more detailed. For example, by 1957 in the Bristol Bay Area (commercial district) personal use fishing was not permitted between June 22 and July 27 in the Kvichak/ Naknek district in waters open to commercial fishing except for 12 hours each Wednesday (USFWS 1957:35).

With the advent of statehood, the term subsistence fishing replaced personal use fishing in the regulatory language. Additionally, the subsistence fishing regulations began to be more specific. permits were required for the taking of salmon, and the harvest could be limited. Initially state regulations declared only Alaskan residents were eligible to take salmon for subsistence purposes. Specifically, a permit was required to take salmon less than 12 miles upstream from waters open to commercial fishing, or within the defined commercial area if one did not hold a commercial license. Permits were obtained through application to a representative of the Department of Fish and Game. Cause showing why the permit should be granted (104.90) was required, although no example of what an acceptable "cause" might be was offered. In the Naknek River, salmon could be taken with set gill nets not to exceed 50 fathoms and all gear had to be plainly marked.

There have been several regulatory changes that stand out in the memory of individuals who have been fishing on the Naknek River for a

number of years, regulations which have signified substantial changes in their fishing practices. One change remembered by local long-term subsistence fishing participants was the closing of the Naknek River upstream from Savonoski in 1967. According to the Department's area biologist during the time, Ken Middleton, the FAA was at the time conducting several major construction projects, and crew members, temporarily domiciled in the King Salmon area, began putting subsistence nets out along stretches of the Naknek River where nets had not previously been used. Ken Middleton stated that this practice along with some reported waste led to the regulation change. He reported that the presence of the nets in the formerly unused areas was more of a "perceptual" rather than a biological problem. He said that local residents were very protective of their natural resources and did not want the system or the resource abused. Ken Middleton also said that the sports fishing activity during this time centered around military personnel. There were active recreational sites at Lake Camp and Rapids Camp which were not closed until 1975. The professional sport fish guiding industry was just getting started in the mid-1960s. However, potential conflict between the gear types (rod and reel and set gill nets) was apparently another factor in the regulation change (Ken Middleton, pers. comm., April 1985). The Savonoski boundary not only lessened the open fishing area by approximately eight miles, it also required that King Salmon households subsistence fish relatively far from their homes. The time involved in checking nets was mentioned was the main inconvenience created by the regulation.

In 1969 a regulation change reduced the legal amount of gear from 50 to 10 fathoms. The regulation followed a similar one previously passed for the Nushagak River. According to Mike Nelson, Division of Commercial

Fisheries, Nushagak king salmon were being harvested in very large numbers in areas where several species were highly concentrated. Newcomers to the area and to subsistence fishing tended to fish the allowable limit of gear without considering potential harvest quantities. Frequently nets were swamped with fish and fishermen were unable to process the catch in a timely manner. Alaska Department of Fish and Game approached local groups for support in controlling the daily catch by limiting the amount of gear allowed. The proposed regulation change was supported and subsequently put Into effect on the Nushagak. Successful there, the change from 50 to LO fathoms of gear followed on the Naknek River where similar problems were occurring with sockeye salmon (Mike Nelson, pers. comm., April 1985). In 1982 some individuals still resented this regulation, saying they preferred to get all their fish in one or two sets with more gear than having to set nets several times. The majority of those interviewed, however, saw no problem with the LO fathom limitation and said they did not want to get an overabundance of fish at any one set.

In 1968 subsistence fishing was limited to a single 24-hour period per week from June 26 through July 15 in the Naknek River. According to the Bristol Bay Data Report No. 19 (Nelson 1970), the drop in subsistence fishing totals in the Naknek River can be explained by this regulation[1]. According to the report, people felt it was too much trouble to put a net out for one

L A discrepancy appears between the published regulations (Alaska Commercial Fishing Regulations, 1968) and the Bristol Bay Data Report No. 19. According to published regulations, the 24-hour fishing period occurred in1969 (Alaska Commercial Fishing Regulations, 1969). It is possible an Emergency Order was issued during the 1968 season, though no mention is made of one in the 1968 Bristol Bay Annual Report (Alaska Department of Fish and Game 1969b)

day a week and took their fish during the open commercial season, presumably from their own commercial catches (Nelson 1970:5). The subsistence fishing time had been shortened to combat commercial fishing violations. All subsistence fishing was eliminated June 23 through July 17 from 1971 until 1975. The regulation was passed in a continuing effort to lessen commercial fishing violations. In response to pressure from individuals who wanted to subsistence fish during the peak of the sockeye run, in 1975 two weekly fishing periods for the Naknek River were added. The major objections against a total closure were that people could not take advantage of closures in the commercial fishery to put up family fish. Additionally, persons not involved with the commercial fishing could not take their fish during the peak of the sockeye run. In 1982 concerns voiced about the current weekly fishing periods focused on the 24 hour opening. It was felt by some it would be more effecive to run by tides, as there were some openings in which nets could only be fished for one tide.

A regulation change that affected persons holding both commercial and subsistence permits occurred in 1977 (5 AAC 06.990 (b)). It prohibited fishermen operating or assisting in operating commercial salmon net gear from simultaneously operating or assisting in operating a subsistence salmon net. This regulation was cited by some commercial fishermen as a reason for keeping fish from their commercial catch. They said it was too hard to pull the gear from their commercial site to put out a subsistence net.

Previous to 1980, anyone eligible for subsistence fishing in the Naknek River could obtain a permit in his/her name. Since 1980, only one permit per household has been allowed rather than one per individual. Limiting the number of permits per household was done in order to hold down potential allowable harvest levels, particularly for king and coho. The number of fish allocated on permits when each person was eligible could potentially over-

subscribe the king and coho runs entering the Naknek River (R. Russell, pers. comm. April 1985). The change has confused some of the long-time users. The major concern expressed by those people upset by the regulation change was that they or their children would not be "documented" as being participants in the subsistence fishing system which could be a detriment to them at a later date. The permit itself had space to enumerate those household members who will help with subsistence fishing activities; however this did not satisfy eveyone's concern. A number of households in the borough are rather fluid in composition, particularly during the commercial salmon season. Certain individuals might appear on more than one household permit, or appear on none.

In 1981 subsistence fishing permits became available only to those persons domiciled in the Naknek/Kvichak River drainages [5 AAC 01.330 (d)]. This created resentment among former non-local users who were no longer eligible to obtain a permit. It also led to hard feelings within the community, as a number of families had friends or relatives who regularly returned in the summer and put up salmon to take home. Some people felt that the biological condition of the salmon stock did not warrant limiting the permits on the basis of residency. Other local residents generally supported the concept of limiting subsistence fishing permits to persons domiciled in the area. The most frequently cited justification for the supporting the limitation was that the net sites were more difficult to find when the river had been open to all Alaskans. It was also stated by some local people that those who live in any area deserved the protected and continued use of local natural resources. In response to the concern raised by those ineligible to harvest salmon with subsistence gear, in 1982 the Board of Fisheries created a personal use fishery for the Naknek River. This allowed any Alaskan resident to harvest

up to 75 sockeye salmon with either a gill net or dip net once an escapement of 900,000 sockeye had been reached.

Subsistence Salmon Harvest Levels

Subsistence salmon harvest data have been collected since 1963, the first year permits were issued (Nelson 1970:5). Harvest levels through 1980 (Table 36) include all persons who subsistence fished in the Naknek River during those years, not just residents of the Bristol Bay Borough. A regulatory change effective in 1981 stipulated that only residents of the Naknek/Kvichak drainage were eligible to subsistence fish in the Naknek River. Therefore, since 1981 the catches are primarily those of borough residents.

Table 37 compares sockeye salmon runs for the Naknek River with the expanded subsistence catches for a 20 year period. The subsistence sockeye harvest has varied from .5 percent to less than .1 percent of the total run. According to Middleton (1983:7), the variation in subsistence catches both historically and annually are not significant. He felt this indicated a basic use level that was somewhat independent of fish abundance.

When the state permitting system began in 1963, it was not well understood by local users, and compliance was probably low. Therefore, harvest data for the early years of the permitted subsistence fishery are not reliable measurements of use (Nelson 1970). During the course of the project it appeared that most residents in 1983 understood that a subsistence permit was required. With the exception of 1980, the number of permits issued has remained fairly consistent in the last several

TABLE 36. NAKNEK RIVER SUBSISTENCE PERMITS ISSUED AND HARVEST LEVELS BY SPECIES, 1963 – 1983.

Number of Permits			Expanded Harvest Levels by Species					
Year	Iss.	Ret.	King	Sockeye	Chum	Pink	Coho	Total
1963	50	33	500	3,900	100	+	400	4,900
1964	71	61	500	3,400	+	1,100	800	5,800
1965	64	32	500	2,400	100	+	300	3,300
1966	76	45	600	3,800	300	2,700	400	7,800
1967	68	43	500	4,900	100	+	500	6,000
1968	62	54	500	2,400	100	300	200	3,500
1969	74	65	400	2,100	100	+	400	3,000
1970	Data Missing							
1971	57	44	240	6,296	32	+	65	6,635
1972	85	42	410	3,687	371	693	50	5,211
1973	114	82	565	2,513	235	+	493	3,817
1974	132	118	870	4,625	242	1,395	200	7,332
1975	179	72	576	7,097	116	+	216	8,021
1976	145	81	675	6,262	228	1,099	208	8,472
1977	203	130	1,093	9,420	339	+	263	11,168
1978	219	111	1,023	9,192	339	970	226	11,750
1979	243	112	1,044	9,547	232	+	897	11,746
1980	358	270	1,419	15,680	661	1,780	844	20,384
1981	233	194	738	9,468	204	+	899	11,397
1982	215	155	933	10,072	317	791	862	12,975
1983	213	162	851	11,388	268	+	803	13,449

Sources: Alaska Department of Fish and Game 1971
Alaska Department of Fish and Game 1984

TABLE 37. INSHORE SOCKEYE SALMON TOTAL RUN IN THE NAKNEK RIVER, 1964 - 1983.

	Commercial Catch & Escapement	Subsistence Harvest	Total	Subsistence Harvest as Percent of Total
1964	2,556,000	3,400	2,559,400	.1%
1965	1,832,000	2,400	1,834,400	.1%
1966	2,109,000	3,800	2,112,800	.2%
1967	1,225,000	4,900	1,229,900	.4%
1968	1,791,000	2,400	1,793,400	.1%
1969	2,135,000	2,100	2,137,100	<.1%
1970	1,726,000	(Data Missing)		
1971	2,706,000	6,296	2,712,296	.2%
1972	1,315,000	3,687	1,318,687	.3%
1973	501,000	2,513	503,513	.5%
1974	1,621,000	4,625	1,625,625	.3%
1975	3,493,000	7,097	3,500,097	.2%
1976	2,354,000	6,262	2,360,262	.3%
1977	2,463,000	9,420	2,472,420	.4%
1978	1,896,000	9,192	1,905,192	.5%
1979	2,219,000	9,547	2,228,547	.4%
1980	4,759,000	15,680	4,774,680	.3%
1981[a]	7,302,000	9,468	7,311,468	.1%
1982a	4,215,000	10,072	4,225,072	.2%
1983[a]	5,395,000	11,388	5,406,388	.3%
19 Year Total[b]	51,887,000	124,247	52,011,247	.2%
19 Year Average[b]	2,731,000	6,539	2,737,434	.2%

[a] **Preliminary data**

[b] **1970 was not figured into total or average.**

Source : Nelson 1970:23. (1964-1969)
Alaska Department of Fish and Game 1984:121 (1971-1983)

years. 1980 was the last year non-residents of the Naknek/Kvichak were allowed permits for the Naknek River. (In 1985, they were again eligible for subsistence permits.) The reason for the increase that year is not clear, but the strong sockeye run in 1979 might have brought attention to the Naknek River and the possibility of subsistence fishing there.

During the summer of 1982, 214 permits were issued to Bristol Bay Borough households. This represented 58 percent of the 371 households in the area. In 1983 the percent of households obtaining permits was very similar to that of the previous year. Two hundred and thirty permits were issued, all but nine to local residents. As will be discussed in a later section, obtaining a permit and using subsistence salmon do not always coincide.

Subsistence Salmon Fishing Methods

Historically, a number of methods were used to harvest salmon in the Naknek River area, including spearing, gill-netting, and seining. In 1982 set gill nets were the only gear allowed for subsistence fishing in the Naknek River. The nets are fixed to shore and anchored at right angles to the shore, with a buoy attached to the outer end. The following discussion describes methods utilized by Naknek River residents in 1982 and 1983.

The nets, either king or red, were often lengths of old commercial gear. Regulations limited the length of gear in the river to ten fathoms. In the commercial district, which is outside the Naknek River mouth, it was permissible to use either set or drift gill net gear. Up to 25 fathoms were allowed for a subsistence net set in the commercial district. No local residents reported

drift subsistence fishing. Further, few of surveyed group set subsistence nets in the commercial district.

Set nets were put out at low tide if worked from the shore. If set from a skiff, the net was set at low water or a couple of hours before high water and the fish "picked" (removed from the net) soon after high water. If the net was picked from the shore, work began as soon as the water level was low enough to make access feasible by foot, though some nets were left until dry. Most people said they preferred to pick the net while it was still in the water as the fish were cleaner and seagulls had had less opportunity to damage the fish.

Some nets were left out to fish continuously until sufficient fish to meet the households's harvest goals had been met. Due to regulations and run strength, king and coho were the two species fished in this manner. During the emergency order period (June 23 until July 17) nets could only be fished on Tuesdays and Saturdays. Therefore, it was not possible to fish for sockeye with a net left out on a continuous basis.

Subsistence Net Locations

The general location of where subsistence gill nets were placed along the Naknek River was determined in part by regulations which prohibited gill nets upstream from Savonoski (Fig. 14). Secondly, subsistence nets were required to be spaced at least 300 feet apart. Meeting these two criteria, general area and spacing, nets could be set anywhere along the river bank. Gradually sloping gravel beaches which were easily accessible from the road system appeared to be the most popular locations for setting subsistence nets. While the entire

subsistence fishing area was legally open on a first-come basis to all eligible fishermen, distinct patterns of where nets were set, locally referred to as a "site," have developed. Particular fishing locations, or sites, have developed conditioned by such factors as proximity, which appeared to have had the greatest overall bearing on where a household set a net, access, and traditional use.

South Naknek permit holders, without exception, set on the south side of the river. Most of the nets were placed on the beach just below the village while others used beaches located closer to their homes. As shown in Figure 15, nets were somewhat clustered in family groups. Some sites were used by one family or person at one time in the season, and someone else at another time. Nets on the village beach were generally located on the same sites from year to year, although variations occurred. For example, an older resident said that she usually set her net in a particular spot, but in 1982 the site was taken by someone else. She did not make an issue of the incident and set her net in a different location. The village is located on a bluff from which the fishing sites were visible. This made checking the nets convenient and people reported they often walk to the bluff and looked for fish in their nets. Children also checked nets since fishing sites were located close to most households.

Subsistence fishermen living in King Salmon were the least conveniently situated to fishing sites. Savonoski, the nearest possible site, is approximately eight miles by river or road from King Salmon. The eastern section of the open area was most heavily used by King Salmon residents. Seventy-two percent of the permit holders from King Salmon indicated their nets were set in that general vicinity. Most used their automobiles or a combination of automobile and skiff to set and pick the nets. Those who set on the south side of the river depended solely 'on skiffs.

