

**KWETHLUK SUBSISTENCE: CONTEMPORARY LAND
USE PATTERNS, WILD RESOURCE HARVEST AND
USE, AND THE SUBSISTENCE ECONOMY
OF A LOWER KUSKOKWIM RIVER
AREA COMMUNITY**

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ABSTRACT

Kwethluk is a community located near the Kuskokwim River in western Alaska, 20 river miles upstream from Bethel. In 1986, the community contained 540 residents, primarily Yup'ik Eskimo, living in 112 households. This study was conducted to examine subsistence wildlife harvest and use, including areas used when hunting, trapping, and gathering, seasonality of harvest, methods and means of harvest, processing and preservation methods, distribution, and harvest levels. Data on demographics, employment, and income were also collected.

During the study period (1986-87), employment in the community was highly dependent on state and federal funding. Seventy-seven percent of the available jobs were government funded. Twenty-five percent of the households were not involved in wage employment. The majority of households that were involved in wage employment derived income from a single job. Fifty percent of the wage-earning jobs lasted for nine months or less and 44 percent of the jobs were part time. Average household income earned from wage employment was only \$9,747. Wage employment income accounted for 45 percent of the total community income. The median household income during 1986 was relatively low at \$16,624.

Fifty-two percent of the households earned income from commercial salmon fishing in the Kuskokwim Area commercial fishery. Average household income earned from commercial salmon fishing was \$6,814. Overall commercial fishing contributed 16 percent of the community income. During 1986 there were 68 "limited entry" commercial salmon fishing permits in the community. Kwethluk residents were not involved in other commercial fisheries.

Kwethluk's life and economy relied heavily on the traditional harvest and use of wild resources. All households participated in harvesting wildlife for subsistence use. Household harvests of wildlife averaged 3,860 pounds edible weight. The per capita harvest was 800 pounds edible weight, among the highest of communities in Alaska. Household harvests ranged from 19 to 23,758 pounds edible weight. Seventy percent of the households were involved in harvesting or processing salmon for subsistence use in 52 subsistence salmon production units. Salmon

production units were composed of extended families in multiple households. During 1986 there were 52 salmon fishing camps being used for processing and preserving salmon for subsistence use. Some salmon fishing camps had been used for more than 50 years by their current owners. Several salmon fishing camps had been relocated due to erosion along the Kuskokwim River or Kuskokuak Slough. Salmon comprised 53 percent of the total community harvest of wildlife. Salmon harvests during 1986 totaled 229,063 pounds edible weight. Harvests of salmon for subsistence use averaged 884 pounds of chinook, 591 pounds of chum, 349 pounds sockeye, and 203 pounds of coho salmon per household. Harvests levels during 1986 were about average.

Freshwater fish contributed 32 percent of the total pounds edible weight of wildlife harvested. Northern pike, whitefish, and burbot were the primary freshwater fish harvested. Moose accounted for 90 percent of the big game harvested and brown bear constituted the next highest quantity of big game harvested. During certain years, caribou was an important subsistence resource. Extended family members in multiple households often comprised hunting, fishing, and gathering groups. Sharing of wildlife harvested for subsistence with households in the community and with households in other communities was common.

Kwethluk used a substantial area for obtaining wild foods, including inland mountains, rivers, and coastal marine waters. Areas used for hunting, fishing, and gathering extend from Kuskokwim Bay to McGrath, and from Baird Inlet to the Nushagak River. Contemporary patterns of land use were closely linked to historical use patterns and traditional use areas.

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CHAPTER 1.
INTRODUCTION

This report describes the subsistence uses of wildlife by residents of Kwethluk, a community situated near the confluence of the Kwethluk and Kuskokwim rivers in western Alaska (Fig. 1). Located approximately 12 miles by air east of Bethel, the largest community along the Kuskokwim River, Kwethluk was not linked to other communities by roads. The primary means of access was by air, water, and overland during the winter months. In 1990, Kwethluk had a population of 558 people and was the second largest community along the entire Kuskokwim River drainage (Alaska Department of Labor 1991). The foundation of the community's economy during 1986-87 was cash and subsistence. Cash was received primarily through limited wage employment, state and federal public assistance programs, and commercial salmon fishing. Fish, including salmon, northern pike, burbot, and whitefish, represented the greatest component of the overall subsistence harvest. Big game such as moose, caribou, and brown bear were harvested as were several species of furbearers, small game, waterfowl, and marine mammals.

The information presented in this report is the result of a study that was conducted between June 1986 and May 1987. The study was undertaken primarily to gather basic descriptive information that could be used by the Boards of Fisheries and Game when considering regulatory proposals effecting the harvest and use of wildlife. Such information is also useful to local, regional, state, and federal land and resource managers. Recently, concerns of resource management agencies and the local resource users, have focused on declining salmon stocks and waterfowl populations, increased competition for many of the area's resources such as salmon, certain freshwater fish, moose, and caribou; an increased effort from "outside" users for these resources and the associated impacts such as litter, pollution, displacement of resources, trespass, and non-traditional uses of the resources; and the allocation of these resources among the various user groups, including subsistence, personal, recreational or sport, and commercial. In 1984, the Kwethluk City Council, Kwethluk IRA Council, and Kwethluk, Incorporated passed a joint resolution (Appendix 1) recommending that a subsistence study be carried

out in their area to document and describe the community's subsistence uses of fish and game prior to the U.S. Fish and Wildlife Service issuing guiding permits in the area.

This study was also undertaken to gather information that would help the Boards of Fisheries and Game, and the Department, better understand some regional issues concerning the harvest and use of wildlife (such as moose, caribou, and brown bear). This study was not designed to focus solely on use activities involving any one specific resource. It was designed to provide information describing patterns of historic and contemporary resource harvest and use by residents of Kwethluk for a variety of resources. The information presented in this report represents an initial step in filling an existing data gap about the subsistence uses of wildlife by people living on the lower section of the Kuskokwim River.

PURPOSE AND OBJECTIVES OF THE STUDY

The primary purpose of this report is to provide information about fishing and hunting for subsistence use by residents of Kwethluk, Alaska. This information includes descriptions of the types and quantities of resources harvested, methods and seasonality of harvest, a description of the areas used to harvest resources, methods of preparation and use, and distribution patterns. In addition to describing patterns of resource harvest and use, this report also provides an overview of the socioeconomic conditions in the community.

The objectives of the study were to:

- (1) describe the socioeconomic characteristics of the community;
- (2) describe the historical and contemporary seasonal round of wildlife harvesting activities;
- (3) document types of wildlife resources harvested;
- (4) describe methods and means of harvesting, processing, and preserving wildlife;
- (5) describe how wildlife resources are used;
- (6) document the quantities of salmon harvested;

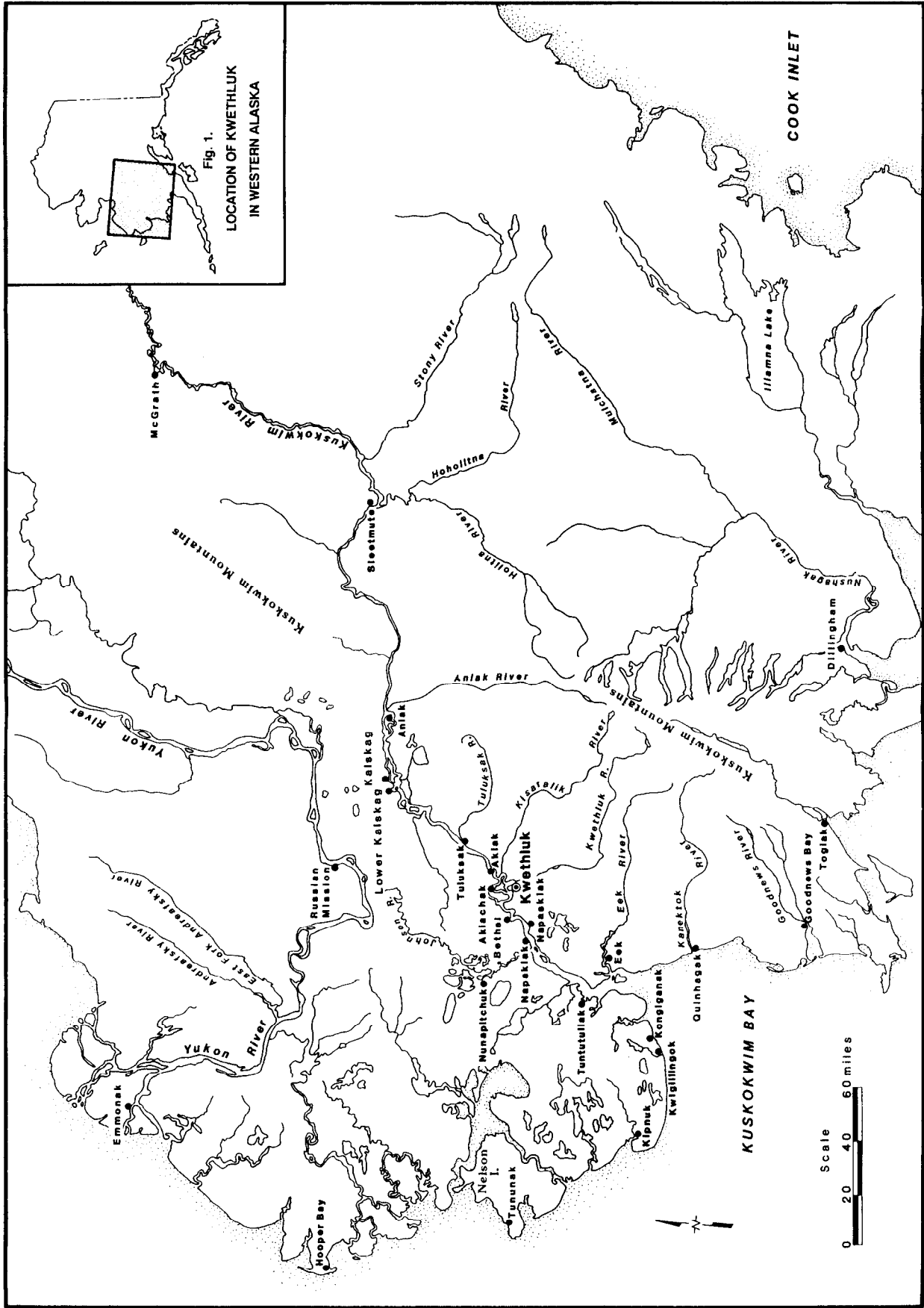
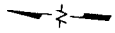