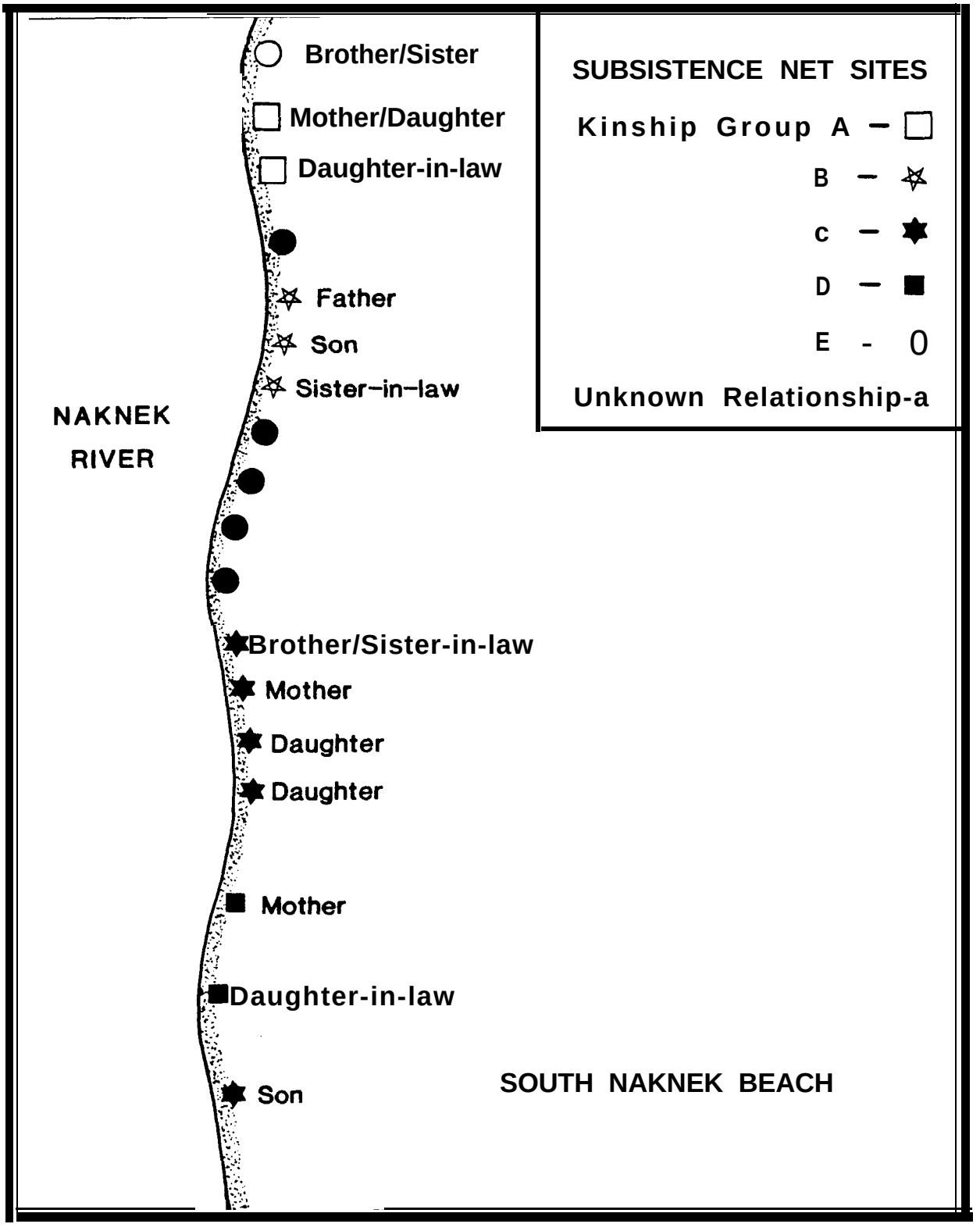

Figure 15. Subsistence Nets Set on South Naknek Beach, 1982, Showing Cluster by Kinship Relaticnsh p. (Not to Scale)

When asked why they set their net in a particular area, most fishermen from King Salmon responded that they had been introduced to that general area by work associates when they first began subsistence fishing. As a result, subsistence net sites in certain areas are fished by groups related by professional affiliations, an interesting contrast to the kinship linkages of South Naknek fishing sites. Figure 16 illustrates the approximate location of some of these groups who fished in the area just below Savonoski. As can be seen, employees of a single agency tend to fish as neighbors along a stretch of beach. There were, of course, exceptions to this generalization. For example, three FAA employees contacted in 1982 put their nets on the Naknek beach. One said he just assumed he could put his net anywhere, another said he wanted to be able to drive his vehicle to the same site, and the third said he usually set around Savonoski, but due to extenuating circumstances had moved this year. He planned to return to the Savonoski location next year.

Access was a problem for upriver sites. Steep bluffs overlook the river and few roads or trails were available to the beach sites. Many of those setting nets on the north side of the river drove their vehicles as close to the actual setting location as possible then backpacked fishing equipment down. Similarly the fish and equipment was carried up the bluff, a distance of up to one-half mile. Sometimes, the equipment was taken down by vehicle and set at low tide; the person returned later in a skiff to check and pick the net. Some people expressed reluctance to backpack fish up the bluff through the alders for fear of running into bears.

Time spent in the actual setting, checking, and picking a net for individuals from King Salmon was substantially greater than for those from the other two communities. A minimum of an hour, as opposed to a matter of minutes, was required to get to and from the site. People in King Salmon talked about

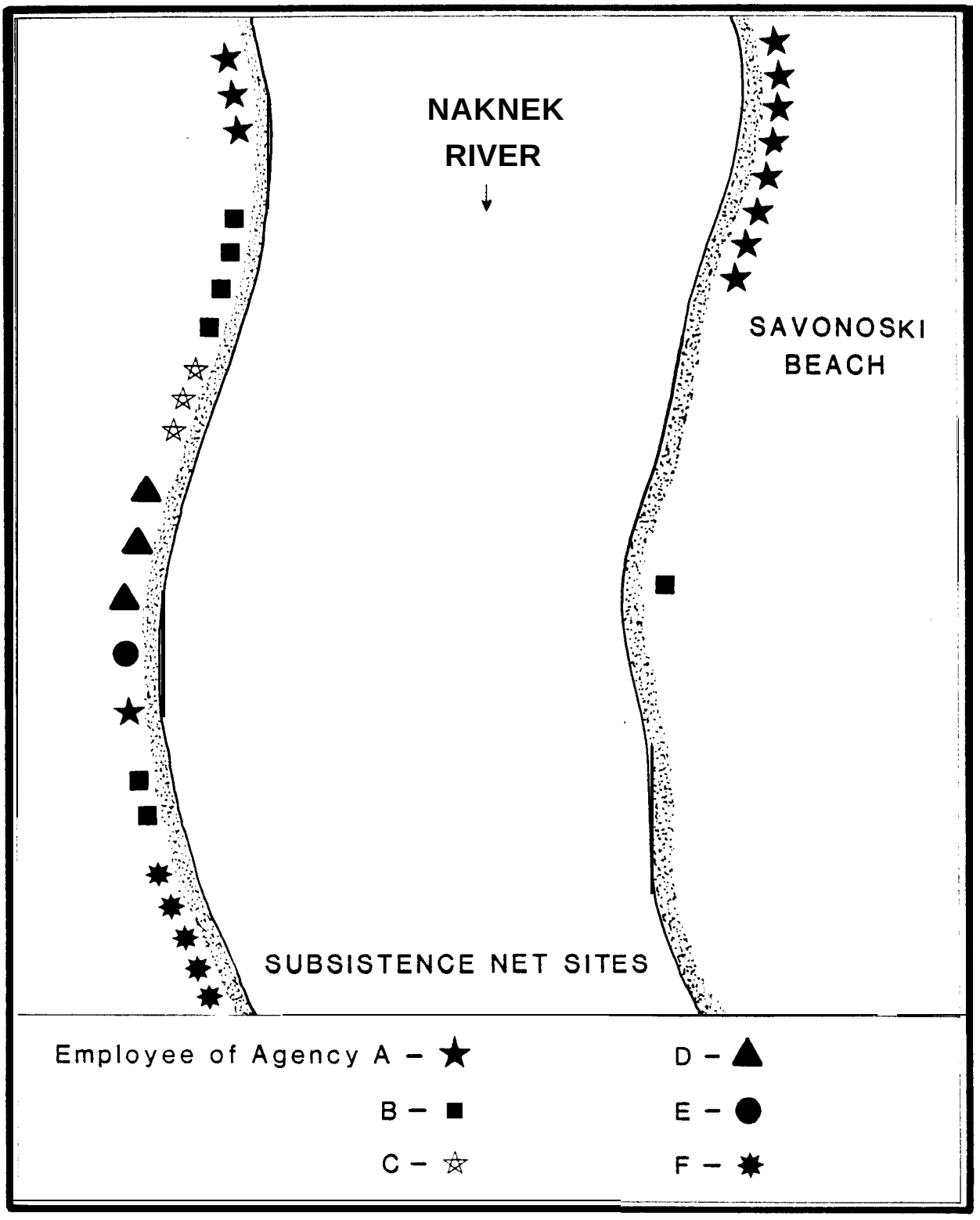

Figure 16. Subsistence Nets Set Near Savonoski Beach, 1982, Showing Clustering by Work Association. (Not to Scale)

making subsistence fishing a "family outing." The day was spent setting the net, waiting on the beach for the fish to strike, picking the nets, and then returning home. This was not a pattern described by the residents of Naknek or South Naknek.

Net locations in Naknek were unlike either King Salmon or South Naknek. The area used for setting nets was much larger than that used in South Naknek. Adjustments have been to accommodate an influx of newcomers in recent years. However, there appeared to be a system of rules recognized by Naknek residents which honored "traditional" family net locations which was not apparent among King Salmon fishermen. In most instances the locations were accessible by three-wheeler or automobile. In no instance did a Naknek subsistence fisherman report using a skiff to reach his site.

Near Naknek, there were several popular areas of subsistence fishing sites from Red Salmon cannery to the commercial fishing district, a stretch of three and a half miles. Certain spots, such as Red Salmon Ways, HUD housing beach, the stretch of beach between Naknek Trading Company and Queens, Peter Pan, and the Naknek beach were most heavily used. On these beaches, there were a number of sites that had been used by the same individuals or families for a number of years. These sites were felt to be "owned" by the individual and others who wished to fish the site had to obtain permission from the "owner." As an illustration, the Department of Fish and Game received a call the summer of 1982 from a Naknek resident who said that someone had "jumped her subsistence site." From the state's regulatory position, all subsistence net locations were open. After this position was given to the caller, she personally talked to the individual involved and the matter was resolved with the new site user moving over enough to accomodate both nets.

As an individual net may only be set out a few times during a single season, and stretches of time occur when no nets are observed set, it was not always clear to newcomers unfamiliar with the fishing system which locations were traditionally used or by whom. Another problem encountered by newcomers was that sites were referred to by local place names which were not always known to newer arrivals. Newcomers responded in different ways to the community rules governing traditional net sites. Some took the philosophy that legally no one could hold the site and therefore they did not worry about disrupting any any "system." Others said they had talked to local residents and asked how they could get a site. In every instance, the person was told of a particular site which could be used. There appeared to be no problem in getting a place to fish because people were willing to share, but it was also evident that it was appreciated when a newcomer to the fishery showed a willingness to cooperate within the confines of the locally established rules. Two of subsistence permit holders interviewed said that on separate occasions there was no room for them to set their nets during open periods during the Emergency Order Period. Both were able to find open sites at later dates. When subsistence fishermen in 1982 were asked if there had been a problem getting sites when subsistence fishing was open to non-local residents, several reported that beaches had been more crowded. Eventually, though, they had always found an open site.

Characterizing social groupings to Naknek net locations was more difficult than in the other two borough communities. The incidence of long-term sites was much higher than among the King Salmon users, but the sites appeared to be scattered and not grouped in any identifiable pattern. Some commercial fishing households set their subsistence fishing nets near the canneries for which they commercially fished. Others set at beaches near their homes and other households set at particular sites because “they just always set there.”

Preferred Species

All five species of salmon that enter the Naknek River drainage were utilized by Bristol Bay Borough residents. King, sockeye, and coho were specifically targeted by commercial, subsistence, and sports fishing groups. Pink and chum were most frequently taken incidentially. A management assumption about subsistence salmon use has been that species are interchangeable. However, the different species were not used in exactly the same manner. Certain species were preferred for various preservation techniques and the time of the runs influenced which fish were preferred.

The arrival of king salmon in the river system was eagerly anticipated due to the size of the fish, the quality of their firm red flesh, and their early availability. The run normally occurs before commercial fishing begins, enabling those involved with commercial fishing time to catch and preserve fish for their families. Environmental conditions are also an important factor in preferring kings. During the early season there usually is less rain and no blow flies to disrupt and complicate drying and smoking. Every subsistence permit holder requested kings (Table 38), and almost all asked for the full limit of ten.

As discussed earlier, the number of kings reported in the subsistence harvest does not reflect the numbers used for home consumption. Ninety percent of the commercial fishermen interviewed in 1982 said they kept king salmon from their commercial catches for home use. In addition to the ten kings obtained by subsistence fishing, some households reported using as many as twenty-five more that were kept from a family's commercial catch. Table 39 shows that 36 of the 57 commercial fishing households contacted in the 1984 survey kept commercially caught kings for home use, an average of eight

TABLE 38. REQUESTED HARVEST OF SALMON SPECIES, BRISTOL BAY BOROUGH SUBSISTENCE FISHING PERMIT HOLDERS, 1982 and 1983.

Species	1982 n=215 Number of Permits Requesting Species	Percentage	1983 n=210 Number of Permits Requesting Species	Percentage
King	215	100%	200	98%
Sockeye	213	99%	208	99%
Chum	40	19%	104	50%
Pink	55	26%	82	38%
Coho	184	86%	168	80%

Source: ADF&G Division of Commercial Fisheries, office files, King Salmon, 1982 and 1983.

TABLE 39. SALMON KEPT FOR HOME CONSUMPTION FROM COMMERCIAL HARVEST, BRISTOL BAY BOROUGH RESIDENTS, 1983.

Species	Commercial Fishing Households Keeping Salmon (n=57[a])		Total number of fish kept	Mean Fish per Household Keeping Species
King	36	(63%)	294	8.2
Sockeye	26	(49%)	782	30.7
Coho	13	(23%)	121	9.3
Chums	3	(5%)	26	8.6
Pink	0	(0%)	0	0.0

[a] 116 households participated in the survey, 57 of those participated in commercial fishing.

Source: ADF&G Division of Subsistence March 1984.

kings per household. Forty-eight of all sampled households added to their supply of king salmon through rod and reel fishing. Thus, in 1983, the sample households harvested for family use an additional 294 kings with commercial nets, and 475 kings with rod and reel gear, along with the 206 king salmon taken with subsistence gill nets. More king salmon for local use were taken with commercial rod and reel gear than in subsistence gill nets in 1983.

Although chums arrive early in the season, they did not generate the same interest as did kings or sockeyes. No one reported that they looked forward to "his first chum." The lack of preference for this species was reflected in the number of permits that requested a chum quota (Table 38). When asked why chums were requested at all, most replied that they are inevitably caught when fishing for kings or sockeyes. The requests were made to cover the incidental chums. Among those persons interviewed, no one listed chums as the preferred species. An overall poor quality fish was the main reason listed for their undesirability.

Most heavily harvested of all salmon species, sockeye salmon has comprised the basis of the commercial, subsistence, and personal use fisheries. In the subsistence salmon fishery, sockeye harvest outweighed, both in terms of edible weight and numbers of fish, all other salmon species (Table 36). However, when combined with total of salmon kept from the commercial and sports fisheries, king salmon provided almost as much edible weight per capita of the surveyed households as did sockeye salmon, 41 pounds and 45 pounds respectively (Tables 16 and 33). Considered less rich than king salmon, easier to work than chum or pink salmon, and more dependably harvested with gill nets than the other species, sockeye salmon were thought of as the basic subsistence fish. If circumstances prevented a household from getting desired numbers of sockeye salmon, other species were substituted, but differences were often noted.

Pinks were ranked in order of preference behind king, sockeye, and coho, but ahead of chum. They are considered less desirable largely due to their soft flesh, which must be processed immediately. They were said to make a very poor smoked fish. The major reason for those who selected pinks appeared to be the time of the run, which occurs more or less between sockeye and coho. People had the option of getting fish at a time when other activities had slowed down, particularly if a family had not been able to get a sufficient number of king or sockeye salmon. Pinks were also used when inadvertently taken with subsistence or commercial gear.

Coho were a popular species for all user groups, though due to the uncertain market and small run size, they have not figured prominently in the commercial fishing industry of the Naknek River. The time of the run and the good quality of meat, particularly desired for salt salmon, were specific specific reasons given for the popularity of cohos by the subsistence fishermen contacted during the 1982 study. In 1982, 86 percent of the subsistence permit holders requested coho, while in 1983, 80 percent did so (Table 38). Compared with the king and sockeye catch (41 and 45 pounds respectively), coho salmon provided to sampled households 11 pounds per capita of edible meat (Table 16).

SUBSISTENCE SALMON PROCESSING, PRESERVATION, AND PREPARATION

Processing salmon involved several steps. Once out of the net the fish had to be cleaned and, if not eaten fresh, preserved. Where and how the fish were processed varied among subsistence fishing households. This section begins with a brief discussion of processing sites. It then outlines preservation techniques, how different parts of the fish are used and, finally, methods of preparation.

Processing Sites

To clean salmon, one of four processing sites was normally selected: the net site, the boat docks, a processing area outside a house, or an area inside a house. Households which smoked large quantities of salmon invariably had an outdoors processing site located near a smokehouse. In some instances, the processing site was shared by members from a number of kin-related households. A large flat working platform, running water, large containers of water for holding the cleaned fish, plus a collection of knives and sharpeners were the standard equipment found at these processing sites. A few ulus (traditional women's knives) were still used. Some households had processing sites with permanent facilities while others had sites of a more temporary nature, often reconstructed each fishing season. Unused parts of the fish were hauled to the dump or thrown back in the river.

A few fishermen cleaned fish at their nets. Factors contributing to this practice appeared to be based on the amount of time available when the net was picked, number of fish in the set, ii a good processing site was available at the residency, and if the same person or persons who picked the net were the

ones did the processing. Cleaning equipment, such as boards and knives were sometimes hauled to the net site. The need for running water was negated by using the river itself for cleaning the fish and equipment. Unused portions of the fish were returned to the river.

Some residents, usually groups of King Salmon men who had used skiffs when working their nets, set up cleaning areas at the local dock area. They either erected a makeshift table or cleaned directly on the dock, throwing the unwanted portions of fish immediately into the river. The last location noted, inside a house, was mentioned when a very small number of salmon were to be processed and the weather conditions were undesirable for working outside.

Parts of Salmon Used for Human Consumption

A variety of parts of the salmon were used for human consumption by Naknek River residents during the study period. Some parts, such fillets, are used from every fish. Other parts, such as milt, were used on an occasional basis. King and sockeye salmon were the two species most frequently mentioned when referring to various parts which were utilized. The size of fish was apparently an important consideration, the larger the fish the more likely it was that a wide variety of its parts would be processed. Table 40 presents the use level of a number of different parts of salmon as given by households contacted in the 1982 survey. The percentage of use does not imply that the household used that particular part from each fish, but that this was a part of the fish which the household was accustomed to using and eating at least occasionally.