Fig. 1.
 LOCATION OF KWETHLUK
 IN WESTERN ALASKA

Scale
 0 20 40 60 miles



- (7) estimate the quantities of all wildlife resources harvested; and
- (8) describe the geographical areas used for harvesting wildlife.

METHODOLOGY

General Design

The research design that guided this study was aimed at producing a study report which was community based and descriptive in nature. Following the drafting of a research design, a proposal for conducting this study was reviewed with the Kwethluk City Council, IRA Council, and Kwethluk, Incorporated during late May and early June 1986. For purposes of planning the fieldwork, the study was partitioned into three components: 1) collecting information about salmon production units and salmon harvesting activities during the 1986 season; 2) collecting information about the annual round of resource harvest activities, quantities of resources harvested, and socioeconomic information; and 3) mapping of the community's resource harvest areas.

Sample Design

Since the fieldwork was designed to address three specific areas of investigation, there were, likewise, three specific groups or subsamples within the community that were targeted. Two components of the fieldwork involved structured household interviews and one component involved land use mapping. The overall sample for this study was the community of Kwethluk and included only permanent households. Seasonal residents, specifically non-Native school teachers who usually leave Kwethluk during the summer months, were not included in this study.

Salmon Harvest and Use Survey

The first component was aimed at gathering information about the use of salmon fishing camps, salmon fishing and processing activities, gear types, and harvest levels. Fifty-two households were identified as having a salmon fishing camp during this study. Since several households often shared fish camp operation responsibilities, the household chiefly responsible for establishing the camp, or was recognized as the camp "owner," was delegated to this group subsample. The first survey was administered to this group (Appendix 2).

A member of the IRA council who knew the locations of all of the Kwethluk salmon fishing camps was delegated by the IRA and City councils to assist with this phase of the study. This individual served as interpreter, assisted the researcher on the initial visits to the camps during the first phase of the study, and assisted with implementing the first survey instrument. Visits to fishing camps, which began in early June and continued through mid-September, provided opportunities throughout the summer to observe salmon processing activities, monitor the harvest, and collect subsistence salmon harvest calendars which were mailed in May by the Division of Commercial Fisheries. These visits provided opportunities for the researcher to become acquainted with many of the residents of Kwethluk, answer questions, and explain the scope of the study in more detail. During these informal visits the researcher became more familiar with the seasonal round of resource harvesting activities such as berry picking, freshwater fishing, and moose hunting. During this time, four other community residents periodically assisted in administering the first survey instrument and collecting salmon harvest data. Fifty-two salmon fishing camps at 35 locations were visited repeatedly throughout the season.

The people contacted during the summer were primarily those associated with salmon fishing camps. To collect community demographic information and to contact the remaining households, the researcher and an interpreter made house-to-house visits during August, after all families had returned to Kwethluk from their camps. These visits provided an opportunity for collecting census information and allowed the researcher to meet most of the community residents, briefly explain the study, and answer questions. Through this process, many people became familiar with the researcher and the

focus of the project. During these visits, households were identified as to whether or not they: 1) owned and operated a salmon fishing camp, 2) participated in salmon production activities with other households having a camp, or 3) neither operated a salmon fishing camp nor assisted in salmon production activities during 1986.

Non-Salmon Fisheries and Wildlife Resource Harvest and Use Survey

The second component of the study focused on collecting harvest and use information about non-salmon fisheries and wildlife. A survey instrument was used to collect information on the seasonality of resource harvests, methods of harvest, quantity of resources harvested annually, and the distribution of those resources. Also collected was information describing the various sources of household income, the types, number, and duration of wage earning jobs held by household members, and the types of subsistence-related equipment owned.

Prior to developing this second survey instrument (Appendix 3), six Kwethluk residents helped the researcher prepare a list of the species of fish and game known to be harvested by Kwethluk residents. Yup'ik names were also provided. Once prepared, the survey was administered to a stratified sample of all community households. The decision to use a stratified sampling approach was based on an assumption that some households were high harvesters of wildlife while others were low harvesters. Investigations by Wolfe (1987) indicate that, in some communities, there exist a few highly productive households who harvest much of the community's wild food. Discussions with people at salmon fishing camps indicated that most of the households that had a camp were also households that harvested a wide variety of wildlife. At the time the census information was gathered in late August, it appeared that the households that responded as not having a salmon fish camp and not participating in salmon production activities were often elderly or single member households. These households, as a group, were expected to harvest relatively low amounts of resources.

In order to arrive at the best estimate of the total community harvest, in a situation where there was perhaps marked difference in harvest and production levels between households, a stratified

sampling approach is preferred over a simple random draw of households. For purposes of administering this survey, the community was stratified into three groups. The first group represented households owning and operating a salmon fishing camp during 1986; the same group that was surveyed on the initial fish camp visits. The second group was comprised of households who identified themselves as not "owning" a salmon fishing camp during 1986, but participated in salmon production activities with other households having camps. The third group was made up of the remaining households, those not operating a salmon fishing camp in 1986 and not participating in salmon fishing or processing activities (Table 1).

Based on experience from other harvest surveys (Walker, pers. comm. 1986), it was determined that a 30 percent sample would provide a good estimate of the total community harvest. Using this sampling effort as a guide, 16 households from the first group, 8 households from the second group, and 10 households from the third group were initially selected to be surveyed. Households were each previously assigned a random number and selection was based on a draw of numbers from a random number table. As the surveys progressed, and after looking over the results of the data gathered after about 75 percent of the surveys had been completed, it appeared that there was more variability within the Group 1 data than the Group 3 data. The sampling effort was altered to include three additional households from Group 1 (resulting in 19). One less household than desired (9 instead of 10) was surveyed in Group 3.

Thirty-six households representing 32 percent of the community's households were surveyed. Surveys were usually conducted in the respondent's home. A bilingual assistant helped with the surveys and took notes which helped to record resource harvest activities. This phase of the study was conducted between early September and mid-December 1986.

Land Use Mapping

The third component of the fieldwork involved mapping community land use areas. The aim here was to produce maps that depicted all geographic areas used by community residents for harvesting fish

TABLE 1. SAMPLE GROUPS SURVEYED IN KWETHLUK DURING 1986

Sample group	Number of households in group	Percentage of households in group	Number of households surveyed	Percentage of households surveyed
<u>Group 1</u> Household was main proprietor of fishing camp.	52	46.4	19	36.5
<u>Group 2</u> Household did not have a fishing camp, but assisted with salmon harvesting and processing.	26	23.2	8	30.7
<u>Group 3</u> Household neither had a fishing camp nor assisted with salmon harvesting or processing.	34	30.3	9	26.4
	—	—	—	—
Totals	112		36	32.1

and wildlife during the years they resided in Kwethluk. The intent was to develop land use maps showing the outer boundary, or the extent, of the areas used by the community for harvesting fish and wildlife. The species list, which was prepared before conducting the resource harvest surveys discussed above, was used as a guide to develop the resource categories to be mapped. Twelve categories were used when mapping resource use areas (Table 2).

The land-use mapping was completed in two phases. First, ten key respondents, ranging in age from 35 to 65, were each interviewed and their land use areas mapped. The key respondents were selected on advice from members of the City council, IRA council, and Kwethluk, Incorporated. Each mapping session usually began with an explanation of the overall community subsistence study that was underway and the way in which the mapping component fit into the study. Key respondents were usually interviewed at different times and at different locations. Respondents were asked to identify the areas that they had used while living in Kwethluk. For people who had lived in Kwethluk all their lives, the maps represented use areas from the time of their birth until the date of the interview. For people who moved from other communities or from now-abandoned settlements, the map depicted the areas used from the time they moved to Kwethluk until the date of the interview. Any areas used only while respondents were residing outside of the community were not included. In all situations, the primary respondent was the head of the household and was a male. During some of the interviews, wives, sons, and daughters also participated. In others, however, the household head was the sole respondent.