All respondents reported using the belly or the fillet section of the fish. They were frozen, salted, canned, smoked, dried, or eaten fresh. Heads,

TABLE 40. PARTS OF SALMON UTILIZED BY BRISTOL BAY BOROUGH RESIDENTS, 1982. (n = 72)

Part	Number of Households Using	Percent of Sample
Head	36	50%
Tail	17	24%
Fillets	72	100%
Eggs	32	44%
Milt	21	29%
Stomach	6	8%
Backbone	28	39%
Cheek	24	33%
Whole	42	58%

Source: ADF&G Division of Subsistence, August 1982.

particularly those from kings or large sockeyes, were utilized by many households. Fish head chowder was the most common method of preparation. Among those persons who used fish heads, it was ranked as a favorite part of the fish, particularly of the king salmon.

Eggs were frequently used, either as bait or eaten. If eaten, eggs were boiled or prepared as caviar. Fried milt was also used as food. Like the eggs it was eaten by numerous households but large quantities were not consumed. Milt can be frozen but most reported using it fresh. The backbone was used two ways, either when a whole fish was canned or as "gumchuk." Gumchuk is the local term for a backbone that is hung until the outside layer of meat is dry while the inside portion remains moist. It is then stored in a freezer. The dried backbone piece is boiled for eating. The backbone itself is not eaten, but sucked to extract the marrow and juices. The second method of preserving the backbone was canning. This method of processing disintegrates the backbone which is then eaten along with the meat.

Other salmon parts were used on a less frequent basis by local Naknek River residents. Some households fixed salmon tails. These were either dried and smoked, or more frequently, salted, soaked out, and boiled. Tips were mainly salted and then boiled. The stomachs were cleaned and boiled by a few households. Livers and hearts were fried.

Preservation Methods

There are several basic preservation techniques used throughout the Bristol Bay Borough communities. Smoking and freezing fish were the most common techniques (Table 41). Salting and canning were also popular. Drying without smoking was the least widely used of the basic preservation techniques.

TABLE 41. PRESERVATION TECHNIQUES AND PREPARATION METHODS OF SUBSISTENCE SALMON, BRISTOL BAY BOROUGH RESIDENTS, 1982. (n = 72)

Preservation Techniques			Preparation Methods		
Type	Number of HH	Percent	Type	Number of HH	Percent
Freeze	72	100%	Bake	68	93%
Smoke	61	85%	Fry	65	90%
Can	51	71%	Chowder	48	67%
Salt	55	76%	Barbecue	44	61%
Dry	20	28%	Boil	39	54%
			Pickle	42	58%
			Casseroles	46	64%
			Broil	31	43%
			Saloonuk	21	29%
			Gumchuk	21	29%

Source: ADF&G Division of Subsistence, August 1982.

Smoked salmon was the most preferred type of preserved fish, but not the technique most widely used. Capital investment, time involved, basic knowledge, and risk of spoilage were reasons given for the dichotomy between preference and practice. Smokehouses in the local area consisted of wooden structures built to handle anywhere from 20 to 300 fish at one time. When someone was asked the size of their smokehouse, most gave the number of fish which could be smoked at one time and not the building's dimensions. A smoldering fire is set inside the building and partially covered with a piece of tin or barrel to produce the desired level of smoke.

Two other types of fish smoking devices are used locally. One is the commercially produced item, commonly referred to by its brand name, "Little Chief." These smokers run on electricity and require commercially-produced wooden chips. Their maxiumum capacity is one or two sockeye-sized fish. Another type of smoker gaining in popularity during the early 1980s was a homemade version built from a wooden packing crate. This box usually measured approximately 3' x 3' x 4' and took electricity to heat commercial wood chips placed in a hot plate located on the inside floor of the unit. Old refrigerators were also converted into smoking units, much like the wooden packing crate.

Each salmon species processed in smokehouses was prepared in specific ways. Kings were made into strips, tied with cords or string, brined, and hung. Strips were used as the fish is too large to be smoked in large sections without flesh spoiling before it is adequately cured. Smaller salmon, sockeyes, or cohos, were split, left connected by the tail, brined, and hung as a single piece. All species were hung outside on a drying bar for a period of time to develop a glaze before being transferred to the smokehouse. It was at this point in processing that people were most concerned about the presence of

blow flies. Alder, birch, driftwood, or combinations of the three were burned to create the smoke. Adding tundra to the fire was mentioned as a way of stretching a supply of firewood, but several people felt this made the fish taste too strong. Formerly when families put fish up for their dogs it was a common practice to use tundra on the fire. Preference for one type of fire over another seemed to be determined by what one's parents had done. Better tasting fish was the standard reason for one's preference and individuals strongly defended their particular choice of wood. There seemed to be no pattern as to who tended the fire, the chore falling to whomever was home. How long the fish were left in the smokehouse or how often the fire was stoked depended greatly on weather conditions.

A major reason for targeting on kings in the spring was less rain and the lack of blow flies which help assure families of better quality smoked fish. It takes a great deal of care to keep a good fire going in the smokehouse and completing the smoked fish. Meeting these labor requirements before and after the demands of the commercial fishing seasons was a major concern of those involved with both fisheries. If conditions did not permit the harvesting and processing of kings, some families using smokehouses elected to wait until coho were available or to freeze sockeye until later in the fall when weather and blow flies were more predictable. Frequently, smoked fish were bagged and stored in freezers.

For those using the smaller smoking units, all species were filleted and cut into smaller strips. Fish were brined, dried on trays or racks and placed in the smoker. The amount of smoking time varied with the unit and amount of fish being smoked at one time. Several individuals with Little Chief units said they smoked their fish for a few hours in the smoker and finished it in their ovens. Weather and blow flies were of less concern when

salmon were smoked by this technique. The fish were frozen or canned for longer term storage.

Salting was an important preservation technique among many local residents (Table 41). Salt fish was soaked out and eaten raw or pickled. Also, once soaked out, salt fish could be used like fresh salmon. All species of salmon were used for salting, though pinks were generally considered too soft to be worth the effort. Sockeyes, cohos, and heads of kings were salted in the greatest quantities. Most salting was done by splitting the fish, and placing them in a container skin side down on a layer of dry salt. Another layer of salt was added and then another fillet with the flesh side down. This sandwiching continued until the container was full. A weight, such as a rock on a plate, was added and the container covered. If the fish had been salted properly it formed its own brine. While the majority of people used dry salt, some individuals made a brine and poured it over the fish. Still others initially used dry salt and after a brine had formed, drained it off, and filled the bucket with a fresh brine.

Six gallon plastic buckets were the most commonly used containers for salting fish. Some older individuals salted their fish in wooden barrels, called vats. The barrels were formerly used as shipping containers for salt pork, dried beef and such, but are now difficult and/or expensive to obtain. The change to the plastic containers for salting fish has led to some concern of botulism possibilities (pers. comm. Extension Service Fairbanks August 1982). Botulism, a potential problem due to the airtight nature of the plastic bucket, did not occur with use in the older wooden barrels which allowed for the flow of air through the slats. Salting has several advantages as a preservation technique including ease of preparation, low capital investment, and the ability to keep the fish for long periods of time. One man reported

keeping a bucket of salt fish for over five years and having it taste as good as fresh fish. The buckets can be stored anywhere, for freezing will not harm the fish. Carrying buckets on their boats, commercial fishermen are able to salt fish when away from home. The buckets of salt fish were easily shipped on boats, barges, airplanes or in the mail, and were taken home by non-local commercial fishermen. Subsistence fishermen also prepared buckets of salt fish to exchange outside the immediate area.

Canning, either with cans or jars, was extremely popular. Approximately 70 percent of those interviewed in 1982 reported canning salmon (Table 41). Females were responsible for most of the canning chores. Mostly whole fish was canned, though some persons reported processing only skinned fillets.

Freezing is a relatively new preservation technique. Before individual freezers were commonplace and when the local population was smaller, canneries allowed local residents to use their freezers. This practice has died out. By the early 1980s, almost every household either owned a personal freezer or had access to one. One hundred percent of the survey sample listed freezing as a preservation technique. It was convenient way to take care of salmon and allowed for preparing the fish in a variety of ways at a later date. Freezing was also used to reduce the workload of having to process fish during the peak of the fishing season. People referred to "throwing" their fish in the freezer when it was first harvested and later when more time was available or weather conditions improved, continued to process the fish. Freezing was also used to preserve smoked and dried fish for long-term storage. Previously such fish was stored in caches but a freezer lessens concern of spoilage or bears breaking into the cache.

Drying without smoking was a technique used by some local native residents for preserving whole fish or backbone. Spawned out salmon, locally

called tamuanaq, were split and dried. Gumlanek was made from older salmon that had been aged and hung outside to dry. If roe was present it was left in the fish. This fish was either left outside or put in the freezer and eaten frozen.

Fermenting in pits is a preservation technique that dates back to prehistoric times. In 1982 only one family contacted continued to use this technique. While the second and third generations in the family enjoyed eating the "stinky" fish, they did not know how to prepare it.

Fish Preparation

There were a number of salmon preparation and serving methods utilized by Bristol Bay Borough residents. During fieldwork in 1982, use levels, types of preparation methods, and recipes were collected. It was difficult to classify these into discrete categories. Differentiating between casseroles and salads, for example, seemed arbitrary. Also some of the traditional native methods (Table 42) of preparing salmon were not adequately identified at the onset of the project.

Baking and frying fish were the most widespread preparation techniques noted (Table 41). Over 90 percent of the 1982 sample reported using each of these methods. Chowders, made from frozen fresh, salted, and canned salmon, were prepared in 67 percent of the households. According to residents, barbecuing salmon (61 percent) was possible year-round, but it occured most often in the summer when fresh salmon were a ready resource.

Some preparation and serving methods required that the salmon had been processed and preserved in specific ways. For example, to serve gumchuk, the

TABLE 42. YUP'IK TERMS FOR CERTAIN SALMON RESERVATION AND PREPARATION TECHNIQUES.

Name	Definition
Maniartuq	Fish cooked in a fire. Put fish on a long stick through a side of fish and cook it over a fire. Turn it until done.
Sulunaq	Salt fish, either eaten raw or boiled (not pickled)
Tamuaneq	Dried spawned out, usually eaten with butter on top, formerly bear fat was used.
Kumlaneq	Aged spawned out salmon. The whole fish (except entrails) is dried outside then frozen. Eaten frozen with seal oil. The eggs are considered one of the best parts of the gunurtuq.

Source: Anisha Angasan Elbie pers. comm., 1982.

backbone had to be dried and smoked when first harvested. Though it is possible to make pickled salmon with frozen fish, most people made it from salmon which had been salted at the time of processing. In other instances, salmon was served in the same manner which it had been preserved. Salunaq is soaked out salt fish which required no further preparation before eating. Strips of smoked salmon are another example of a type of preserved salmon which required no additional preparation before serving.

Frequency of Salmon Use

The frequency of using salmon ranged widely among households interviewed in 1982. Some individuals found it impossible to estimate the number of times in a year the household consumed salmon. Among the 57 households which gave an estimate in the 1982 survey, five reported that salmon was consumed daily in their household. On the other end of the scale, six households reported using salmon about once a month. A number of individuals differentiated between the use of smoke salmon strips and other types of salmon. Among some users, smoked strips were consumed each day while salmon prepared in other ways, such as boiling or baking, was consumed less regularly.

A second distinction in assessing the average salmon usage among households was reference to the time of the year. Though not verified statistically it appeared from conversations during the 1982 fieldwork that salmon use was greater during the early part of the summer when the fish first began arriving in the river. As long as a ready supply of fresh salmon was available, use remained high. One exception noted to this trend was among certain

cannery workers who maintatined that after a few days of the "slime line" that salmon was the last thing they desired to eat.

Units of Production, Distribution and Consumption for Subsistence Salmon

This section discusses social groups and networks formed during the processing and distribution of subsistence salmon. The social units formed in the harvest, processing, and consumption of salmon in the Naknek River area exhibited distinct organizational patterns. The social units formed were not necessarily operative throughout all the activities involved in subsistence fishing ok processing, nor did they always coincide with information provided on the subsistence permits. Two basic organizational patterns, one based on kinship and the other on friendship, were found to exist among Naknek River residents.

Permit Holders

As discussed earlier, subsistence fishing permits listed the name of a holder, and the names of persons in the household working with the holder to to put up fish. The names on permits and users of subsistence salmon in the community were not synonymous. During the summer of 1982, 215 permits were issued for subsistence fishing in the Naknek River. Two hundred and nine of these were issued to residents of the 371 Bristol Bay Borough households. The remaining five were issued to persons subsistence fishing in the commercial district, or to residents of the Naknek/Kvichak drainage, but not living in the borough. Permits issued to local borough residents represented 58 percent

of the households. The number of subsistence permits issued, therefore, does not reflect the number of households using subsistence salmon. In South Naknek, for example, 63 percent of the households obtained permits. However, information about distribution networks indicated that 98 percent of the households in South Naknek used subsistence salmon. Households obtained subsistence salmon in a variety of ways. It was harvested by the household under the provisions of a subsistence fishing permit, taken from the household's commercial catch, or given to the household by another household. Though similar data were not obtained for the other two communities, it is likely that similar patterns existed, if perhaps to a more limited extent.

Among permit holders with relatives in the immediate area, it was not unusual for permits to include the names of family members living in separate dwellings. Figure 17 shows examples of some combinations listed on permits issued in 1982, to illustrate work groups recruited through kinship principles. To many local residents, "household or family" does not mean only those family members living under one roof. For example, when a young married man from King Salmon living in a separate residence from his parents was asked why his father no longer got a subsistence fishing permit, the son replied that he (the son) now obtained the permit and it was a regulation that only one permit could be issued per family. Other persons believed that a permit was not necessary to fish for subsistence salmon. Occasionally a person had not gotten a permit early in the summer and as fishing activity picked up found it easier to work with someone who already had a permit rather than getting her own. One woman said she preferred fishing with her sister-in-law who had a permit and saw no sense in getting one herself.

Occasionally permits were issued to people who did not fish during the season. Some individuals have obtained permits for several years and never

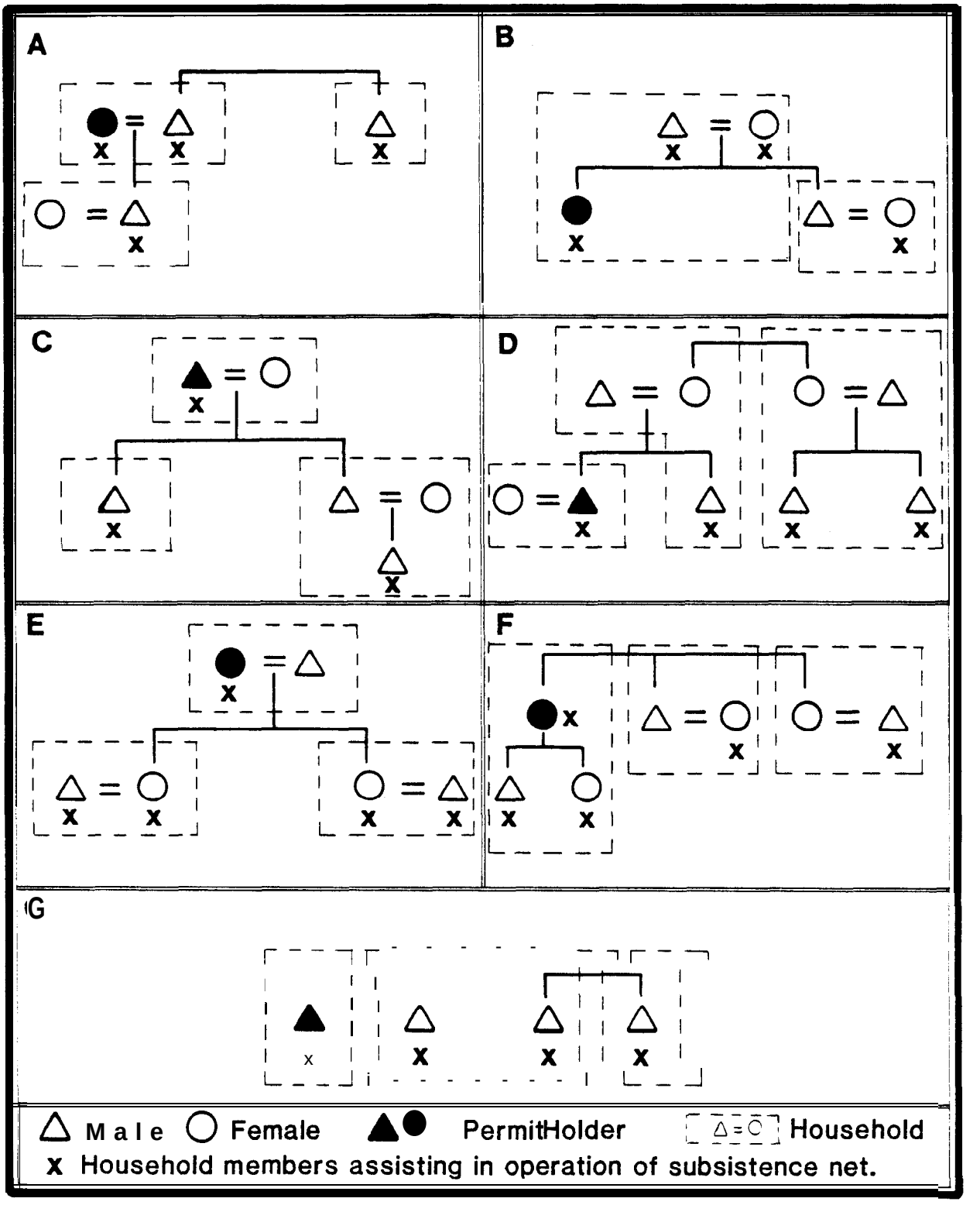

Figure 17. Work Groups Named on Alaska Department of Fish and Game Subsistence Fishing Permits, Bristol Bay Borough, 1982.

fished. One such person explained that the permit was "like insurance," if he wanted to fish he could. He took fish from his commercial catch in 1982 as he had done for the past several years. Others expressed concern that if subsistence fishing became limited, as was done with the commercial fishery, they wanted documentation of their partcipation through the permit system.

Production Groups

Harvesting, processing, and preparing salmon are individual components of the subsistence fishing complex. Few persons operated individually when harvesting and processing subsistence salmon. The production groups were normally organized along the lines of kinship or on the basis of friendship.

Subsistence salmon production networks observed in South Naknek exemplify the units organized through kinship. Consanguinal and affilinal ties connected many of the households. Additionally, residents of the community were so commonly involved in commercial and subsistence fishing activities that everyone, except the youngest children, had learned to set and pick a fishing net. The familiarity of the system, combined with close kinship ties, encouraged sharing of tasks involved with harvesting and processing salmon. Setting a net was usually an individual effort, sometimes a husband setting out for his wife or a son for mother or grandmother. Children of the family unit, whether residing in the same house or not, were often sent to check the nets. Which members of the family picked the net varied from group to group and also from one set to the next. For example, on one tide a man returned with fish he picked from three nets (and three separate households), his own and two of his sisters. He had finished picking his net and simply moved down and took

care of his sisters's nets. Sometimes young children accompanied an adult relative to pick the net, other times an older child did the work alone. If the nets were loaded, anyone present on the beach might give a hand. Due to net locations on the South Naknek beach (Fig. 15), the closest person was often a relative.

Cleaning, splitting, and preparing the fish was a group activity. Sister and sister-in-law, husband and wife, mother, daughter, and grandchildren, father and sons were some of the combinations of the kinship-based groups found working together during the 1982 season in South Naknek (Figs. 18 and 19). Equipment, cleaning areas, and storage units were often shared among the members of these production groups. Smokehouses were frequently the focal point of the work itself, and the preserved salmon, was sometimes stored in smokehouses for the entire group to use throughout the year. In Figure 18, one female, her two children, one daughter-in-law, and a nephew processed subsistence salmon for four households. All fishing was done under one permit, obtained by the daughter-in-law, with a single net being set several times. Once smoked, the fish were divided among all four households. Figure 19 shows an example of a kin-based production group where two permits had been obtained. In this instance, as in Figure 18, only one net was used. Fish harvest was reported on two permits when returned to Fish and Game. The fish were processed by the mother and one daughter-in-law, though the product shared equally among the extended group. One permit holder (Fig. 20) herself did not participate in the processing of the subsistence salmon. However, she owned the smokehouse and the outside work area was located at her house. Once processed, the fish were stored in her cache and she was regarded as the distributor of the fish throughout the year.

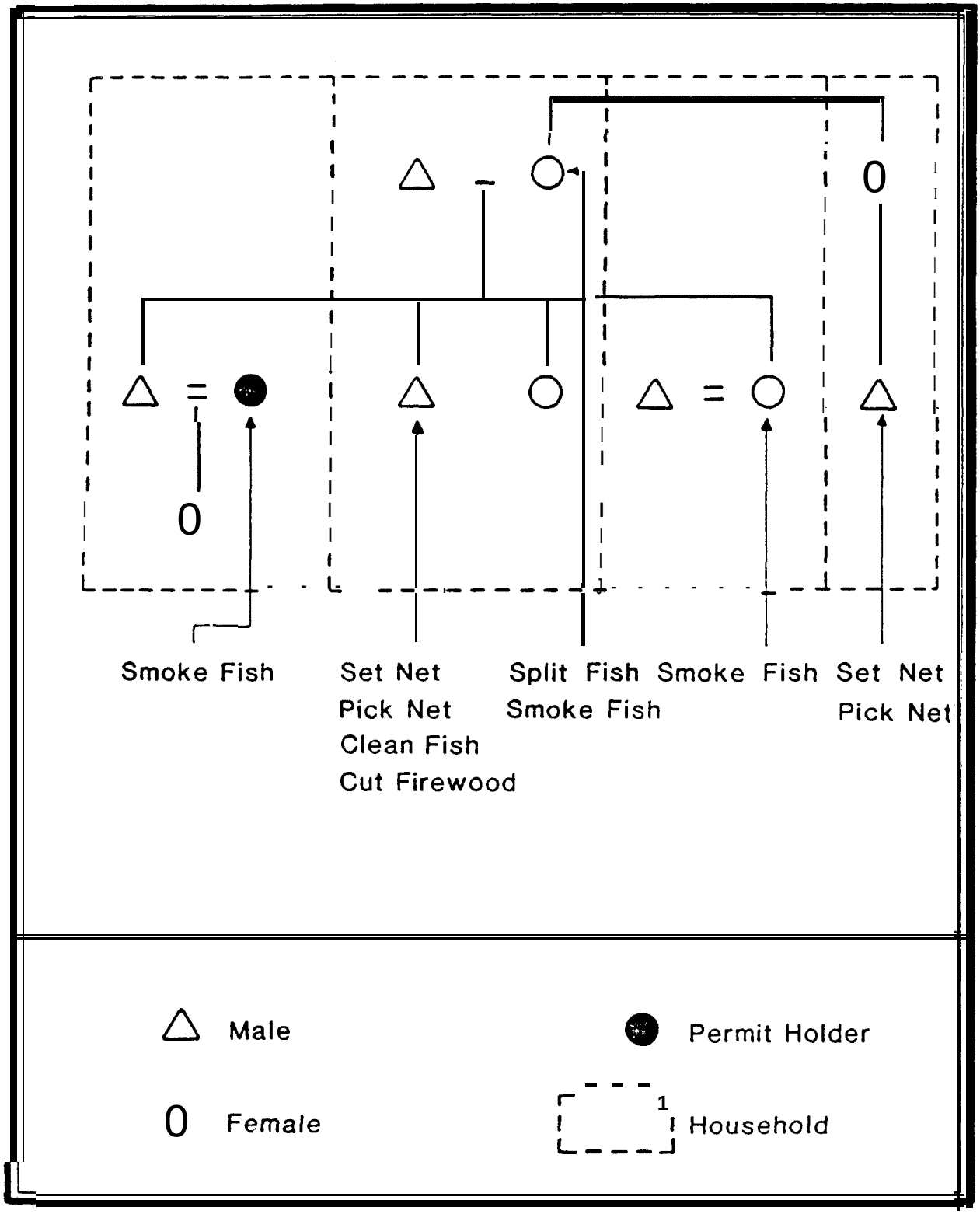

Fig. 18. Subsistence fishing work group based on kinship principles, Bristol Bay Borough, 1982. One gill net and one permit was used to supply the subsistence salmon for four households.

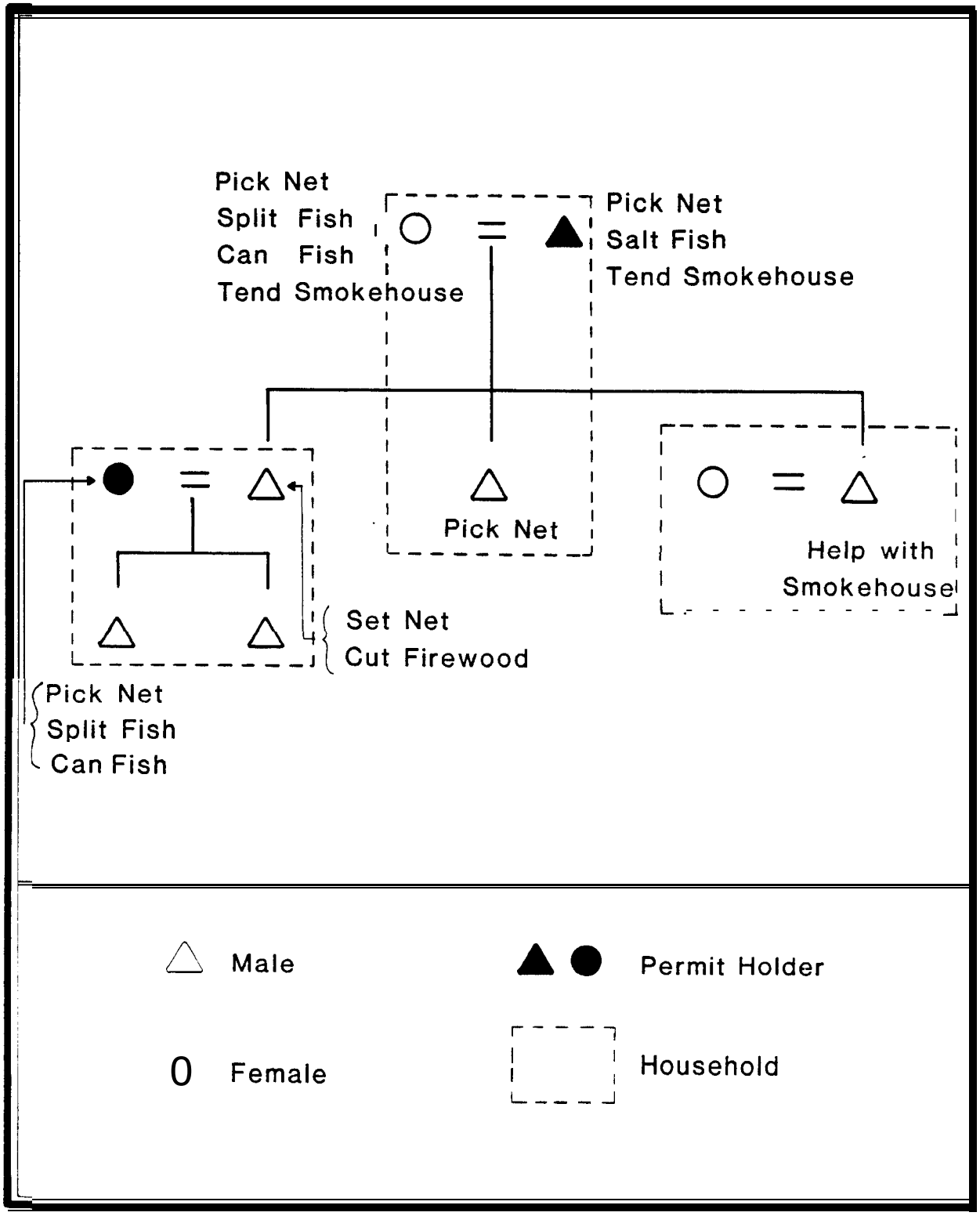

Figure 19. Subsistence Fishing Work Group Based on Kinship Principles, Bristol Bay Borough, 1982. One Gill Net and Two Permits were used to Supply the Subsistence Salmon for Three Households.

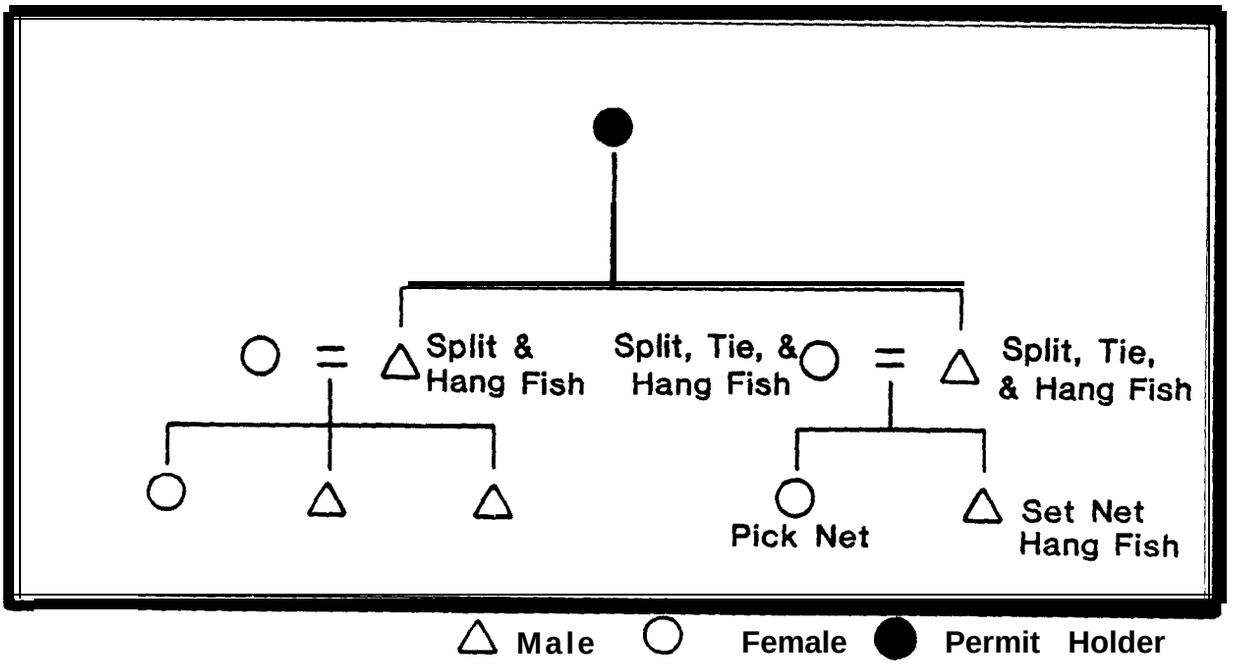

Figure 20. Subsistence fishing work group based on kinship principles, Bristol Bay Borough, 1982. The group worked on one permit, had one net and used a single smokehouse.

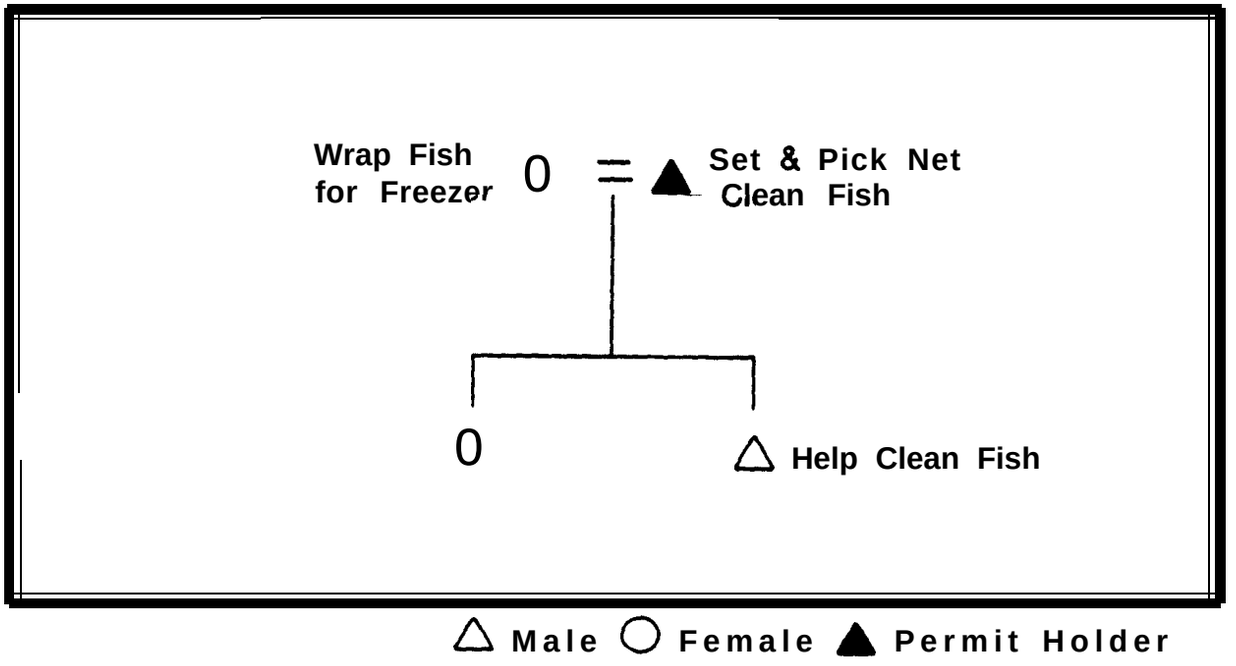

Figure 21. Subsistence fishing work group of a household with no kin-based relations in the immediate area, Bristol Bay Borough, 1982.

A second type of organization of subsistence salmon production groups was not kin-based (Fig. 21). The household was self-contained throughout the subsistence salmon harvest, processing, and distribution. This was a pattern typical of households with no extended kinship ties in the immediate area. Among the isolated nuclear households, work units were sometimes formed on the basis of relationships created through professional, church, or friendship ties (Fig. 22). Such groups at times cooperatively harvested salmon, processed salmon, and shared equipment. Often, however, harvests were divided among the participants once the fish were picked, and the groups split to process the fish separately. Other work groups remained intact through the cleaning process and then split the harvest. Occasionally the communal effort continued through the canning or smoking process. From personal observation it appeared that many of these non-kinship based were unstable in nature, being formed anew each year as newcomers to the area were incorporated into one of the work groups.

Distribution Networks

According to the 1982 survey, subsistence salmon was often distributed along networks of people, samples of which are provided in Figures 23 and 24. The patterns of distribution varied among the user groups with salmon being distributed at different times throughout the year and in various stages of processing and preservation.