In most situations, the mapped interviews were conducted in the respondent's home, although some interviews took place in the community library, the laundromat, and the corporation office. Mapped information was collected using U.S. Geological Survey, 1:250,000 scale topographic maps. Typically, the maps were laid on the floor and were overlaid with clear mylar which was taped and registered to the maps. Felt-tipped pens of different colors were used when delineating resource-specific land use areas. Two overlays were required for each interview. The interview date, researcher's initials, and the list of resource categories represented on the map, were written on each overlay. To ensure confidentiality of the information, each overlay was assigned a unique number

TABLE 2. LAND USE RESOURCE CATEGORIES MAPPED IN
KWETHLUK DURING 1986-1987

Salmon

Chinook
Sockeye
Chum
Coho
Pink

Furbearers

Beaver
Land otter
Muskrat
Mink
Fox

Freshwater Fish

Whitefish sp.
Dolly Varden
Grayling
Smelt
Alaska blackfish
Rainbow trout
Lake trout
Northern pike
Burbot
Sheefish

Marine mammals

Spotted seal
Bearded seal
Ringed seal
Walrus

Waterfowl

Geese
Ducks
Cranes
Swans

Big Game

Moose
Black bear
Brown bear
Caribou

Berries, Plants, Wood

Blueberries
Salmonberries
Cranberries
Crowberries
Plants
Wood

Small Game

Grouse
Ptarmigan
Parka squirrel
Hare
Porcupine

coded to the respondent. As the map interview was being conducted, descriptive information about the areas being identified was also recorded. Additional information such as observations of resource distribution and abundance, harvest methods used, timing of harvest, location of camps, and travel routes was also noted.

Once the ten key respondent interviews were completed, the mapped data were compiled resource category by resource category onto 12 separate mylar overlays; one for each category. Each compiled overlay depicted only the outer boundary of the aggregated use areas identified by key respondents. These outer boundary data were then transferred to blue-line U.S. Geological Survey 1:250,000 scale quadrangle maps to depict the entire use area of each individual resource category on a single map. The maps prepared for review were then displayed in the building containing the Kwethluk city office, IRA office and library, for one week. Soon after the maps were put on the walls for review, an announcement was made in Yup'ik over VHF and CB radio that the maps were available for review. Residents of the community were encouraged to examine the maps for completeness and accuracy. During this time, several community residents came by on a voluntary basis and reviewed the maps. Many were either interested in seeing what the composite community maps looked like or subsequently remembered additional areas, which they wanted to add, that they forgot to include during the initial mapping process. Other people, including hunters of all age groups who had heard about the map review, inspected the maps to see that areas they used were also properly included. When a person reviewing the maps identified areas that he or she used that lie outside of the lines on the map, those areas were added.

When the maps were first posted for review, most of the people who came in to look at them added some new information. As the week progressed, less and less new information was added and more and more people reviewing the maps made comments that it looked to them as if most of the community's use area was included. Towards the end of the week it became apparent that new information was not being added. After consultation with community officials, the maps were taken down and the data were determined to be final for purposes of this study.

Throughout the study households participated on a voluntary basis. During the harvest surveys conducted in fall and winter and the mapping interviews, which were done in spring of 1987, respondents were paid for their time. The harvest surveys took between one-half to one-and-one-half hours per respondent. Mapping sessions lasted for three-quarters to two-and-one-half hours. All household surveys and maps were coded to ensure confidentiality of the information.

Data Analysis

Data from summer salmon fish camp surveys and the household harvest surveys were coded by the researcher and entered into a computerized database by the Division of Subsistence data management staff in Anchorage and Fairbanks. The majority of the data analysis was done using SPSS, however, RBASE and QUATTRO PRO were also utilized by the researcher. The approach to the data analysis was guided by specific questions defined by the researcher and also by the need for general descriptive statistics necessary for interpreting the data.

Limitations

During the course of this study, there were many individuals and households that were not surveyed. The areas they used were not individually mapped nor was their harvest and use of resources recorded on the survey forms. A sample of households was interviewed in this study because time and budget factors precluded surveying every household.

The harvest information gathered during this study represents harvests during one calendar year, September 1, 1985 through August 31, 1986. A 12-month harvest period was chosen for comparability to other single-year subsistence studies by the Division. The study covered one complete cycle or a seasonal-round of activities for harvesting wildlife including species which are either migratory or seasonally available. Harvest data for a single 12-month period, however, does not provide answers to questions such as "How do harvest levels fluctuate over time?;" "Were the harvest levels reported

during the time period selected for this study high, low, or about average?;" and "How do harvest levels of specific resources change in relation to the availability and harvest of other resources?" These questions can be addressed by conducting harvest studies for several 12-month periods.

With the exception of the salmon harvest information, which was collected primarily in-season while harvesting and processing activities were underway, the harvest information for resources provided by households was based on recall. Respondents recalled when and how much of a specified fish or wildlife resource was harvested. Harvest estimates based on recall of the 1986 salmon catch, which households provided to the researcher, were very close to the total harvest amounts tallied from subsistence salmon harvest calendars returned to the Alaska Department of Fish and Game by the same households.

Many factors cause harvest levels to fluctuate year to year and include environmental conditions, economic and time restrictions placed on hunting and fishing ability, personal circumstances, and distribution and abundance of species. Local residents believe that the abundance of fish and game is related to cyclic variations that occur over a number of years. While the harvest information collected during this study is the best data available on the community's annual subsistence harvest, the harvest estimates cannot be used to define either upper or lower limits on harvests. The harvest estimates should be used only as indicators of the annual harvest level.

Because not every hunter was available to review the community land use maps, it is possible, indeed likely, that some areas were not included. Areas used for hunting, fishing, and gathering, like harvest levels, change from year to year. The lines on the maps do not represent limits to the community's use area, rather they represent the documented extent of the areas used for hunting, fishing, and gathering.

RATIONALE AND LITERATURE REVIEW

Information describing subsistence activities in the lower Kuskokwim River region is very limited. Some of the earliest written accounts, describing the kinds of resources harvested and the timing of

resource harvesting, were made by the early Moravian missionaries (Henklemen and Vitt 1985). Oswalt (1963) conducted a study in Napaskiak during 1955-56 and provides a detailed account of the seasonal round of subsistence activities in that community during a time when dog teams were the main means of overland travel. Fienup-Riordan (1982) provides generalized information about subsistence activities in the lower Kuskokwim River area, based largely upon observations and informal conversations with residents. A study conducted by Andrews and Peterson (1983) describing land use along the Tuluksak River drainage provided one of the earliest documentations of land use by a lower Kuskokwim River community.

Information on the harvest of fish and game has been collected by the Alaska Department of Fish and Game over the years. Much of this information has been in the form of big game harvest ticket returns and fur sealing records. The data derived by such reporting methods have failed to reflect the total harvest of these resources, particularly in rural communities. Many fur animals are harvested for personal use (such as for food, clothing, and Native crafts) and are not sold on export markets. Big game harvests are sometimes not reported on harvest tickets. Individual hunters do not always obtain harvest tickets or complete and return them.

Since 1959, the Division of Commercial Fisheries has collected subsistence salmon harvest information from communities in the Kuskokwim River area. This information was gathered by individuals working for the Department who visited the communities and fish camps during August. Since 1962, subsistence harvest reporting calendars have been used in communities to record subsistence salmon harvests. Reporting of salmon harvested for subsistence has never been mandatory along the Kuskokwim River. Nevertheless, many families participate in recording their harvest and answering survey questions on a voluntary basis. The intent of the calendars and the follow-up surveys was to determine how many salmon were harvested for subsistence use by residents of area communities. This information, together with commercial fishing harvest and escapement data, is used to determine the total harvest of Kuskokwim River salmon and to provide an indication of annual salmon run strength. Although the salmon harvest calendars have provided, until recently, the only community-specific subsistence salmon harvest information available, this reporting system has failed

to capture a significant portion of the harvest. Post-season surveys by Department personnel have greatly improved the qualitative and quantitative aspects of the data. Nevertheless, problems do remain, as households oftentimes do not receive harvest calendars or may not be at home when the post-season surveys are conducted.

Extensive efforts by the U.S. Fish and Wildlife Service to gather data on waterfowl harvest have resulted in recently published regional and subregional harvest information (Copp 1983; Copp and Roy 1986; Copp and McCaffery 1987). These studies have provided data on the number of particular species of waterfowl harvested across the Yukon-Kuskokwim Delta and within particular strata, including the Kuskokwim River area from Aniak downstream to Napakiak (Fig. 1). The purpose of the studies, in general terms, has been to identify the avian species which were being harvested and to arrive at a regional estimate of the annual harvest level for each species.

CHAPTER 2. CHARACTERISTICS OF THE AREA

GEOGRAPHIC SETTING

The lower Kuskokwim River area is characterized by a flat landscape of tundra and water (Fig. 2). The most prominent geographical feature is the Kuskokwim River. Flowing in a general southwesterly direction, the Kuskokwim River is heavily laden with silt carried downstream, from tributaries originating in the Alaska Range and the Kuskokwim Mountains, to the Bering Sea. Just upstream from Bethel the river is over one-half mile wide while near the mouth, 68 miles downstream ($60^{\circ} 00'$ N), it is more than 11 miles wide. The Kuskokwim River is tidal influenced at least as far upriver as Akiachak, located approximately 28 miles upstream from Bethel. Kwethluk is located 20 miles upriver from Bethel. Tides are generally no more than four feet at Bethel, however, strong south winds during fall often create storm tides which may flood much of the downriver area.