Perhaps the most liberal example of distributing salmon, not just sharing equipment, occurred when one household had a net of fish ready to be picked and a backlog of fish to be worked. Occasionally when this occurred, the

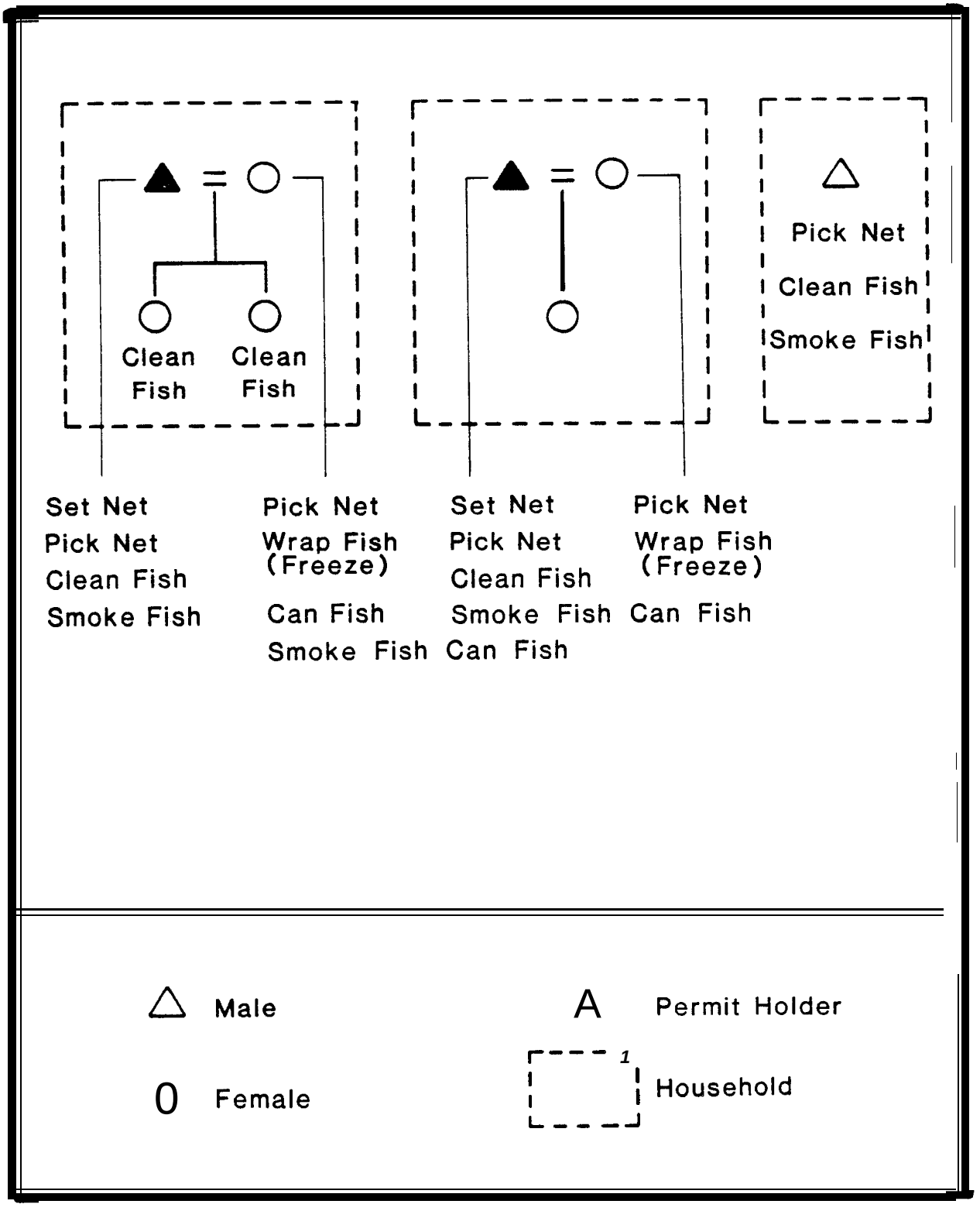

Figure 22. Subsistence Work Group Eased on Professional Relationship, Bristol Bay Borough, 1982. Cne net was used and a single smoke unit shared among the three Households.

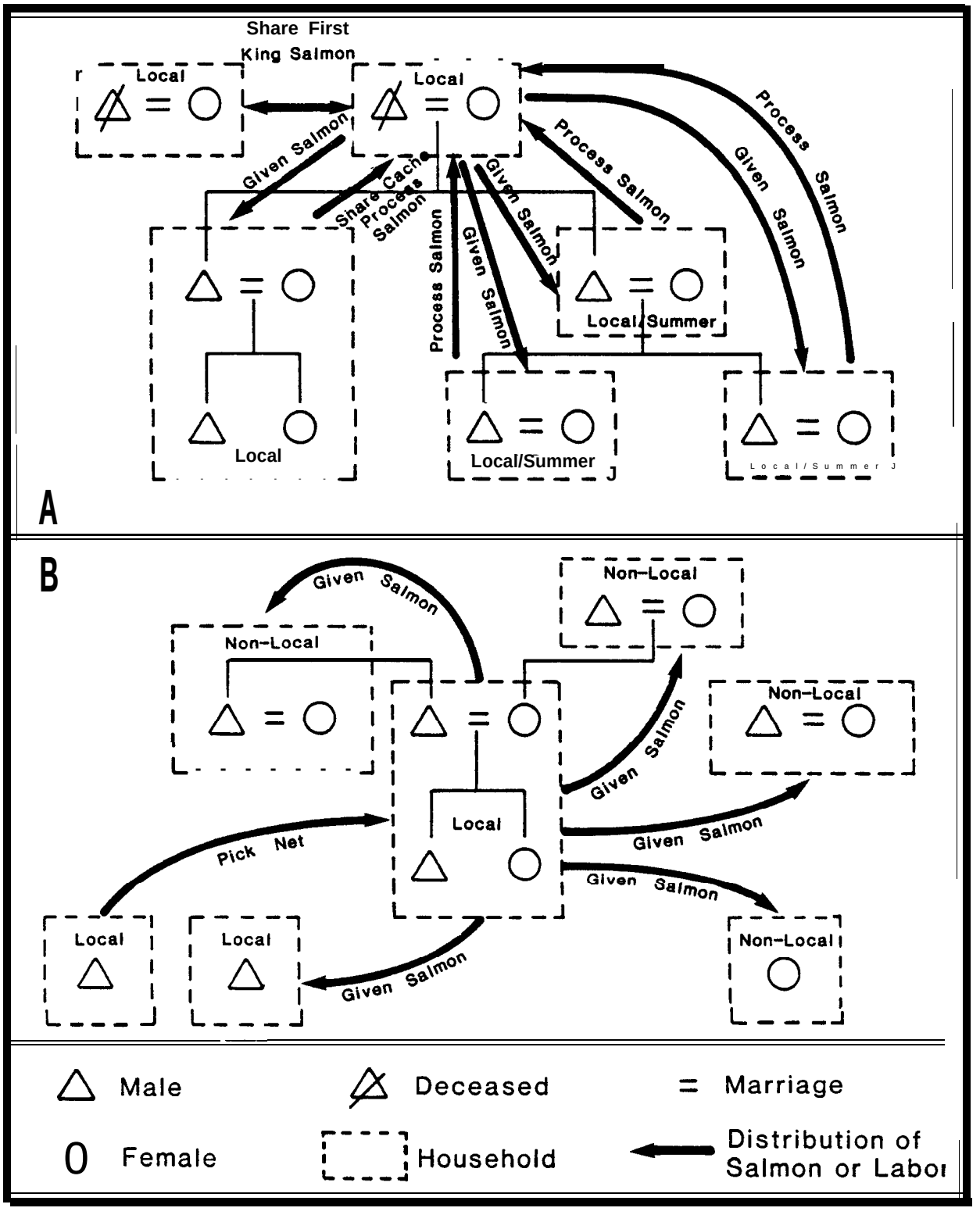

Figure 23. Examples of Salmon Distribution Showing Two Types of Bristol Bay Borough Households. Figure 23A is a locally domiciled kinship group while Fig. 22B is a household with no locally domiciled kin groups, 1982.

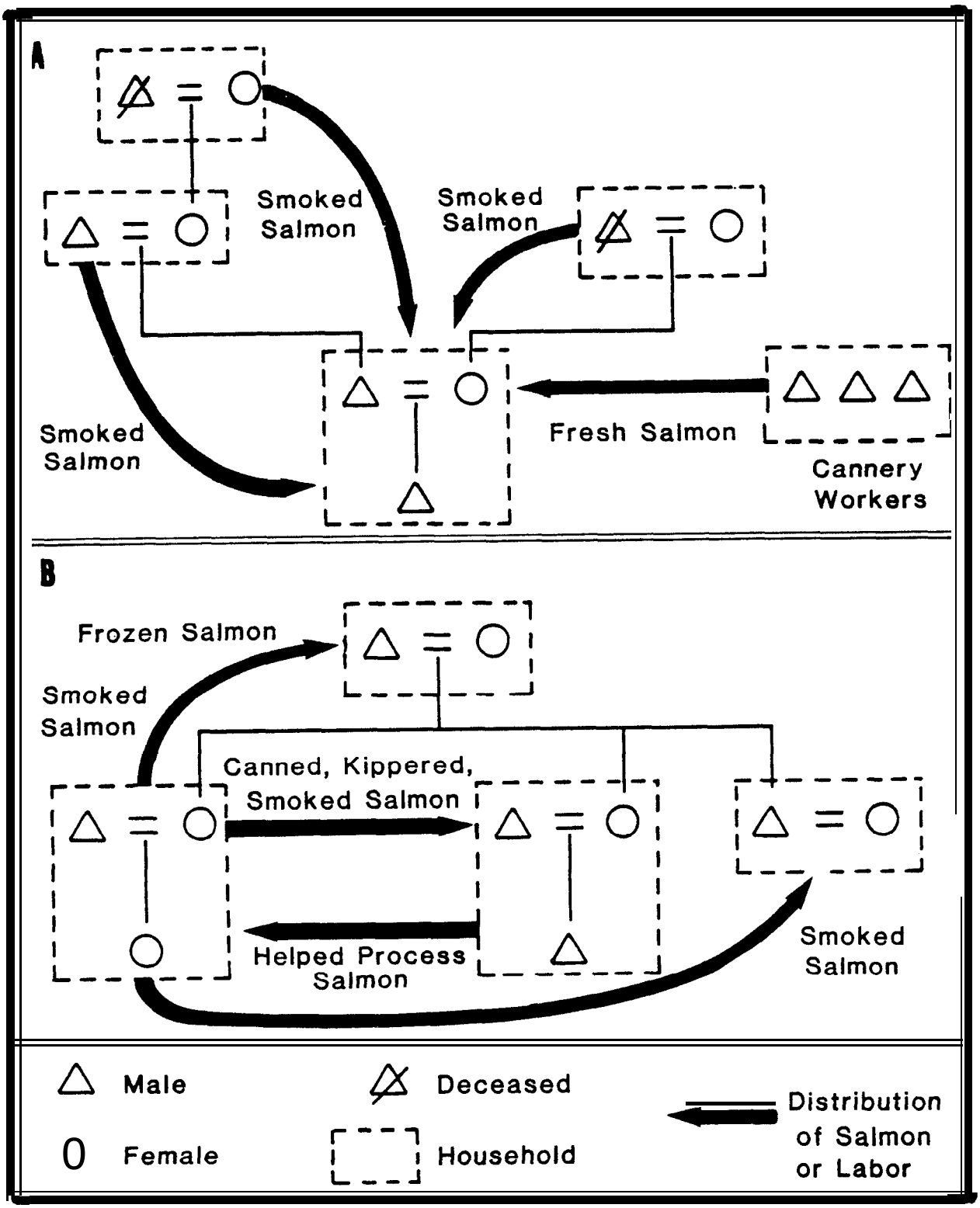

Figure 24. Examples of Salmon Distribution among Kin-based Groups, Bristol Bay Borough, 1982.

unpicked net was offered to a second household. The second household picked the net and processed the salmon for its own use.

Offering a net ready to be picked was not a common occurance; more frequently the first instance of salmon distribution took place among the group of people who had set and picked the net together. When only gear was shared, as was the case in Figure 23B, the salmon tended to be distributed at the time the fish were picked from the net. For groups dividing up the fish at this early stage of processing it generally held true that equipment, such as canners or smoking units, were owned by individual households.

The greater the communal aspects of processing and preserving activities, the longer delayed the distribution of the salmon. When a smokehouse was shared, for instance, though some fish might be taken for immediate consumption, most was not distributed among the members of the processing group for two or more weeks. If a group of households shared a single pressure cooker the fish was distributed when the entire canning process was completed.

Households who shared storage facilities, whether salt buckets, freezers, or caches, tended to give and receive fish continuously throughout the year, or until the supply of fish was depleted. Frequently there was no formalized method of distribution, rather there was an acceptance of the concept that there was an available resource which was to be shared among all members of the group. The households sharing storage facilities were often kinship related, and therefore, salmon distribution followed a network organized along kin-based lines (Fig. 23A).

Sharing salmon with kin was a common practice of all borough residents. The manner in which the fish was distributed seemed to be based on proximity of the households's kinship group. Among extended kinship groups residing locally, fish was shared along kinship based networks working together during

the salmon processing. Sometimes salmon was shared with relatives who had not participated in any phase of the salmon processing. Figure 23A illustrates the ways in which a young couple received salmon during 1982.

When kinship groups did not live locally (Fig. 23B), the times and types of processed salmon which were distributed varied from that which were shared between local kin. Distribution outside the borough was necessarily not an informal, spontaneous event as might be observed among locally domiciled families. Salmon had to be packed and shipped out to be shared with non-local kin. A great deal of salmon distribution occurred in conjunction with the Christmas holiday and when visits were made to or from relatives.

Visitors were frequently given frozen, canned, or salted fish to take on their return home. As the most popular visiting season to the Bristol Bay area is summer; it coincides with the salmon runs, and hence, the possibility of sharing the resource. Children, grandchildren, and other relatives returning to the area for the fishing seasons were often given fish, particularly smoked salmon, for the winter season (Fig. 23A).

Salmon was also distributed outside any work or kin-based group. Frequently when salmon first arrived in the Naknek River, pieces or a single fish or a whole fish were given the older people. Newcomers to the borough, those who did not possess the skill to harvest their own salmon, or who had arrived when fresh salmon was not available, were usually given fish by a local resident. The sharing of salmon with the newcomer was seen both as a welcoming gesture and a way to help the new household establish a food supply.

In conclusion, though salmon distribution occurs throughout the year and among all user groups, it occurred most frequently during salmon season. Production groups, based either on kinship or friendship, were the basis for much of the distribution. When shared locally, fish was distributed during

various stages of processing. However, when shared with those outside the immediate area, it was fully processed in a manner which made the salmon suitable for being shipped long distances.

CHAPTER 7

DISCUSSION: FACTORS INFLUENCING THE CHARACTERISTICS OF RESOURCE USE IN THE BRISTOL BAY BOROUGH, 1983-1984

Results of research conducted by the Division of Subsisence demonstrated that as a group, residents of the Bristol Bay Borough made extensive use of fish and game resources for local use during the study period in the early 1980s. The research also documented broad ranges of resource uses within the sampled population. This chapter discusses the socioeconomic and sociocultural factors which shape these similarities and differences. First, however, it is necessary to provide a context for this anaylsis by outlining the features of mixed, subsistence-based economies and regional centers in contemporary Alaska.

REGIONAL CENTERS IN ALASKA

Regional centers in Alaska are a separate class of communities with a set of socioeconomic characteristics that set them apart from villages and urban areas (Wolfe 1983:268). A regional center is a moderately-sized community which provides service and trade functions for adjacent remote areas of Alaska. These communities' unique characteristics reflect the functional relationships between centers and their satellite communities. But, using Nome as an example, regional centers also have mixed, subsistence-based economies in which a limited wage sector is integrated with relatively heavy and diverse use of wild resources (Ellanna 1983).

Another characteristic of a regional center is a constant migration of people between the community, its satellite communities, and other areas, both

within and out of Alaska. Due to the consequent heterogeneity found in regional centers, sub-populations frequently exist. These may be based on ethnicity, occupation, village of origin, or social class. It was found in Nome that the distinct sub-groups harvested a different mix of resources, though all sub-groups demonstrated a high use of fish and game (Wolfe 1983:270). The high use could be attributed, in part, to the cultural background of Nome's population; the seasonal round activities, complex networks of distribution and exchange, a domestic mode of production and traditional concepts of land use and occupancy were brought to Nome from other communities in Northwest Alaska. Wage employment for many Nome residents was short term, relatively low paying, seasonal, and part-time. Therefore, wage income was frequently used a source of investment capital for fishing and hunting for domestic use and distribution. The Nome study also found that long-term participants holding relatively well paying professional positions participated in subsistence activities. As the length of residency increased, the seasonal round was learned, methods and means of harvest acquired and practiced, and harvest locations discovered. Thus, persons become more deeply integrated into the subsistence system (Ellanna 1983:271).

THE BRISTOL BAY BOROUGH AS A REGIONAL CENTER

In spite of previously acknowledged differences between the three Bristol Bay Borough communities of Naknek, South Naknek and King Salmon, there were a sufficient number of shared elements for them to be considered a single political and social unit (Chapter 3). Unifying elements include a shared school system, borough infrastructure, history, and participation in commercial salmon fishing.