The soils of the lower Kuskokwim River area are poorly drained and composed mainly of silt and sandy alluvial deposits underlain with thick permafrost. These soils are easily eroded by the Kuskokwim River and as such, river channels and sandbars are constantly shifting and changing location. Thousands of lakes, interconnected with slow meandering streams and sloughs or separated by marsh and tundra, blanket the adjacent countryside. West of the Kuskokwim River the immense Yukon-Kuskokwim Delta is a flat prairie-like expanse of tundra and water stretching to the coast of the Bering Sea.

East of the Kuskokwim River, the tundra changes to uplands, rolling hills, and finally the Kilbuck Mountains and the southern extension of the Kuskokwim Mountains. These mountains, which rise to over 4,000 feet, separate the drainage of the Kuskokwim River from that of the Nushagak River, which empties into Bristol Bay near Dillingham. Although not extremely high, these mountains are rugged and are made up of bedrock covered by gravel and a varying thickness of organic layer. On the steeper slopes, bedrock is exposed and the terrain is quite rocky.

Many of the major tributaries of the Kuskokwim River such as the Holitna, Aniak, Tuluksak, Kisarialik, Kwethluk, and Eek rivers originate from these mountains. These rivers range in length from 85 to 108 miles. The headwaters of the Kanektok, Arolik, and Goodnews rivers are adjacent to those of the Kwethluk and Kisarialik rivers, however, they flow into Kuskokwim Bay or Goodnews Bay, south and east of the Kuskokwim River.

The first high banks one encounters while traveling up the Kuskokwim River from Kuskokwim Bay are near Bethel. The elevation of the immediate area is relatively low. Kwethluk is situated less than 25 feet above sea level.

CLIMATE

The climate of the area is influenced by the continental land mass and the Bering Sea. Rather than being in a climatic zone characterized as either continental or maritime, Kwethluk is located in a climatic zone described as transitional. The influence of the Bering Sea results in moderate temperatures ranging from 39 to 62 degrees Fahrenheit during summer and from minus 3 to 20 degrees above Fahrenheit in winter. Extreme annual variations in temperature, recorded at Bethel, which is approximately 10 air miles west of Kwethluk, range from minus 46 in winter to 86 degrees Fahrenheit in summer. Winds average 11 mph and are generally from the north-northeast, however, strong southeast winds as high as 54 mph have been recorded. Average annual precipitation is 16 inches including 50 inches of snow (Selkregg 1975).

Early summers (late May through mid-July) are usually cool and relatively dry. Although summer storms do occur, these tend to come in August, bringing rain and wind which are typical of the Delta's late summer weather. The period during late August to early November is usually cool, rainy, and stormy. There are often several clear, cool days during September. The Kuskokwim River freezes over near Kwethluk generally sometime between late October and mid-November.

During the winter months, persistent winds blow much of the tundra free of snow and deposit it in wind-packed drifts near ravines and on the leeward side of dense vegetation and small hills.

Periodic mid-winter warm spells sometimes bring rain or cause the snow-cover to melt. This combination of warm weather and rain, followed by cold winter temperatures, often results in either extremely icy conditions or little or no snow covering the ground. During January through late March or early April, temperatures are typically and invariably cool and skies clear. The Kuskokwim River ice breaks up during mid-to late May.

FLORA AND FAUNA

Vegetation found in much of the area is characteristic of low, wet tundra underlain with permafrost. Scrub willow, Labrador tea, alder, blueberry, lowbush cranberry, cotton grass, and a variety of other sedges and grasses dominate the lowlands areas. Clumps of black spruce, as well as solitary trees, are scattered here and there over the lowland, upriver from Napakiak. In the better-drained sites, such as on small knolls and the high banks lining the tributaries, are found balsam poplar, white spruce, birch, willow, alder, and wild rose. Several species of broadleaf plants such as rhubarb, sourdock, and skunk cabbage are common. Lichens are also common in the area. A thorough discussion of vegetation types in the area is contained in the Comprehensive Conservation Plan for the Yukon Delta Refuge (United States Department of Interior 1988).

Many of the wildlife species found in the lower Kuskokwim River area are migratory and are only seasonally abundant. The Yukon-Kuskokwim Delta is a very important nesting area for the majority of the Pacific Flyway arctic nesting geese including white-fronted geese, Pacific black brant, emperor geese, and several species of Canada geese. Birds begin arriving in mid-late April and depart in August and September. White-fronted geese and lesser Canada geese are the most common geese found in the area near Kwethluk (Copp and Roy 1986). Also common to the area are tundra swans, sandhill cranes, and several species of diving and dabbling ducks. Pintail, mallard, greater scaup, black scoter, greenwing teal, American wigeon, goldeneye, and white-winged scoter are the primary species of ducks found in the area (United States Department of Interior 1988; Copp 1988). Kwethluk residents report

that some ducks overwinter along warm tributary streams west of the mountains where there is open water throughout the winter months.

For many years, fish have been the mainstay of the peoples living along the lower Kuskokwim River. Freshwater and anadromous fish play an important role in the diet of people living along the Kuskokwim River and in the economy of the region. Fish species found in the area include five species of Pacific salmon (chinook, sockeye, chum, coho, and pink) several species of whitefish, least cisco, northern pike, burbot, sheefish, Dolly Varden, rainbow trout, lake trout, Arctic grayling, rainbow smelt, and Alaska blackfish.

Chinook salmon ascend the Kuskokwim River and many of its tributaries beginning in late May or early June. Sockeye, chum, pink (during even numbered years), and coho salmon are also seasonally abundant. Sockeye and chum salmon are available in the Kwethluk area by mid-June. Coho salmon are common near Kwethluk by the first of August and are harvested as late as October. Whitefish, cisco, burbot, pike, and sheefish are commonly found in the Kuskokwim River and many of the slow-moving tributary streams. Arctic grayling, Dolly Varden, and rainbow trout are available in the swift clear water streams flowing from the mountains such as the Kwethluk, Tuluksak, and Kisaralik rivers. Lake trout are common in several mountain lakes east of Kwethluk. Blackfish are common in many of the sloughs and tributaries connecting tundra lakes to the Kuskokwim River. Whitefish are found throughout the area and many of the tundra lakes that are connected to the river system via streams or sloughs have whitefish. These fish are commonly found in the Kuskokwim River from December through early spring, but beginning in early May, they are found throughout the many tributaries, sloughs, and lakes on the Delta. Pike are common in most of the slow-moving waters such as near river mouths, sloughs, and accessible tundra lakes. During winter, pike are found in the Kuskokwim River near the mouths of prominent tributaries and in overwintering areas in the larger tributaries such as the Kisaralik, Kwethluk, and Gweek rivers. Burbot and sheefish are found in the Kuskokwim River and in the lower reaches of the tributary streams (Alaska Department of Fish and Game 1986a).

Small game such as ptarmigan, grouse, hare, and porcupine are found throughout the region. Parka squirrels and marmots are common in the mountains east of Kwethluk. Big game are not

abundant near Kwethluk. Moose are sometimes seen near the lightly-wooded areas close to sloughs and streams and occasionally on the open tundra. During summer the animals are distributed widely, but not abundantly, over the lower Kuskokwim River area. The upper Kuskokwim River area supports more moose and during winter, the animals are usually concentrated in the riverine corridors where dense stands of willow provide food and cover. Caribou, historically abundant in the Yukon-Kuskokwim Delta area, are found in the foothills and mountainous area east of the Kuskokwim River. Caribou also move westward of the foothills and mountains during summer and may be found in the middle sections of the Kwethluk River valley. Black bear are frequently found in the heavily wooded lowland areas, whereas brown bear are common in the foothills and more rugged mountains. Many kinds of furbearers including beaver, otter, mink, muskrat, red fox, and occasionally marten, lynx, wolf, and wolverine are found in the region. Arctic fox are also occasionally present, but are not abundant. Beaver have become especially numerous and have established themselves throughout the region. Numerous beaver dams are found on many of the tributary streams on the Yukon-Kuskokwim Delta. Marine mammals, such as seals, are sometimes found in the Kuskokwim River as far upstream as Kwethluk, but are more commonly found near the river mouth and the Kuskokwim Bay area. Belukha whale have been seen in the Kuskokwim River as far upstream as Kwethluk, however, during recent times, these whales are rarely seen in the river. A detailed discussion of species distribution is contained in Alaska Department of Fish and Game's *Habitat Management Guides Life Histories and Habitat Requirements* (Alaska Department of Fish and Game 1986b).

REGIONAL SETTING

The lower Kuskokwim River area includes the communities of Tuluksak, Akiachak, Akiak, Kwethluk, Bethel, Oscarville, Napaskiak, Napakiak, Atmautluak, Kasigluk, Nunapitchuk, Tuntutuliak, and Eek (Fig. 1). These 13 communities had a combined population of 6,768 people in 1980 and 8,676 people in 1990 (Table 3). Estimates of the 1985 population indicate that the area population had

TABLE 3. POPULATIONS OF COMMUNITIES WITHIN THE LOWER
KUSKOKWIM RIVER DRAINAGE

Community	1980	1985	1990
Tuluksak	236	321	358
Akiak	198	289	285
Akiachak	438	459	483
Kwethluk	454	546	558
Bethel	3,576	4,006	4,674
Oscarville	56	63	57
Napaskiak	244	303	318
Napakiak	262	299	328
Atmautluak	219	234	258
Kasigluk	342	405	425
Nunapitchuk	299	356	378
Tuntutuliak	216	293	300
Eek	228	257	254
	—	—	—
Totals	6,768	7,831	8,676

SOURCES: Alaska Department of Labor 1987, 1991.

increased approximately 16 percent between 1980 and 1985, whereas the growth rate was 10 percent from 1985 to 1990.

In 1985, Bethel was the largest community in the region with a population of 4,006 and Oscarville, the smallest, with a population of 63 (Alaska Department of Labor 1987). Bethel serves as the regional center for the Yukon-Kuskokwim Delta and is the service and distribution center for the surrounding communities. In 1980, 1985, and 1990 Kwethluk was the second largest community in the entire Kuskokwim River drainage (Table 3). Approximately 81 percent of the population situated in the 13 communities is Alaska Native, presumably Yup'ik Eskimo (Alaska Department of Labor 1985).

Most of the communities along the lower Kuskokwim River have airstrips providing a year-round air transportation link to Bethel. The many streams, sloughs, and lakes in the area serve as a web, interconnecting the communities with one another and providing access to seasonal camps and subsistence harvest areas. Travel by boat is usually possible beginning in late May and extending through mid-October. Snowmachines and all-terrain vehicles are the primary means of travel throughout the area during winter when rivers and lakes are frozen and when there is adequate snowcover to allow travel on established overland trails. From December through March, when the Kuskokwim River ice is of sufficient thickness to support the weight of cars or trucks, the Kuskokwim River between the mouth of the Johnson River and the community of Tuluksak serves as a highway used for travel by automobile, truck, snowmachine, and all-terrain vehicle. During breakup and freeze-up, travel is limited primarily to air transportation.

CHAPTER 3.

HISTORICAL OVERVIEW

The first recorded contact between the Yup'ik along the lower Kuskokwim River and non-Natives occurred in 1830 when Ivan Ya. Vasilev, working for the Russian American Company, ascended the Nushagak River, floated down the Holitna River to the Kuskokwim, and followed the Kuskokwim River to Kuskokwim Bay before returning along the coast to the Company's station at Fort Alexander (Dillingham). This trip was made in haste and there appears to be little detail of information describing the people living along the lower Kuskokwim River (Zagoskin [1847] 1967:80). It is certain that the Yup'ik Eskimo were distributed at least as far up the Kuskokwim River as Sleetmute at that time.

The people living along the lower Kuskokwim River belonged to the regional group of Yup'ik referred to as *Kusquqvagmiut*, one of several regional groups of Yup'ik situated along the Bering Sea coast between the upper Alaska Peninsula and Norton Sound. Northwest of the *Kusquqvagmiut*, along the Yukon River, were the *Kuigpagmiut*; to the east, in the Bristol Bay area, lived the *Aglurmiut*; and on the tundra area immediately west of the Kuskokwim were the *Akulmiut* (Shinkwin and Pete 1984). *Kusquqvagmiut* occupied the Kuskokwim River as far upstream as Kolmakoff Redoubt, located approximately 12 miles upstream of Chuathbaluk. The Kuskokwim River between the vicinity of Kolmakoff Redoubt and Stony River was occupied by both Eskimos and Athabaskan Indians living in mixed communities (Oswalt 1962). Farther upriver, in the drainages of the Stony and Mulchatna rivers, and eastward to the Iliamna Lake and Cook Inlet regions were the Dena'ina (Tanaina) Athabaskan Indians (Fall, Foster, and Stanek 1984).

Beginning in the 1830s, traders for the Russian American Company were established in the central Kuskokwim area (Zagoskin [1847] 1967). Soon afterwards, in 1838-39, a smallpox epidemic struck which devastated the Native population of the region (Burch 1984). The epidemic resulted in the death of perhaps one-half of the Eskimos and Indians in the area (Wolfe 1982). Although most of the early Russian presence in western Alaska was along the lower Yukon and central Kuskokwim rivers, in 1844,

Russian trader Semen Lukin, established a trading station at "Ogavik," located along the lower Kuskokwim River approximately 18 river miles upstream from present-day Tuluksak (Oswalt 1980). This was one of the earliest posts established primarily for trading with the Yup'ik of the lower river area. Nevertheless, this temporary station was apparently short-lived. The influence of Russian occupation was apparent in other avenues of the daily lives of the Yup'ik. Prior to the transfer of Alaska to the United States in 1867, many of the Yup'ik along the central and lower Kuskokwim River had been converted to the Russian Orthodox faith. In approximately 1870, a trading post was established at the present site of Bethel (across the river from the traditional Yup'ik community of *Mamterillermiut*) and by 1884 the Alaska Commercial Company had established a post there (Oswalt 1980). Following the arrival of Moravians missionaries in 1884, and establishment of a mission in 1885, the lives of the Yup'ik people living along the lower Kuskokwim River began to change in many respects.

The people situated in communities along the lower Kuskokwim River depended on many kinds of wild resources for subsistence, but perhaps none so much as salmon. In some years, when spring breakup was late or when there was high water for prolonged periods of time, people had difficult times harvesting salmon. In particular, 1885 and 1886 were especially bad years for harvesting salmon and by spring 1887, several people had died from starvation while others were severely hurting for food (Henkelman and Vitt 1985; Oswalt 1980). Some of the people went to the mountain areas in search of game. The residents of Kwethluk were well-known at that time for their expert hunting and trapping skills (Henkelman and Vitt 1985). Elders in Kwethluk recalled hearing that at one time, during a famine, people who are ancestors of Kwethluk people, moved over to the Iliamna Lake area because they knew that the lakes there provided a dependable source of food. Local tradition holds that some of the communities in the Bristol Bay region were settled by ancestors of people living in Kwethluk at the time of this study. There probably were differences in the types of resources harvested by people living near the mouth of the Kuskokwim River and people living near the more timbered country in the central Kuskokwim area, from those living in the vicinity of Kwethluk. People living near the coast relied more heavily on marine mammals, while people living farther upriver relied more on big game

such as moose and caribou. It should be noted that many families whose descendants now live in Kwethluk lived year-round in settlements near the mountains east of the community. They relied heavily on big game available. People all along the river were linked by trading networks and resources were distributed widely.

By the late 1880s more and more non-Natives were making their way to the Kuskokwim River region. In summer 1900, an influenza epidemic occurred and many people along the Kuskokwim River died with some communities losing between 25 and 50 percent of their inhabitants (Wolfe 1982). Shortly after the turn of the century, the price of furs rose dramatically. Mink skins were each selling for \$.25 in 1900, but sold for \$4 in 1906 (Henkelman and Vitt 1985). Gradually, more and more people were able to purchase goods from the merchants and traders in the area. By 1901, reindeer had been introduced by the Bureau of Education to the Moravian mission at Bethel and several Yup'ik men became involved with herding activities (Henkelman and Vitt 1985). Herding continued with varying degrees of local participation until the 1940s when several factors, including the increase in the number of wolves in the area, brought it to an end. Wolves became so numerous that they were reportedly shot from the steps of the Bethel Hospital in the early 1940s (Alaska Sportsman 1944). Mining activities flourished for a short time in the Kuskokwim River drainage as it had in many parts of Alaska. Small gold strikes occurred around 1908 in the mountains along the Tuluksak River and along Canyon Creek, a tributary of the Kwethluk River. Later, these mines provided employment for a few local people and a market for reindeer meat (Henkelman and Vitt 1985).

Commercial fishing in the lower Kuskokwim River was occurring at least as early as 1913. In 1920 there was concern expressed by the federal government that commercial fishing at the mouth of the Kuskokwim River would be detrimental to the river's subsistence fishery. It was suggested that the Bureau of Fisheries look into the matter and in 1922 a study of the salmon fishery on the Kuskokwim River was made (Bower 1923). Following a conditional prohibition from 1926 to 1929, commercial fishing occurred periodically until 1952 when complaints of declining subsistence catches resulted in the commercial fishery being closed. The commercial fishery reopened in 1954, however, no one fished commercially until 1959 (Pennoyer, Middleton, and Morris 1965:42).