The distinguishing features of regional centers in Alaska were present in the Bristol Bay Borough during the study period. First, with a population over 1000 people (including air force personnel) the borough was more than twice as large as other communities in the Iliamna Lake-Upper Alaska Peninsula region. Next, there was a spectrum of wage earning opportunities. As discussed in the community descriptions, wage employment varied between highly seasonal work associated with the commercial fishing industry to fulltime professional positions. Many of the full-time positions, such as the staff of Lake and Peninsula school district, Fish and Game personnel, and the transportation facilities provided services for local residents as well as for a number of satellite communities.

Persons were drawn to the borough by the services and economic opportunities it provided. People came from a variety of backgrounds, which contributed to the heterogenity of the borough. Kinship networks were strong between residents of the borough and communities of the Kvichak River and Iliamna Lake area, as well as with ones located to the south, such as Egegik and Pilot Point. In addition to drawing from surrounding communities, the borough contained persons from the greater Alaskan area as well as from the Lower 48.

By offering more seasonal and year-round wage opportunities than surrounding rural villages, the borough provided a mechanism for integrating newcomers into the local area. School teachers, government employees, and military personnel regularly transferred in and out of the borough and brought with them a wide range of experiences and expectations. The business community, too, provided opportunities for newcomers to become locally established. Generally, rural villages do not receive an influx of seasonal or permanent newcomers as was found in the Bristol Bay Borough.

Most village residents have kinship ties with one another and incidences of persons without such ties remaining in the communities are rare.

Compared to more urban areas, though, the borough did not have a diverisfied economic base. The economy was built around commercial salmon fishing, a seasonally fluctuating industry dependent on harvesting a revewable resource. This type of system is significantly different than one based upon year-round manufacturing or trade industries.

Another characteristic of regional centers observed in the Bristol Bay Borough was the high level of resource harvest by local residents. This is illustrated in Table 43. The per capita harvest quantities of Naknek (212 lbs), South Naknek (278 lbs), and King Salmon (227 lbs), were higher than places with larger populations, such as Kenai (38 lbs). The higher use level might be attributed to several factors, including more availability of resources, easier access to harvest areas, and the presence of residents with a long history of resource use.

Conversely, the borough's resource harvests were lower than those of smaller, more isolated villages. For example, per capita subsistence harvest for Egegik, located 80 miles southwest of the borough, was 385 pounds (Division of Subsistence, office files King Salmon 1984). Nondalton, to the northeast, reported a per capita harvest level of 738 pounds in the late 1970s (Table 43). These communities and others listed in Table 43, reflect resource harvest levels for communities with fewer job opportunities than in the borough, more readily available wild resources, less restrictive seasons and bag limits, and less enforcement of these regulations.

Resource use patterns of borough residents also illustrated other characteristics of a regional center. Table 15 shows that the majority of

TABLE 43. HARVEST QUANTITIES FROM SEVERAL ALASKAN COMMUNITIES.

Community	Region	Population	Mean HH Harvest in lbs.	Mean HH size	Per Capita Harvest in lbs.
Sheldon Point	Y-K	103	9784.00	7.00	1397.00
Stebbins	Y-K	331	6375.00	6.30	1006.00
New Stuyahok	S.W.	331	5538.00	5.90	939.00
Karluk	Kod	102	3296.30	3.95	834.50
Mountain Village	Y-K	583	4419.00	5.40	822.00
Quinhagak	Y-K	427	3656.00	4.84	756.00
Nondalton	S.W.	180	4195.00	5.68	738.56
Alakanuk	Y-K	522	4821.00	6.60	733.00
Emmonak	Y-K	567	2759.00	4.50	612.00
Akhiok	Kod	103	1975.20	3.81	518.40
Kotlik	Y-K	293	3429.00	6.70	510.00
Old Harbor	Kod	355	1758.30	3.79	463.90
Egegik	S.W.	80	886.00	2.30	385.00
Larsen Bay	Kod	180	1558.80	4.16	374.70
Ouzinkie	Kod	233	1196.30	3.34	352.20
Nabesna Road	C.B.	50	1104.50	4.10	269.39
Tyonek	S.C.	273	964.00	3.54	272.00
South Naknek	S.W.	136	753.00	2.80	278.00
Port Lions	Kod	291	865.90	3.30	262.40
Slana	C.B.	49	677.30	2.69	253.00
King Salmon	S.W.	374	666.00	3.00	227.00
Gakona	C.B.	87	643.96	3.13	201.71
Naknek	S.W.	369	586.00	3.10	212.00
Chickaloon	M.V.	69	443.70	2.33	190.14
Lake Louise	C.B.	39	450.20	2.38	188.81
Kodiak City	Kod	5,873	588.70	3.32	177.30
Chitina	C.B.	42	295.10	1.78	165.54
Glenn Highway	C.B.	182	402.73	2.80	143.83
McCarthy Road	C.B.	52	411.69	2.92	140.84
Cantwell	S.B.	136	335.20	2.48	135.00
Mentasta	C.B.	59	442.00	3.42	129.18
Lower Tonsina	C.B.	40	491.13	3.88	126.74
Chistochina	C.B.	55	297.40	2.54	116.82
Gulkana	C.B.	104	313.40	2.75	114.00
Homer City	K.P.	2,588	287.13	2.80	102.55
Copper Center	C.B.	213	344.70	3.37	102.26
Mat Glacier	M.V.	179	284.90	2.96	96.00
Homer Area	K.P.	2,069	294.15	3.30	98.14
Ninilchick	K.P.	341	261.96	3.00	87.32
Kenny Lake	C.B.	357	246.80	3.33	74.10
Sheep Mt.	C.B.	59	224.30	3.11	72.10
Glennallen	C.B.	511	228.30	3.39	67.30
Seldovia	K.P.	505	190.45	3.50	54.41
Kenai	K.P.	4,558	122.09	3.20	38.15

Source: Wolfe 1984. Updated 1986.

surveyed households used locally harvested resources, either through their own harvest or by receiving these products from other local hunters. Extensive sharing and distribution networks were based on kinship or by occupational affiliation. Thus, unlike urban areas of the state, a high percentage of the borough households continued to follow a tradition of using locally procured fish and game.

However, due to the influx of newcomers, resource use patterns were more varied among the Bristol Bay Borough population than in smaller, more isolated, and more homogeneous villages. A long history of locally established hunting and fishing patterns has developed in rural villages. Knowledge of traditional harvest sites, seasonal rounds, and harvest techniques is held in common by all, or most, residents. In regional centers, segments of the population may possess particular bits of resource use information, an indication of the presence of sub-populations within the center. The subsistence fishing complex of borough residents discussed earlier in the report is an example of the diversity of resource use patterns in the borough. Where and when households set their subsistence nets depended on such factors as their participation in commercial fishing or on their community of residence.

Data collected during the study were analyzed to identify socioeconomic and sociocultural characteristics of sub-populations within the Bristol Bay Borough. The goal was to discover if diverse patterns of resource use existed based upon these socioeconomic and sociocultural variables. However, no clear conclusions could be drawn after examining such questions as how length of residency affected a households's resource use pattern.

Sub-populations sharing a set of socioeconomic and sociocultural characteristics could be identified. Commercial fishing households are an example.

However, it was not demonstrated that commercial fishing households exhibited significantly different resource use patterns from non-commercial fishing households. It is possible that the similarity of resource use patterns among identified sub-populations might well be due to the fact that many newcomers choose to move to a place such as the Bristol Bay Borough in order to pursue a way of life that includes the harvesting of locally available wild resources.

CONCLUSIONS

The research findings support several broad conclusions about wild resource harvesting and use patterns by Bristol Bay Borough residents. First, home use of wild resources was common among local households during the study period in the early 1980s. Three resources provided the greatest percentage of the harvest as measured in pounds per household. These were caribou, moose, and salmon. Further, no significant differences were found among resource users based on such variables as employment characteristics of the household, or age of the household head. The original hypothesis of the study, that Bristol Bay Borough households characterized by long residency in the local drainage areas exhibit a distinctive resource use pattern, was not verified when resource use pattens were examined on a borough-wide basis.

Resource use might be shaped, in part, by the environmental setting and cultural traditions in which members of each household originated. Resource harvesting activities such as big game hunting, waterfowl and game bird hunting, rod and reel freshwater fishing occur throughout much of North America. Harvesting these resources draws upon skills and use patterns familiar to persons from a variety of geographic backgrounds. But, fishing, hunting, and gathering activities which are specifically adapted to western Alaska may not be

incorporated into resource use patterns of households whose members have been raised in other parts of the country. Use of porcupine or seal oil, while not widespread in the borough, was nontheless limited to residents with traditional ties to western Alaska. The reported use of these resources was too small in the 1984 survey to be tested statistically. However, that does not rule out the presence of some type of relationship between the use of these resources and the cultural characteristics of the people who used them.

When a particular species was targeted heavily by respondents certain factors were evident: the species was abundant (caribou, salmon), familiar to many users whatever their residency history (big game), and could be taken with familiar gear (rifle). Some species which could have been harvested and used in greater quantities were not. Brown bear, for example, was historically used in some western Alaska communities (Behnke 1981). Bears were abundant in the local area during the study period, but were not taken for consumptive purposes nor considered a food source by most local residents. Porcupines, also, could be harvested for human consumption. Again, there was little reported use in 1984 and all use occurred in households with long-term associations in the local drainage. Scarcity of the resource may have been a contributing factor for the limited use levels, but most probably it was lack of knowledge and/or desire to use porcupine that were responsible for the low level of use. Marine mammals, such as seals, could only be harvested by Alaskan Natives. Incorporation of these resources into the diets of non-Native households has not been an option since 1972.

The model of resource use which best describes the characteristics of hunting, fishing, and gathering found in the Bristol Bay Borough is that of a regional center. The socioeconomic system of the three borough communities seems more similar to other regional centers such as Nome than to urban areas or small

villages. Regional centers represent special cases of subsistence uses where hunting and fishing is mixed with reliable levels of cash employment. The mixed nature of this system provides more opportunities for both earning a wage income and access and time for resource harvest. In this regard Bristol Bay Borough probably most closely resembles other medium-sized Alaska communities, such as Nome, Dillingham, and Bethel. Despite the presence of seasonal wage opportunities and the important role of supplying services for the surrounding area, a significant dependence on noncommercial hunting and fishing activities remains an important feature of the economies of these communities.

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APPENDIX A

Conversion Factors for Wild Natural Resources

Quantified harvests for certain resources were recorded during the course of the project. Collected in numbers of fish and game, these figures were then converted into standard weight measures in pounds. Additional resources exchanged, given, or otherwise distributed to a household, were not included in harvest estimates.

The conversion weights are expressed in pounds. They were determined by using average weight for particular species, taking into account age and sex characteristics of harvested animals, and using a conversion factor to arrive at an average usable weight. It is obvious that there exists tremendous variety among individual animals with regard to size. Furthermore, household use patterns are not consistent when processing the resource. For example, when using a caribou, some households use basically the fleshy meat while other households make use of the bones, marrow, brains, and hooves. While the diversity of resource size and use patterns of individual households cannot be accounted for in every situation, the conversion factors do attempt to take the variety into consideration. A number of sources were consulted when determining the conversion factors.

CONVERSION FACTORS

Species	Usable Weight	Source
Caribou	150.0	Behnke 1982
Moose	540.0	Behnke 1982
Harbor Seal	56.0	Wright 1984
Arctic Hare	5.6	Behnke 1982
Snowshoe Hare	2.0	Behnke 1982
Porcupine	8.0	Behnke 1982
Beaver	20.0	Behnke 1982
King Salmon	14.6	Commercial Fisheries 1984
Sockeye Salmon	3.9	Commercial Fisheries 1984
Coho Salmon	4.1	Commercial Fisheries 1984
Chum Salmon	4.3	Commercial Fisheries 1984
Pink Salmon	2.5	Commercial Fisheries 1984
Smelt	.25	Researchers Estimate 1984
Rainbow Trout	1.5	Gwartney 1983
Pike	2.8	Behnke 1982
Dolly Varden	1.5	Researchers Estimate 1984
Grayling	1.0	Gwartney 1983

APPENDIX B

GENERAL PROFILE

1. How long have you lived in Naknek _____
   South Naknek _____
   King Salmon _____

2. Where did you live before you lived in the Naknek area?

3. How many people live in your household?

   Jan _____, Feb _____, Mar _____, hpril _ _, June _____,

   July _____, Aug _____, Sept _____ Oct _____ Nov _____,

   Dec _ _

4. Do you and your family use salmon obtained locally from the Naknek River? Yes_____ No _____

5. If so, how do you acquire this fish? (1982) You may mark more than one catagory.
   a. From own subsistence fishing permit _____

   b. From own commerical harvest _____

   c. From own sports fishing _____

   d. Given fish by other people _____

6. If you have a subsistence fishing permit, how many years have you set a non-commercial gill-net in the Naknek River?
   Years with own permit _____
   Years as part of parents' permit _____

7. If you do not have a subsistence permit in 1982:
   a. Have you ever participated in non-commercial set gill-net fishing? Yes' _____ No_____

   b. Which species?

      Sockeyes _____ Kings_____ Chums_____Pinks____ Cohos____

   C. Where was your fishing site?

   d. Why aren't you setting a net this year? (non-commercial)

   e. Do you plan to set a net in future year-s?

   f. Do you plan to help others with their subsistence permit in 1982?

Code Number _____ _____

PROCESSING/SPECIES PREFERENCE/STORAGE

1. How many fish do you usually put up? _____
Approximately how many do you give away?
To **family** members _____ to friends _____

2. Who decides when you have enough fish for one season?

3. Which months of the year do you eat salmon?

J F M A M J J A S O N D

4. How many days a week do you eat salmon?

1 2 3 4 5 6 7

5. Which is your favorite type of fish? why? (taste, keeps well, **first fish** of the season, etc.)

Sockeye	King	Chum	Pinks	Cohos

6. How do you preserve **your fish?** (SAlt, SMoke, FReeze, CAn, DRy)

Sockeye	King	Chum	Pinks	Cohos

7. Have you always preserved your fish this way? Yes No ____

8. What changes have you made in your preserving methods?

9. Who taught you **how to preserve your fish?**

10. **Where do you** process **your fish** (preserving)?

11. How **do you preserve your fish and who helps** you?

12. Do you own a smokehouse? Yes _____ No _____
How large is it _____
Do you share it with others? Who? _____
Do you own a smoker (ie. Little Chiefs) Ye No _____
Do you share it with anyone? Who? _____

13. What type of wood do you use for your smokehouse?

Why?

Where do you get it?

Who cuts it?

Code Number. _____

14. Who **splits** the fish?

Who ties **the** fish?

Who hangs the fish?

15. Where do you store **your** smoked fish?

16. Do you salt fish? Yes _____ No _____
Who salts the fish?

What do you store it in?.

Where do you store it?

17. Do you own a freezer?

Do you share it with anyone? Who?

Do you store fish in your freezer?

19. Do you own a pressure cooker?

Do you borrow one?

If you have one, do you share it with anyone? who?

20. **Do you** use a can sealer?

Do you own one?

Do you share it with anyone? K-ho?

21. How do **you prepare** your fish for eating? baking _____.

boiling _____, bar-be-que _____, pickling _____,

frying _____, chowder _____, broiling _____,

other (specify) _____.

22. What is your favorite fish **meal?** (ie. boiled backbone, fried king steaks, smoked strips, etc.)

23. What **is your** childrens' favorite f**ish meal?**

24. What is **your** parents favorite fish **meal?**

ode Number

25. What type of fish is best for old people?

26. In addition to salmon, what other types of fish and game did your family use last year?

moose_____, caribou_____, freshwater fish_____,

ducks _____, geese _____, berries _____,

other (specify) _____.

27. About what percentage of your household's meat, fish and fowl come from local fish and game?

0-10%_____, 10-20%,_____ 20-30%_____, 30-40%_____, 40-50%,_____

so-60%_____, 60-70%_____, 70-80% ,_____ 80-90%,_____ 90-100%___

28. Where do you get most of the test of your food?
Seattle_____, cannery sales _____, Anchorage_____,

Naknek, _____, South Naknek _____, King Salmon_____

COMMERCIAL FISHING

1. Did you keep any fish from your commercial catch for your personal use? yes _____ no _____

2. If so, how many of each species did you keep?

Sockeyes	Kings	Chums	Pinks	Cohos

3. Why did you keep fish from your commercial catch?

4. Why did you keep the particular species?

5. Did you give other people fish from your commerical catch for their personal use?
Yes _____ No _____

(If yes use Form G)

6. If no fish are kept from your commercial catch, why not?

Code Number _____ Form D Date _____

Interviewed _____
Observed _____

FISHING

1. Do you always set your net in the same place?

2. How many years have you used this site?

3. Do other people think of this as your site?

4. Do you have trouble finding a site?

5. Why are you setting your net right now? (particular day, tide, closed commercial period, etc.)

6. When will you pull the net in?
   For good _____
   This particular set _____

7. How often do you pick it?

8. Who taught you to handle a net?

9. Have you ever taught someone new to the area how to set or pick a net?

10. Do children help with the net? Which chores?

11. Where did you get your net?

12. How long have you had it?

13. Do you share it with anyone? Who?

14. Who repairs the net? _____
    Who hangs the net? _____
    Where do you store it? _____

Code Number

15. Have you always used a gill net for taking family fish?
Yes _____ NO _____ (explain)

16. What other methods have you used for taking fish?
(sports gear, dip net, seining, etc.)

17. Will you give any of your fish away? Yes _____ No _____
(If yes, then use Form)

Code Number | Form E | Date | Interviewed ____ Observed ____ Photographed site/work ____

FISHING

1. Site location _____

2. Who set the net? What is their relationship to the permit holder? What was their particular task? How much time was involved?