SEASONAL ROUND OF SUBSISTENCE ACTIVITIES: 1900 TO 1930s

This section describes the seasonal round of subsistence activities by Kwethluk residents from 1900 to 1930s, based largely upon interviews with seven Kwethluk elders. During summer, most Kwethluk families were busy harvesting and processing salmon for later use by people and dogs. Some families had their summer fishing camps along the main Kuskokwim River, while others were situated along the Kwethluk River as far upstream as Elbow Mountain, a distance of about 50 river miles from Kwethluk. A few families had camps along the upper Kanektok River. Salmon were harvested using various techniques depending on the characteristics of the fishing location. Elders remember using short drift gill nets made from braided willow bark, having weights made from reindeer antler and floats of wood. When the salmon got their teeth tangled in the net, the entire net was dragged up on a sandbar in order to prevent the fish from breaking the net and escaping. In the main Kuskokwim River, drift nets and later, after commercially manufactured linen twine nets became available (in the 1940s), set nets became more widespread in the vicinity of Kwethluk. These linen generally lasted a couple of years and most were good for only one season. Set nets allowed to soak were especially susceptible to rotting and most people preferred to fish by drifting with their nets, allowing the nets to dry when not in use. When the king salmon runs were below normal, fish traps made of spruce were sometimes placed near sandbars to harvest whitefish. In the Kwethluk River, set nets and fish traps were employed. On the upper Kanektok River, salmon were harvested using set nets and spears. Fish were preserved by drying and smoking similar to the way it was done in the 1980s. Families often remained at fish camp until September. All families made a concerted effort to harvest berries during slack periods. In fall, after salmon harvesting activities were over, some families remained near Kwethluk where they harvested whitefish using large funnel-type fish traps. Families who had fishing camps further up the Kwethluk River would usually float downriver to Kwethluk in boats made from skins of caribou, reindeer, bear, or seal, bringing with them part of their dried fish. The remainder of the dried fish was retrieved after freeze-up via dogteam.

In September and October families maintaining a household at Kwethluk throughout winter were busy gathering firewood and harvesting whitefish. In early fall, more mobile families began returning to the mountain areas east of the community where they harvested squirrels, freshwater fish, brown bear, caribou and feral reindeer. Families often traveled from Kwethluk to the mountains on foot. Some used dogs as pack animals and others traveled by paddling or poling a boat up the Kwethluk River as far as possible and then walked to their hunting areas. After freeze-up, efforts shifted to hunting furbearers and "hooking" or jigging for fish through holes cut in ice. Several Kwethluk men left their families and traveled to the mountain areas to hunt wolverine, red fox, mink, otter, and beaver. Skins of hare, wolverine, squirrel, beaver, birds, brown bear, and reindeer leggings were traded to people from other communities who would travel to Kwethluk with seal skins, seal meat, and seal oil to exchange. The people that had been in the mountains for most of the fall and early winter usually returned to Kwethluk for Christmas festivities in December or January. Families residing in Kwethluk throughout the winter set fish traps for blackfish, snares for hare, and hunted and trapped furbearers and small game in close proximity to the community. Some waited until after Christmas to begin trapping. Many tried to be in Kwethluk during the Russian Orthodox Christmas celebration or "Slavic" which begins on January 7.

Beginning in late January or early February, families once again returned to hunting areas in the mountains. As the amount of daylight increased, men traveled eastward over the Kuskokwim Mountains to Togiak Lake, the Tikchik Lakes, and to the upper Aniak and Holitna River drainages, looking primarily for furbearers, but also harvesting caribou, moose, and brown bear. Squirrel were hunted in the vicinity of Kagati Lake, located at the headwaters of the Kanektok River, and Heart Lake, located near the headwaters of the Kwethluk River. Beaver were hunted in the Tikchik Lakes area as far east as the Nushagak and King Salmon River. Beaver and moose were not usually found on the west side of the Kuskokwim Mountains until the 1930s, but they were harvested when available. While trapping in the Nushagak River area, men sometimes traveled to Dillingham to sell their furs.

As temperatures warmed and the snow melted, men headed west, back over the mountains, to their camps. Brown bear were hunted at this time; moose, caribou and feral reindeer were also

hunted. Some individuals obtained permission to harvest reindeer belonging to the Kuskokwim Reindeer Company herd. The meat of game harvested while in the mountains was usually dried. Once men reached the camp where women and families were trapping squirrel and snaring small game, such as ptarmigan and hare, the entire group made their way to the Kwethluk, Kisaralik, Eek, or Kanektok rivers where they built skin covered, wooden framed boats (*angyaqatet*). Families left their various camps to rendezvous with other families to build *angyaqatet* and then floated downstream to their spring camp, salmon fishing camp, or Kwethluk. These boats varied in size but were shaped similar to the shallow, bowl-like skin boats still being built and used in the 1980s. Wooden frames made of spruce or cottonwood were first lashed together. After the frame was completed, skins that had been sewn together were stretched over the frame, hair side in, and lashed over the gunwales to the inside frame. The skins were usually those of caribou, reindeer, moose, brown bear, or seal. Some families traded for seal skins, which they brought with them each year, specifically for this purpose. These boats were capable of carrying several people, their gear, dried meat, and furs. Sometimes canoes made of birch bark were also used to tow one of these boats. The trip was often dangerous and the skin boats punctured easily. Swift water carried the rafts downstream at a relatively rapid speed. It took families approximately three days to reach their salmon fishing camps near Three Step Mountain, the last mountain encountered along the Kwethluk River, approximately 25 airmiles southeast of Kwethluk. Others continued on downstream to spring hunting camps for waterfowl and muskrat. People remember being at their salmon fishing camps by about the 10th of June.

Families that remained near Kwethluk most of the year made trips based from the community in search of furbearers and small game. Pike and burbot were harvested by "hooking" through holes cut in the ice. In spring, often soon after Easter, families left for spring camp. Many families had their spring camps located along the Kisaralik and Kasigluk rivers, located north of Kwethluk, and the Akulikutak River, a tributary of the Kwethluk River. At spring camp people harvested whitefish, pike, waterfowl, and muskrats. Towards the end of May, families with spring camps near the Kuskokwim River harvested smelt and sheefish, and usually by the second week of June, families had moved to their summer fish camps.

For men and families who worked as reindeer herders, the seasonal round was different. The men tended to stay out on the land following and tending to the reindeer for extended periods of time. In spring, herders often had their entire families with them. Camps were made near the reindeer herd and families built fish traps that were used for harvesting salmon and freshwater fish from the inland tributaries during summer. When the reindeer began to move about after calving, herders packed their belongings onto the backs of reindeer and migrated along with them. For the most part, families that herded reindeer subsisted on resources near the areas where they herded, harvesting squirrel, hare, ptarmigan, and several kinds of fish. These foods were dried or smoked and often buried or cached for later use. Some reindeer were butchered in August, soon after salmon season was over, as this was the time when the reindeer hides were best suited for parkas. Reindeer were also slaughtered when the family needed food or when the owner wanted to barter or trade an animal for other commodities. Families had smokehouses and caches at their camps where the reindeer meat and fish were dried, smoked, and stored. Just before Christmas, most of the people who were herding returned to Kwethluk on sleds pulled by teams of from two to six reindeer per sled, taking some of the dried meat and fish with them. The herders tethered the reindeer used to pull the sleds, at "Birch Hill" near Kwethluk, where they foraged until time to return to the herd. A few men stayed behind with the herd to see that the reindeer did not wander far and to protect the herd from predators. Herders worked in "shifts" and were relieved every month or so by herders from one of the winter villages. Herders returned to Kwethluk periodically to rest for a while before returning to the herd. During winter, herders set traps for red fox and wolverine. Predation was especially hard on the herd during spring calving. Only during this time were firearms used to protect the herd from foxes, wolverine, and wolves.

SETTLEMENT OF KWETHLUK

Prior to the arrival of Moravian missionaries in 1884, there was very little information recorded about the people and the communities in the lower Kuskokwim River Area. Residents of Kwethluk

report that their ancestors have lived at the present-day location for many years preceding this century. Today's residents are cognizant of the fact that the community is in a very favorable location. The community is situated away from the main Kuskokwim River, making it relatively safe from spring floods, along a smaller river providing access to inland areas. They suggested these as reasons why the village site was selected. The adjacent Kwethluk River also provides an open water transportation route to and from the upland and mountain areas. Residents report that there were at least two traditional *qasgit* (communal men's houses) in the community and artifacts have been found along the eroding bank of the Kwethluk River, evidence that people have inhabited the site for many years. There appear to be three primary groups of people that constituted the community in 1986. The first group are those families who have lived in Kwethluk as long as anyone can remember. The second group are families who, at one time, spent most of their time living primarily in the foothills and mountain areas east of the community. The third group are families that have more recently moved to Kwethluk from other communities or from now-abandoned settlements in the lower Kuskokwim River region.

The earliest written accounts of people living at "Kvuikgugliugmiut" (*Kuiggluk*, Kwethluk) is found in journals of Iakov Netsvetov who recorded the presence of 28 people and 6 dwellings sometime between the years 1860 and 1863 (Black 1984: 488). Little is recorded regarding the size and demographic characteristics of the community between 1863 and 1925, however, the 10th federal census reports that in 1880 there were 75 people at Kwethluk (Oswalt 1980: 50). Oswalt also reports that following the influenza and measles epidemics near the turn of the century, which killed an estimated 50 percent of the Eskimos and Indians along the Kuskokwim River, seven families in Kwethluk were reported to have survived. Interestingly enough, during this study, while trying to reconstruct the population characteristics of the community during the early part of this century, an elder informant recalled that following the epidemics, before 1920, there were seven houses in Kwethluk. In 1896 a small Moravian chapel was built in the community (Oswalt 1980: 50).

Reportedly, before the turn of the century, people living in Kwethluk were joined by families living in four settlements along the Kwethluk River (Oswalt 1980: 50). Kwethluk residents interviewed

during this study were aware of old village sites located along the middle Kwethluk River in the vicinity of Three Step Mountain, located approximately 25 airmiles southeast of Kwethluk, and Elbow Mountain, located 25 miles by river upstream of Three Step Mountain, however, they were unsure how many settlements were abandoned because people moved to Kwethluk. Prior to the 1920s, a few present-day residents were living in settlements and camps along the Kwethluk, Kisaralik, and upper Kanektok rivers. During this period and up through the 1940s, there were several families living along the middle and upper Kwethluk River valley and near the lakes located in the mountains areas. Some of these families were involved with herding reindeer owned by the Kuskokwim Reindeer Company. Other families were simply living off of the land, hunting, fishing, trapping, and gathering wild resources. People were reportedly pretty well off, using fish and wildlife resources available near the mountains, from the lakes and rivers, and trading furs for other items they needed.

In approximately 1912, the first Russian Orthodox Church was built in Kwethluk. The first school in Kwethluk began to operate in 1922 by the Alaska Native Services (U.S. Department of Interior 1931). During the 1920s, people that were living out on the land began to be drawn to permanent villages, such as Kwethluk, after churches and schools were built. Some families living in the vicinity reportedly moved to Eek near the mouth of the Kuskokwim River and Quinhagak at the mouth of the Kanektok River. Several residents who remember moving to Kwethluk from their hunting and fishing camps reported that when they first moved from the mountains to the lowlands near the Kuskokwim River, the water tasted bad, the air smelled different, and the children were often sick. This shift of people from remote camps to a permanent village site resulted in relatively rapid, but sporadic increases in the community's population. People continued to use traditional hunting and fishing areas and the camps associated with them. Interviews with elders during this study indicated that during the early 1920s there were 12 cabins, including one sod cabin, in the community. After 1927, residents reported that there were a total of 15 households in the community. In 1930 there were reported to be 22 one-room or two-room log cabins and one *qasgiq* (Oswalt 1980). In 1939 funds were made available for a Bureau of Indian Affairs school in Kwethluk and construction on the school began (U.S. Department of Interior 1939, 1940). In 1940 Kwethluk was chartered under the terms of the amended

1936 Indian Reorganization Act which created a federally recognized tribal council (U.S. Department of Interior 1941). Some families continued to move seasonally in and out of Kwethluk until the 1940s, living part of the year in Kwethluk and part of the year in the mountains, near the lakes, and along the Kwethluk and Eek rivers. In 1941 a measles epidemic struck during the winter and many individuals died, especially mothers and children. Key informants interviewed during this study reported that the people living in reindeer camps, winter camps, and small settlements outside of the established community were largely unaffected.

During more recent times, residents of several surrounding communities have moved or married into the community. In 1953, Kwethluk's population included people originally from Bethel, Akiak, Tuntutuliak, Eek, and Kipnuk (Oswalt 1980: 50). In 1986 the community included people from the communities listed above as well as Tuluksak, Akiachak, Napaskiak, Kwigillingok, and Mekoryuk.

CHAPTER 4.
CONTEMPORARY COMMUNITY PROFILE

COMMUNITY SOCIOECONOMIC CHARACTERISTICS

Kwethluk lies approximately one-half mile east of the mouth of the Kwethluk River. The town site is laid out in an east-west direction with a 1,700-foot gravel runway paralleling the community on the south side and the Kwethluk River flanking it on the north. The oldest part of the community is on the west end of town and over the years the community has expanded eastward along the Kwethluk River. A gravel road constructed in 1985-86 connected the airport with the new school and houses located near the east end of town. The offices of the City, IRA Council, Village Corporation, police, and Village Public Safety Officer were centrally located.

Public and Private Sectors

Kwethluk was incorporated as a second class city in 1975. A mayor, who presides over a six-member city council, and several city employees, carry out the day-to-day operations of the city government. The City provides a variety of services which include a library, police and jail, water services providing treated water at several watering points, a laundromat, fire protection, garbage collection, and a landfill. A community health clinic, providing routine medical care to residents, is operated by the City and the Yukon-Kuskokwim Health Corporation. Health aides, who are local residents of Kwethluk, oversee the daily operation of the clinic, however, public health nurses from Bethel make routine visits, as does a physician and a dentist.

The IRA Council is also very active. It oversees operations of the Kwethluk Native Store and meets frequently to deal with issues affecting the resident Native community. The Kwethluk Native Store was established by the Alaska Native Industries Cooperative Association (ANICA). This store

was quite well stocked in 1986 and provided food, clothing, hardware, and building materials. Kwethluk, Incorporated, the village corporation formed as a result of the Alaska Native Claims Settlement Act (ANCSA), manages the lands selected through ANCSA. Under Section 12(a) of ANCSA, Kwethluk, Incorporated was entitled to approximately 138,246 acres of land. As of January 1987, approximately 131,463 acres had been conveyed. Under Section 12(b), the Corporation was entitled to approximately 19,777 acres; 6,677 acres remained to be conveyed. Much of the Corporation lands are adjacent to the Kwethluk River and a tributary, the Akulikutak River. The Corporation also operates an electricity generating plant, which provides the only source of electricity to residents, a sporting goods store, a river taxi during the winter months, and an outlet selling gasoline and stove oil. Public education was provided through an elementary and high school administered by the Lower Kuskokwim School District, based in Bethel. A Russian Orthodox church and a Moravian church were also present in the community.

Housing

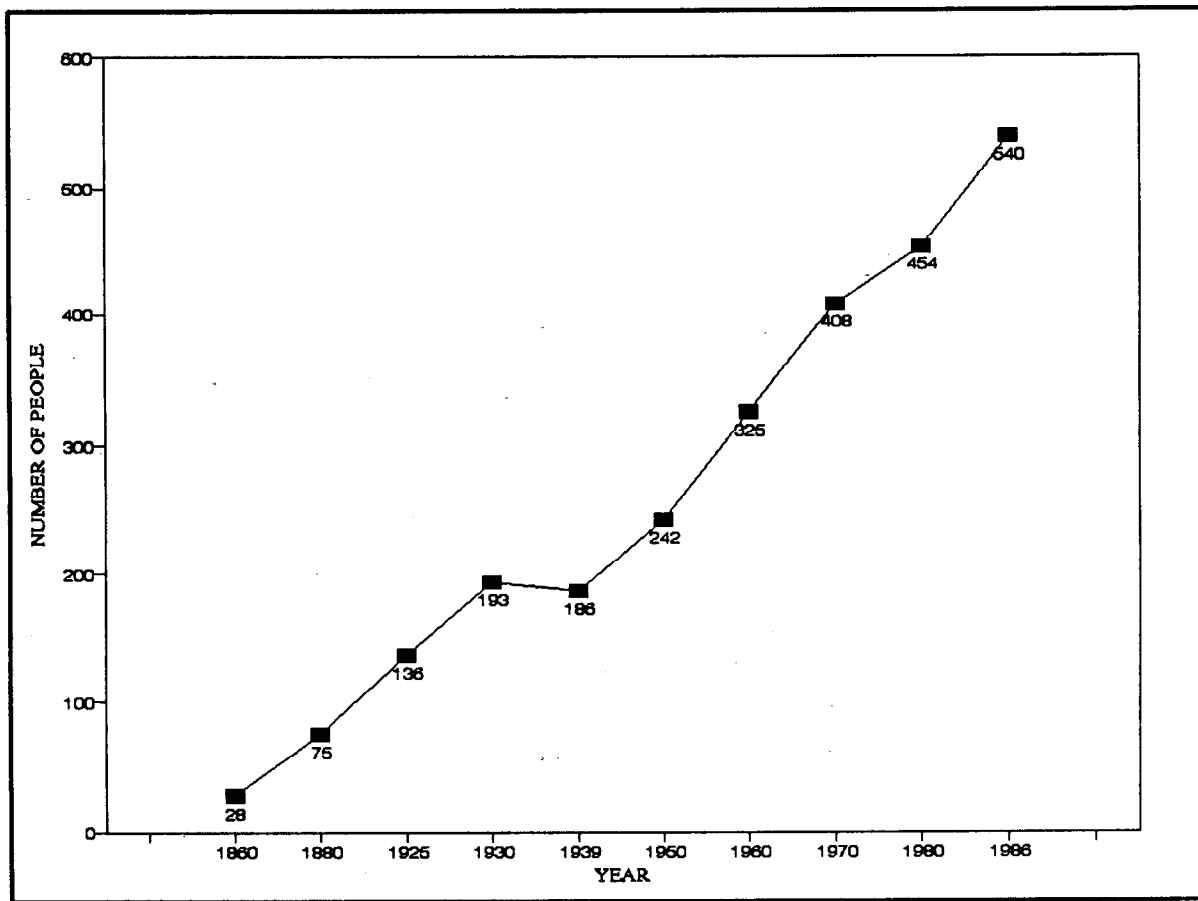
During the time of this study there were 112 occupied houses in the community. Several two-story houses were built by the Alaska State Housing Authority (ASHA) and were centrally located. Thirteen one-story houses constructed by the Association of Village Council Presidents (AVCP), completed in December of 1986, were placed at the east end of the community. Several houses were privately built. Most houses were of frame construction, however, two homes were made of log (one old and one relatively new). Houses ranged in size from approximately 350 to 1,000 square feet. There were few, if any, vacant houses in the community. Homes in Kwethluk were heated with oil and a large percentage also contained wood-burning stoves. Virtually all of the houses were wired for electricity and many of the homes had private telephone service provided by United Utilities, Incorporated. Radio was available from the Bethel station (KYUK) as were two television channels provided through KYUK and the Alaska Satellite Television Project.