Person	Relationship	Task	Time

3. Who picks the net? What is their relationship to the permit holder? What was their particular task? How much time was involved?

Person	Relationship	Task	Time Involv

4. Which species are harvest? Amount?

Sockeyes	Kings	Chums	Pinks	Cohos

Code Number | Form F | Date | Interviewed ____ Observed ____ Photographed process ____

SALMON PROCESSING

Location of processing site _____
Equipment being used _____

Fish came from (name of permit holder, commercial or subsistence) _____

Lead Questions: 1. Name of person participating in processing 2. What is the relationship to the permit holder? 3. What is the specify task that this person is performing? 4. What is the time involved in this task?

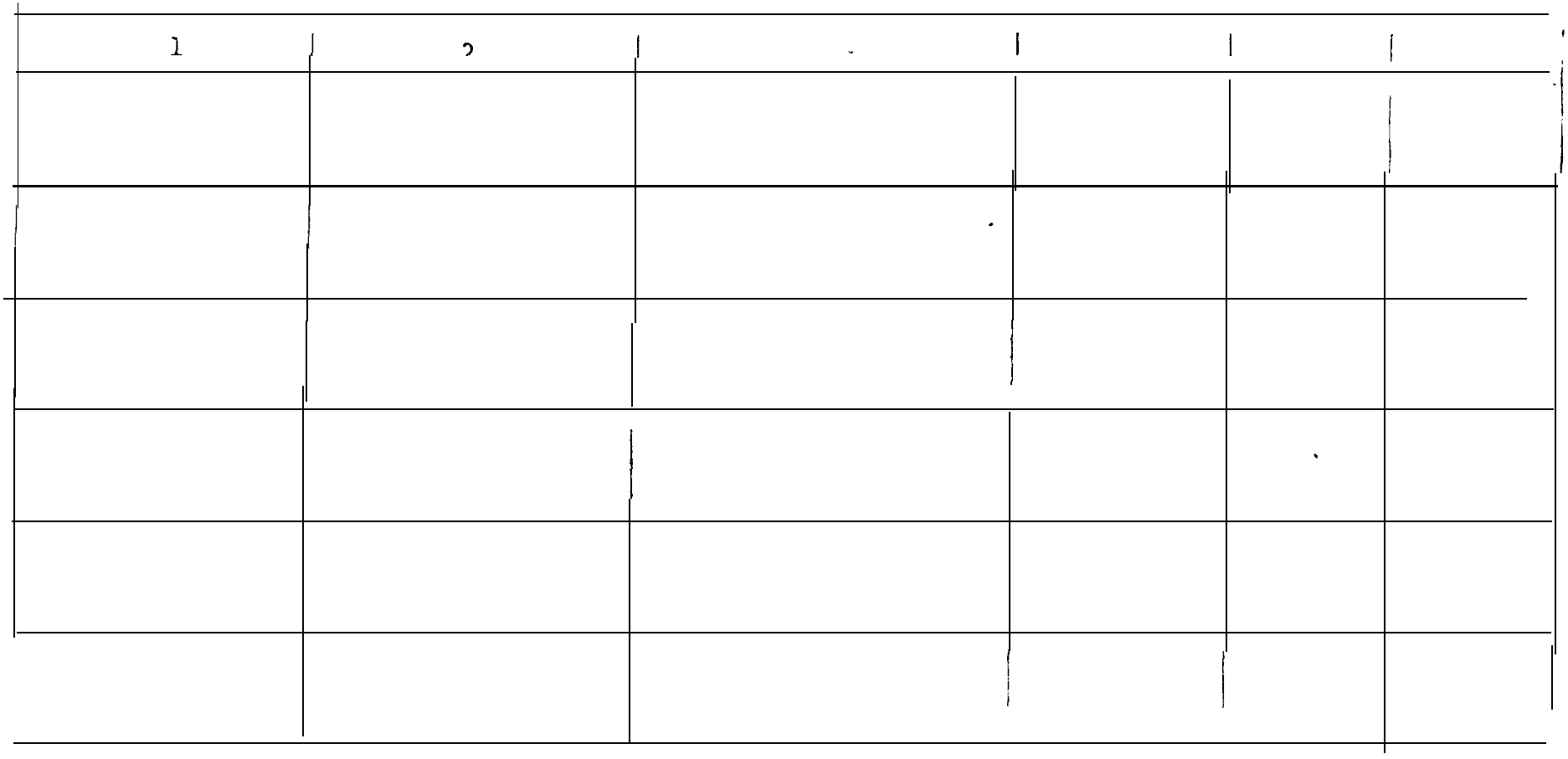
Code Number

FORM G

Date Interviewed

FISH DISTRIBUTION

1. Who gave you fish this year? or To whom did you give fish this year? 2. Is this person related to you? If so, how/ 3. Why did this transaction take place? (A. Division of catch where person helped in the harvest; B. Division of processed fish where person helped in the processing; C. Gift--explain; D.) Extra fish; E. Exchange--explain; F. Other--explain) 4. Which species were given? How many? 6. In what "form" were the fish given? (SAlted, SMoked, PIckled, DRied, CAnned, FResh)



APPENDIX C

ID # _____ Interviewer: CZ J r ,

Rcs idency _____ Date: _____

NAKNEK RIVER USE SURVEY

1.

INDIVIDUAL #	M/F	BIRTH YEAR	YEARS IN KVI/NAK	MONTHS EMPLOYED FULL-TIME '83	MONTHS EMPLOYED PART-TIME '83	RECEIVE TRANS.PAY.	RETIREMT.

2. Did anyone in the household COMMERCIAL FISH in the Bristol Bay Distrfct in 1983?

H = herrfng
K = king salmon
R = red salmon
C = coho salmon

Drift captains (ID#) _____
Drift crews (ID#) _____
Set-net permit holder (ID#) _____
Set-net crew (ID#) _____

3. Did anyone in your household attempt to harvest CARIBOU in 1983?

Did your household use caribou meat in 1983?

If yes: Given meat by friends _____

Given meat by family members living outside the household _____

Household members hunted _____ (If yes, following questions)

	1st Season	2nd Season
Hunting locations		
When		
Transportation		
# of day trips		
# of overnight trips		
total number harvested		

Did anyone in your household attempt to harvest MOOSE in 1983?
Did your household use moose meat in 1983?

If yes: Given meat by friends
Given meat by family members living outside the household
Household members hunted (If yes, following questions)

Hunting locations	1st Season	2nd Season
When		
Transportation		
# of day trips		
# of overnight trips		
Total number harvested		

5. In 1983, did your household attempt to harvest or use:

	# Harvested	Received from other households	Season and Relative Importance (H,M,S, or O)
Harbor seal (meat or oil)			
Sea Lion			
Beluga			
Walrus			
Tundra Hare			
Snowshoe Hare			
Porcupine			
other?			

6. Did anyone in your household attempt to harvest BIRDS in 1983?
Did your household use birds in 1983?

If yes: Given by friends
Given by family members living outside the household
Household members harvested (If yes, following question:

ront'd a. DUCKS
when did the person(s) hunt: _____
where (specific): _____
forms of transportation used: _____
number of times went out: _____
overnight?

b. GEESE
when did the person(s) hunt: _____
where (specific): _____
forms of transportation used: _____
number of tfmes went out: _____
overnight?

c. PTARMIGAN
when did the person(s) hunt: _____
where (specific): _____
forms of transportation used: _____
number of tfmes went out: _____
overnight?

Other?

7. In 1983 did your household use: Tern eggs Seagull eggs Clams
Other?

In 198 did anyone in the household TRAP FURBEARERS?' Yes No
If yes:
which members trapped? (ID#) _____
where (general) _____
(for example: Big Creek. King Salmon Creek)
forms of transportation used:- _____
Species taken (# harvested, also put * if eaten also)
beaver _____ land otter _____ mink Lynx _____
wolf _____ Wolvet-ine _____ red fox other?

9. Did you use SUBSISTENCE SALMON in 1983? Yes NO
If yes:
had household subsistence permit _____
took from commercial permit _____ K _____ R _____ C _____ dogs
(were these included on subsistence permit report? _____)
given fish by another household _____
shared a subsistence net/permit with another household _____

10. In 1983 did anyone in your household participate in FRESHWATER FISHING?

If yes:	Season	# Harvested	Location	Relative Import.
Smelt: Ice				
Dipnet				
Rainbow: Ice				
God and reel (eat)				

		Season	#Harvested	Location	Relative Import.
10 cont'd.	Pike: Ice				
	rod and reel				
	Dolly Varden: ICC				
	rod and reel				
	Grayling: I C C				
	rod a d reel				
	Salmon: rod and reel				
	kings				
	reds				
	cohos				

11. How did your household use the NAKNEK RIVER (or its tributaries) in 1983?

Subsistence fishing

Sports fishing

access to caribou hunting:	skiff	3-wheelers	automobile
access to moose hunting:	skiff	3-wheelers	automobile
access to waterfowl hunting:	skiff	3-wheelers	automobile
access to berry picking:	skiff	3-wheelers	automobile

APPENDIX D

Important Plants in the Bristol Bay Region Source: Kramer, Chin, and Mayo 1983

IMPORTANT PLANTS OF THE MARINE COMMUNITY

Diatoms	*Asterionella kariana*
	A. japonica
	Bacteriastrum delicatulum
	Biddulphia aurita
	B. sinensis
	Chaetoceros atlanticus
	C. compressus
	C. concovicornia
	C. constrictus
	C. convolutus
	C. debilis
	C. didymus
	C. furcellatus
	C. lacinosus
	C. radicans
	C. similis
	C. socialis
	Coscinodiscus curvatulus
	C. radiatus
	Coscinosira polychorda
	Leptocylindrus danicus
	Melosira sulcata
	Nitzschia pacifica
	N. closterium
	N. delicatissima
	N. seriata
	Rhizosolenia hebetata
	R. semispina
	Skeletonema costatum
	Synedra SD.
	Thalassionema nitzschioides
	Thalassiosira aestivalis
	T. decipiens
	T. gravida
	T. nordenskioldi
	T rotula
	Thalassiothrix longissima
Dinoflagellates	*Ceratium furca*
	C. fusus
	C. longipes
	C. pentagonum
	C. tripos
	Dinophysis acuminata
	D. acuta
	D. arctica
	D. caudata
	D. ellipsoides
	D. ovum
	D. rotundata
	Gonyaulax tamarenis
	Peridinium crassipes
	P. depressum
	P. divergens
	P ovatum
	P. pentagonum
	P. steinii
	Phalacroma rudgei
	Protocentrum micans
Brown algae	*Agarum cribrosum*
	Alaria crispa
	A fis tulosa
	A. praelonga
	A. taemata
	A tenuifolia
	A. valida
	Chorda filum
	Costaria costata

	Cymathere triplicata
	Desmarestia sp.
	Fucus furcatus
	F. inflatus
	F. latifrons
	Halosaccion sessile
	Laminaria bullata
	L. dentigera
	L. groenlandica
	L. longipes
	L. saccharina
	L. setchellii
	L. yezoensis
	Nereocystis leutkeana
	Scytosiphon lomentaria
	Thalassiophyllum clathrus
Red algae	*Laurencia* ***spectabilis***
	Porphyra perforata
Green algae	*Chaetomorpha* sp.
	Ulva latuca
Eelgrass	***Zostera marina***
Arctic rush	***Juncus arcticus***
Large-flowered spear grass	***Pod emines***
Sedges	*Carex* spp.
Rye grass	*Elymus crenarius*

IMPORTANT PLANTS
OF THE FRESHWATER COMMUNITY

Diatoms	*Melosira* sp.
	Stephanodiscus sp.
	Fragilaria sp.
	Asterionella sp.
	Tabellaria sp.
	Synedra sp.
	Navicula sp.
Green algae	*Phaeotus* sp.
	Pediastrum sp.
	Ankistrodesmus sp.
	Dictyosphaerium sp.
Blue-green algae	*Microcystis* sp
	Lyngbya sp.
Seed Plants	
Mare's tail	*Hippuris vulgaris*
Pondweed	*Potamogeton* spp.
Bur reed	*Sparganium* sp
Sedge	*Carex* spp.
Cottongrass	*Eriophorum* spp.
Duckweed	*Lemna trisulca*
Yellow pond lily	*Nuphar polysepalum*
White pond lily	*Nymphaea* ***te tragona***
Bladderwort	*Utricularia vulgaris*

IMPORTANT PLANTS
OF THE WET TUNDRA COMMUNITY

Characteristic Species

Bog orchid	*Platanthera dilatata*
Cotton grass	*Eriophorum angustifolium* ssp *subarcticum*
Sphagnum moss	*Sphagnum rubellum*

Additional Species

Shrubs	
Dwarf birch	*Betula nana* ssp *exilis*
Blueberry	*Vaccinium uliginosum*
Labrador tea	*Ledum palustre* ssp. *decumbens*
Willow	*Salix fuscescens*

Herbs

Bistort	***Polygonum*** *bistorta* ssp *plumosum*
Bur reed	*Sparganium* sp
Bog cranberry	*Oxycoccus microcarpus*
Mare's tail	*Hippuris : algaris*
Marsh marigold	*Caltha palustris* ssp *arctica*
Pond weed	*Potamogeton* sp
Wild flag	Iris ***setosa*** ssp *setosa*

Grasses and sedges

Beach rye grass	*Elymus arenarius* ssp *mollis*
Marsh arrowgrass	*Triglochin palustris*
Oat grass	*Hordeum brachyantherum*
Rush	*Luzula Wahlenbergii* spp. *Piperi*
Sedge	*Carex pluriflora*
Spear rye grass	*Poa eminens*

Fern relatives

Fir clubmoss	*Lycopodium selago* ssp *selago*
Quillwort	***Isoetes*** *maricata* ssp *maritima*

Lichens, mosses, and liverworts

IMPORTANT PLANTS OF THE MOIST TUNDRA COMMUNITY

Characteristic Species

Crowberry	*Empetrum nigrum* ssp *nigrum*
Sedge	*Carex saxatilis*
Hair moss	*Dicranum* sp.
Reindeer lichen	*Cladonia* sp

Additional Species

Shrubs

Arctic willow	*Salix arctica* ssp. *crassijulis*
Blueberry	***Vaccinium uliginosum***
Cranberry	*V. Vitis-idaea* ssp *minus*
Dwarf birch	*Betula nana* ***ssp. exilis***

Herbs

Aster	*Aster sibiricus*
Bistort	*Polygonum bistorta* ssp *plumosum*
Buttercup	*Ranunculus Eschscholtzii*
Goldthread	*Coptis trifolia*
Lousewort	*Pedicularis Kanei* ssp. *Kanei*
Monkshood	*Aconitum delphinifolium* ssp *delphinifolium*
Violet	*Viola epipsila* ssp. *repens*

Grasses and sedges

Bentgrass	*Agrostis borealis*
Bluejoint reed grass	*Calamagrostis canadensis*
Cottongrass	*Eriophorum angustifolium* ssp. *subarcticum*
Hair grass	*Deschampsia caespitosa*
Mountain timothy	*Phleum* ***commutatum***
Wood rush	*Luzula parviflora*
Sedge	*Carex pluriflora*

Fern relatives

Alpine clubmoss	*Lycopodium alpinum*
Fir clubmoss	*L. selago* ssp *selago*

Lichens and mosses

IMPORTANT PLANTS OF THE ALPINE TUNDRA COMMUNITY

Characteristic Species

Blueberry	*Vaccinium uliginosum*
Crowberry	*Empetrum nigrum* ssp. *nigrum*
Lichens	

Additional Species

Shrubs

Alpine azalea	*Loiseleuria procumbens*
Arctic willow	*Salix arctica*
Bearberry	*Arctostaphylos uva-ursi*
Cinquefoil	*Potentilla fruticosa*
Cranberry	*Vaccinium vitis-idaea* ssp *minus*

Herbs

Anemone	*Anemone parviflora*
	A narcissiflora
	ssp. ***villosisszma***
Aster	Aster *sibiricus*
Cow parsnips	***Heracleum lanatum***
Gentian	*Gentiana algida*
Lousewort	*Pedicularis Kanei* ssp *Kanei*
Lupine	*Lupinus nootkatensis*
Moss campion	*Silene acaulis*
Mountain avens	*Geum Rossii*
Saxifrage	*Saxifraga bronchialis*
	ssp *funstonii*
Sweet coltsfoot	***Petasztes frigidus***
Yarrow	*Achillea borealis*

Grasses

Fescue grass	*Festuca altaica*
Mountain timothy	*Phleum commutatum*
Tufted hairgrass	*Deschampsia caespitosa*

Ferns and fern relatives

Fragile fern	*Cystopteris fragilis* ssp *fragilis*
Rockbrake	***Cryptogramma crispa*** var *achrostichoides*
Spike moss	*Selaginella sibirica*

Lichens and mosses

IMPORTANT PLANTS OF THE BOTTOMLAND SPRUCE-POPLAR COMMUNITY

Characteristic Species

White spruce	***Pzcea glauca***
Balsam poplar	*Populus* ***balsamzfera***

Additional Species

Trees

Paper birch	*Betula* ***papyrzfera***

Shrubs

Blueberry	*Vaccinium uliginosum*
Green alder	*Alnus crispa*
Littletree willow	*Salix arbusculoides*
Low bush cranberry	***Vaccinzum vitis-idaea***
Narrow ieaf Labrador tea	*Ledum palustre* ssp. *decumbens*
Rose	*Rosa acicularis*

Herbs

Bluebell	*Mertensia paniculata*
Columbine	*Aquilegia brevistyla*
Fireweed	*Epilobium angustifolium*

Grasses

Bluejoint reed grass	*Calamagrostis purpurascens*

Ferns and fern relatives

Oak fern	*Dryopteris dilatata*
Fir clubmoss	*Lycopodium selago*
Horsetail	*Equisetum arvense*

Lichens and mosses

IMPORTANT PLANTS OF THE LOWLAND SPRUCE-HARDWOOD COMMUNITY

Characteristic Species

Black spruce	*Picea* ***mariana***
Tamarack	*Larix laricina*
Paper birch	*Betula* ***papynfera***

Additional Species

Trees

Aspen	*Populus tremuloides*
Balsam poplar	*Populus balsamifera*
White spruce	*Picea glauca*

Shrubs

Low brush cranberry	*Vaccinium vitis-idaea* ssp. *minus*
Bebb willow	*Salix bebbiana*
Littletree willow	*S. arbusculoides*
Vet leaf willow	*S. reticulata*

Herbs

Arctic dock	*Rumex arcticus*
Northern water carpet	*Chrysosplenium tetrandrum*
Sidebells pyrola	*Pyrola* ***secunda***
Sweet coltsfoot	*Petasites frigidus*

Grasses and sedges

Grass	*Poa paucispicula*
Bluejoint reed grass	*Calamagrostis canadensis*
Polar grass	*Arctagrostis latifolia*
Sedge	*Carex lugens*

Fern relatives

Horsetail	*Equisetum scirpoides*

Lichens and mosses

APPENDIX E

Important Animals in the Bristol Bay Region

Source: Kramer, Chin, and Mayo 1983

IMPORTANT ANIMALS OF THE MARINE COMMUNITY

Invertebrates

Bacteria	*Schizomycetes* (Phylum)
Protozoa	*Sarcodina* (Phylum)
Jellyfish	*Scyphozoa* (Class)
Sea anemones	*Anthozoa* (Class)
Marine worms	*Polychaeta* (Class)
Comb jellies	*Ctenophora* (Phylum)
Shrimp	*Pandalus* and *Pandalopsis* spp
Dungeness crab	*Cancer magister*
King crab	*Paralithodes* ***camtschatrca***
Tanner crab	*Chionoecetes bairdi*
	C *opilio*
Other crustaceans	***Isopoda*** (Order)
	Amphipoda (Order
	Copepoda (Order)
	Mysidacea (Order)
	Euphausiacea (Order)
Clams	*Pelecypoda* (Class)
Chitons	*Amphineura* (Class)
Sea urchins	*Echinoidea* (Class)
Sea stars	*Asteroidea* (Class)
Brittlestar	***Ophiuroidea*** (Class)
Sea cucumbers	*Holothuroidea* (Class)

Fish

Pollock	*Theragra chalcogrammus*
Pacific cod	*Gadus macrocephalus*
Blackcod	*Anoplopoma fimbria*
Pacific herring	*Clupea harengus pallasi*
Red (sockeye) salmon	*Oncorhynchus nerka*
Silver (coho) salmon	***0*** *kisutch*
King (chinook) salmon	*0 tshawytscha*
Chum (dog) salmon	*0 keta*
Pink (humpback) salmon	*0 gorhuscha*
Pacific ocean perch	***Sebastes*** *alutus*
Sculpin	*Cottidae* (Family)
Halibut	*Hippoglossus stenolepis*
Rock sole	*Lepidopsetta bilineata*
Turbot	*Atheresthes stomias*
Flathead sole	***Hippoglossoides*** *elassodon*
Yellowfin sole	*Limanda aspera*
Other flatfish	*Pleuronectidae* (Family)

Birds

Whistling swan	*Olor columbianus*
Black brant	*Branta migricans*
Emperor goose	***B*** *leucopareia*
Canada goose	***B*** *canadensis*
Pintail	*Anas acuta*
Mallard	*A platyrhynchos*
Green-winged teal	***A*** *crecca carolinensis*
Peregrine falcon	***Faico*** *peregrinus*
Gyrfalcon	***F.*** *rusticola*
Northern bald eagle	*Haliaeetus leucocephalus*
Red-legged kittiwake	*Rissa brevirostris*
Common eider	*Somateria molissima*
King eider	***S*** *spectabilis*
White-winged scoter	*Melanitta deglandi*
Red-breasted merganser	*Mergus serrator*
Red phalarope	*Phalaropus fulicarius*
Glaucous-Winged gull	*Larus glaucescens*
Arctic rern	*Sterna paradisaea*
Common murre	*Uria aalge*
Thicked-billed murre	*Ulomvia*
Pigeon guillemot	*Cepphus columba*
Kittlitz's murrelet	*Brachyramphus brevirostris*
Ancient murrelet	*Synthliboramphus antiquum*
Cassin's auklet	*Ptychoramphus alcutica*

Parakeet auklet	*Cyclorrhynchus psittacula*
Crestea auklet	*Aethia cristatella*
Least auklet	*A. pusilla*
Whiskered auklet	*A. pygmaea*
Horned puffin	*Fratercula corniculata*
Tufted puffin	*Lunda cirrhata*
Black oystercatcher	*Haematopus bachmani*
Semicalmated plover	*Charadrius semipalmatus*
Rock sandpiper	*Erolia ptilocnemis*
Least sandpiper	*E. minutilla*
Albatross	*Diomedeidae* (Family)
Shearwaters and fulmars	*Procellaridae* (Family)
Storm petrels	*Hydrobatidae* (Family)
Cormorants	*Phalacrocoracidae* (Family)
Loons	*Gaviidae* (Family)
Phalaropes	*Phalaropodidae* (Family)
Grebes	*Podicepedidae* (Family)
Jaegers	*Stercorardae* (Family)

Mammals

Killer whale	*Orcinus orca*
Gray whale	*Eschrichtius* ***gibbosus***
Beluga whale	*Delphinapterus leucas*
Harbor porpoise	***Phocoena*** phocoena
Walrus	*Odobenus rosmarus*
Northern fur sea:	*Callorhinus ursinus*
Harbor seal	*Phoca vitulina*
Steller sea lion	*Eumetopias jubata*
Sea otter	*Enhydra lutra*

IMPORTANT ANIMALS OF THE FRESHWATER COMMUNITY

Invertebrates

Bacteria	*Schizomycetes* (Phylum)
Rotifers	*Rotifera* (Class)
Flagellates	*Mastigophora* (Phylum)
Ciliates	*Ciliophora* (Phylum)
Flatworms	*Turbellaria* (Class)
Aquatic earthworms	*Oligochaeta* (Class)
Crustaceans	***Copepoda*** (Order)
	Cladocera (Order)
	Anostraca (Order)
	Notostraca (Order)
Midge larvae	*Chironomidae* (Family)
Mosquito larvae	*Culicidae* (Family)
Dragonfly larvae	*Odonata* (Order)
Stonefly larvae	*Plecoptera* (Order)
Mayfly larvae	*Ephemeroptera* (Order)
Caddisfly larvae	*Trichoptera* (Order)
Water beatles	***Coleoptera*** (Order)
Clams	***Pelecypoda***-(Class)
Snails	*Gastropoda* (Class)

Fish

Arctrc char	*Salvelinus alpinus*
Lake trout	***S.*** *namaycush*
Dolly Varden	*S malma*
Rainbow trout	*Salmo gairdneri*
Arctic grayling	*Thymallus arcticus*
Northern pike	***Esox*** *lucius*
Sculpin	***Cottidae*** (Family)
Whitefish and cisco	*Coregonus* spp
Burbot	*Lota lota*
Ninespine stickleback	*Pungitius pungitius*
Threespine stickleback	***Gasterosteus*** *aculeatus*
Blackfish	*Dallia* ***pectoralis***

Birds

Canada goose	***Branta*** *canadensis*
Black brant	***B*** *nigricans*
Oldsquaw	*Clangula hyemalis*
Whistling swan	*Olor columbianus*
Pintail	*Anas acuta*

Green-winged teal	*A. crecca carolinensis*
Peregrine falcon	*Falco peregrinus*
Common eider	*Somateria mollissima*
King eider	*S spectabilis*
White-winged scoter	*Melanitta deglandi*
Red-breasted merganser	*Mergus serrator*
Arctic tern	*Sterna paradisaea*
Dipper	*Cinclus mexicanus*
Semipalmated plover	*Charadrius semipalmatus*
Least sandpiper	*Erolia minutilla*
Other geese	*Anserinae* (Subfamily)
Other diving ducks	*Aythyinae* (Subfamily)
Other surface-feeding ducks	*Anatinae* (Subfamily)
Phalaropes	*Phalaropodidae* (Family)
Loons	*Gaviidae* (Family)
Grebes	*Podicepedidae* (Family)

Mammals

Beaver	*Castor canadensis*
Mink	*Mustela vison*
Land otter	*Lutra canadensis*
Muskrat	Ondatra *zibethica*

IMPORTANT ANIMALS OF THE WET TUNDRA COMMUNITY

Mammals

Common shrew	*Sorex cinereus*
Tundra shrew	*Sorex tundrensis*
Beaver	*Castor canadensis*
Northern bog lemming	*Synaptomys boreaiis*
Muskrat	*Ondatra zibethica*
Arctic fox	*Alopex lagopus*
Grizzly bear	*Ursus arctos*
River otter	*Lutra canadensis*
Caribou	*Rangifer tarandus*

Birds

Whistling swan	*Olor columbianus*
Canada goose	*Branta canadensis*
Black bran:	*Branta nigricans*
Emperor goose	*Philacte canagica*
White-fronted goose	*Anser albifrons*
Pintail duck	*Anas acuta*
Greater scaup	*Aythya marila*
Oldsquaw	*Clangula bye-malls*
Spectacled eider	*Lampronetta fischeri*
Northern phalarope	*Lobipes lobatus*
Western sandpiper	*Ereunetes maun*
Dunlin	*Erolia alpina*
Black turnstone	*Arenaria melanocephala*
Bar-tailed godwit	*Limosa lapponica*
Whimbrel	*Numenius phaeopus*
Bristle-thighed curlew	*Numenius tahitiensis*
Lesser sandhill crane	*Grus canadensis*
Rough-legged hawk	*Buteo lagopus*
Marsh hawk	*Circus cyaneus*
Snowy owl	*Nyctea scandiaca*
Short-eared owl	*Asio flammeus*
Common eider	*Somateria mollissima*
King eider	*S. spectabilis*
White-winged scoter	*Melanitta deglandi*
Red-breasted merganser	*Mergus serrator*
Red phalarope	*Phalaropus fulicarius*
Parasitic jaeger	*Stercorarius parasiticus*
Arctic tern	*Sterna paradisaea*

Invertebrates

Spiders and mires	*Arachnida* (Class)
Insects	*Insecta* (Class)
Flatworms	*Platyhelminthes* (Phylum)
Roundworms	*Nematoda* (Class)

IMPORTANT ANIMALS OF THE MOIST TUNDRA COMMUNITY

Mammals

Common shrew	*Sores cinereus*
Tundra snrew	*Sorex tundrensis*
Dusky shrew	*Sorex obscurus*
Brown lemming	*Lemmus trimucronatus*
Red-backed vole	*Clethrionomys dawsoni*
Tundra vole	*Microtus oeconomus*
Gray wolf	*Canis lupus*
Red fox	*Vulpes fulva*
Black bear	*Ursus americanus*
Grizzly bear	*Ursus arctos*
Ermine	*Mustela erminea*
Wolverine	*Gulo gulo*
Caribou	*Rangifer tarandus*
Musk-ox	*Ovibos moschatus*
Moose	*Alces alces*

Birds

Canada goose	*Branta canadensis*
Rough-legged hawk	*Buteo lagopus*
Golden eagle	*Aquila chrysaetos*
Bald eagle	*Haliaeetus leucocephalus*
Marsh hawk	*Circus cyaneus*
Gyrfalcon	*Falco rusticolus*
Peregrine falcon	*Falco pcregrinus*
Northern phaiarope	*Lobipes lobatus*
Western sandpiper	*Ereunetes mauri*
Dunlin	*Erolia alpina*
Black turnstone	*Arenaria melanocephala*
Bar-tailed godwit	*Limos; lapponica*
Whimbrel	*Numenius phaeopus*
Bristle-thighed curlew	*Numenius tahitiensis*
Lesser sandhill crane	*Grus canadensis*
Lapland longspur	*Calcariuslapponicus*
Yellow wagtail	*Motacilla flava*
Tree sparrow	*Spizella arborea*
Raven	*Corvus corax*
Willow ptarmigan	*Lagopus lagopus*
Parasitic jaeger	*Stercorarius parasiticus*
Arctic tern	*Sterna paradisaea*
Least sandpiper	*Erolia minutilla*

Invertebrates

Spiders and mites	*Arachnida* (Class)
insects	*Insecta* (Class)
Flatworms	*Platyhelminthes* (Phylum)
Roundworms	*Nematoda* (Class)

IMPORTANT ANIMALS OF OTHER HABITATS (INCLUDES LOW BRUSH BOG AND MUSKEG; BOTTOMLAND SPRUCE-POPLAR FOREST; UPLAND SPRUCE-HARDWOOD FOREST; LOWLAND SPRUCE-HARDWOOD FOREST; AND HIGH BRUSH)

Mammals

Black bear	*Ursus americanus*
Ermine	*Mustela erminea*
Land otter	*Lutra canadensis*
Least weasel	*Mustela rixosa*
Lynx	Lynx *canadensis*
Marten	*Martes americana*
Mink	*Mustela vison*
Red fox	*Vulpes vulpes*
Wolf	*Canis lupus*
Wolverine	*Gulo gulo*
Moose	*Alces alces*
Beaver	*Castor canadensrs*
Snowshoe hare	*Lepus americanus*

Birds

Black-backed three-toed <woodpecker	*Picoides arcticus*
Northern three-toed woodpecker	*Picoides tridactylus*
Yellow-shafted flicker	*Colaptes auratus*
Hairy woodpecker	*Dendrocopos villosus*
Downy woodpecker	*Dendrocopos pubescens*

Gray jay	*Perisoreus canadensis*
Bareal chickadee	*Parus hudsonicus*
Black-capped chickadee	*Parus atricapillus*
White-winged crossbill	*Loxia leucoptera*
Bank swallow	*Riparia riparia*
Dipper	*Cinclus mexicanus*
Winter wren	*Troglodytes troglodytes*
Yeliow warbler	*Dendroica petechia*
Gray-crowned rosy finch	*Leucosticte tephrocotis*
Common redpoll	*Acanthis flammea*
Savannah sparrow	*Passerculus sandwichensis*
Song sparrow	*Melospiza melodia*
Snow bunting	*Plectrophenax nivalis*

Invertebrates

Spiders and mites	*Arachnida* (Class)
Insects	*Insecta* (Class)
Flatworms	*Platyhelminthes* (Phylum)
Roundworms	*Nematoda* (Class)

IMPORTANT ANIMALS OF THE ALPINE TUNDRA COMMUNITY

Mammals

Tundra shrew	*Sorex tundrensis*
Tundra hare	*Lepus othus*
Hoary. marmot	*Marmota caligata*
Arctic ground squirrel	*Citellus parryi*
Greenland collard lemming	*Dicrostonyx groenlandicus*
Tundra vole	*Microtus oeconomus*
Norway rat	*Rattus norvegicus*
Gray wolf	*Canis lupus*
Red fox	*Vulpes fulva*
Black bear	*Ursus americanus*
Grizzly bear	*Ursus arctos*
Wolverine	*Gulo gulo*
Caribou	*Rangifer tarandus*
Moose	*Alces alces*

Birds

Canada goose	*Branta canadensis*
Golden plover	*Pluvialis dominica*
Western sandpiper	**Ereunetes** *mauri*
Ruddy turnstone	***Arenaria interpes***
Rock ptarmigan	*Lagopus mutus*
Lapland longspur	***Calcarius*** *lapponicus*
Willow ptarmigan	*Lagopus lagopus*
Common murre	*Uria aalge*
Thick-billed murre	*U. lomvia*
Pigeon guillemot	***Cepphus columba***
Kittlitz's murrelet	*Brachyramphus* **brevirostris**
Ancient murrelet	*Synthliboramphus* ***antiquum***
Cassin's auklet	***Ptycboramphus aleutica***
Parakeet auklet	*Cyclorrhynchus* ***psittacub***
Crested auklet	*Aethia cristatella*
Least au klet	***A. pusilla***
Whiskered auklet	***A. pygmaea***
Horned puffin	***Fratercula*** *corniculata*
Tufted puffin	*Lunda* ***cirrhata***
Water pipit	*Anthus spinoletta*
Solitary sandpiper	*Tringa solitaria*
Rock sandpiper	*Erolia ptilocnemis*
Aleutian tern	*Sterna aleutica*

Invertebrates

Spiders and mites	*Arachnida* (Class)
Insects	*Insecta* (Class)
Flatworms	*Platyhelminthes* (Phylum)
Roundworms	*Nematoda* (Class)