Transportation

Travel within the community was primarily by foot, however, all-terrain vehicles and snowmachines were also commonly used. A web of boardwalks connected most houses and extended from the west end of the community to the highschool, near the east end. A few families owned a car or a truck which were used on the gravel road which extended parallel to the community along its south side. Depending on the time of the year and travel conditions, boats, all-terrain vehicles, and snowmachines were often used for traveling from Kwethluk to neighboring communities. During winter, when the Kuskokwim River had sufficient ice cover, travel by car or truck on the river ice was also common. When vehicle travel on the Kuskokwim River was safe, commercially operated "river taxis" also provided transportation between Kwethluk, Akiak, Akiachak, Bethel, Napaskiak, and Napakiak. Scheduled air-taxi service from Bethel-based operators was frequent. During the time of this study, there were at least three scheduled air-taxi operators serving Kwethluk six days per week. Round-trip fare on a scheduled flight from Bethel cost approximately \$40. Charter service from Bethel to Kwethluk cost approximately \$70. During winter, when the river taxis were operating, a one-way ride to Bethel cost \$10.

Population Characteristics

Kwethluk's population has steadily increased since 1939 (Fig. 3). Between 1939 and 1970, the population increased by an average of 30 percent every 10 years. Population growth slowed to just over 11 percent between 1970 and 1980. From 1980 to August 1986 the rate of growth had increased to 18 percent. In August 1986 the population was 540. Demographic characteristics of the 1986 population are illustrated in Figure 4. Based on a census conducted in August 1986 as part of this study, 90 percent of the population was less than 60 years old with 45 percent of the population younger than 20 years old.



SOURCES: 1860, Black 1984
 1880-1970, Oswalt 1980
 1980, Alaska Department of Labor 1987
 1986, this study

Fig. 3. Kwethluk population, 1860 through 1986.

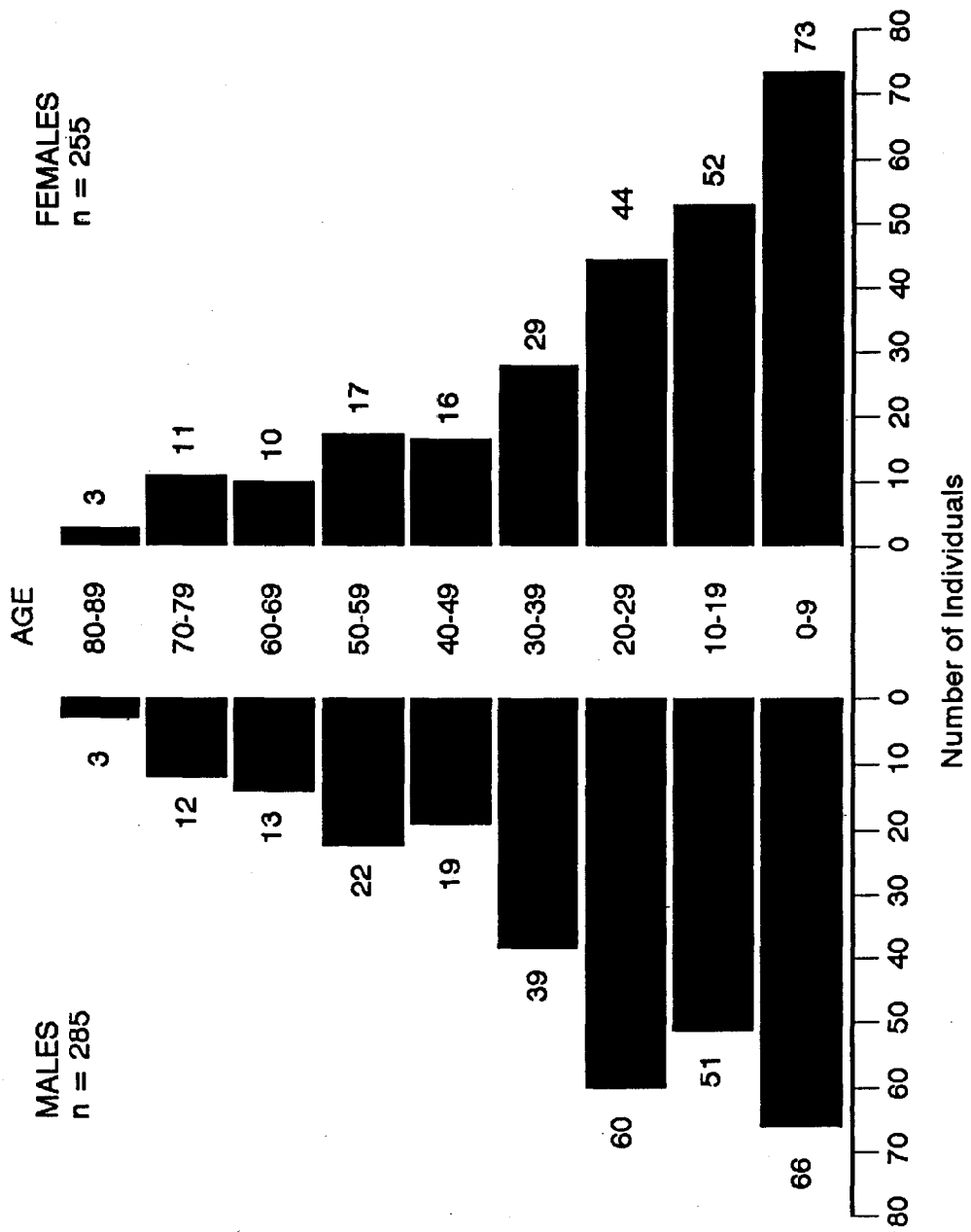


Fig. 4. Age and sex characteristics of the Kwethluk population, 1986 (N=540).

Job Opportunities and Wage Employment

From September 1985 through August 1986, households received income from commercial fishing, wage employment, sale of homemade crafts, Alaska Permanent Fund dividends, and transfer payments (Table 4). Employers included the Lower Kuskokwim School District (LKSD), City of Kwethluk, Kwethluk, Incorporated, Kwethluk Native Store, U.S. Postal Service, Yukon-Kuskokwim Health Corporation, State of Alaska Department of Transportation and Public Facilities, State of Alaska Department of Health and Social Services, and Alaska National Guard (Table 5). General labor and construction-related jobs were periodically available when special projects such as housing construction occurred. Members of some households earned income from babysitting and one individual was employed part time with the U.S. Fish and Wildlife Service, from April through August 1986, to collect household subsistence waterfowl harvest surveys. Four individuals were employed part time to serve as translators and to facilitate data collection for this study.

Wage employment was the major source of income to the community, providing approximately 45 percent of the overall income (Fig. 5). During this study there were 39 year-round jobs (longer than nine months) and 39 seasonal jobs (lasting nine months or less). The Lower Kuskokwim School District was the largest single employer and provided 36 jobs to the community. The City provided 13 jobs, state and federal sectors 12 jobs, Kwethluk Corporation 11 jobs, and the Kwethluk Native Store 6 jobs. The majority of the jobs provided by the City, Corporation, Kwethluk Native Store, and State and Federal sectors were year-round positions. In contrast, most of the jobs with the Lower Kuskokwim School District were seasonal in nature, lasting nine months.

Fifty-six percent of the available jobs were full-time (30 or more hours per week), however, 45 percent of the full-time jobs were seasonal. Less than one-half (44 percent) of the part-time jobs (less than 30 hours per week) were year round and the rest were seasonal.

Funding from state and federal agencies played a significant role in wage-earning opportunities in the community. Seventy-seven percent of the available jobs were government-funded. The Kwethluk Corporation and the Kwethluk Native Store provided the non-government-funded jobs.

TABLE 4. SOURCES OF INCOME TO KWETHLUK
HOUSEHOLDS, SEPTEMBER 1985 - AUGUST 1986
(n = 36)

Income sources	Percentage of households receiving income
Commercial fishing	61
Wage employment	54
Other	89
Social security	31
Longevity bonus	25
Village corporation dividends	3
National Guard	11
Aid for families with dependent children	28
Alaska Permanent Fund dividend	97
Energy assistance	44
Cottage crafts	22
Pensions	8
Supplemental social security	17
Veterans Administration disability	3
Commercial fishing only	8
Commercial fishing and wage employment	25
Commercial fishing and other	8
Commercial fishing, wage employment, and other	19
Wage employment only	3
Wage employment and other	19
Other income only	17

NOTE: Forty-four percent of the households sampled reported selling furs, however, no households reported receiving income from fur sales.

TABLE 5. SOURCES OF WAGE EMPLOYMENT IN KWETHLUK, 1986

Employer and position	Hours per week	Weeks per year	Pay rate
City of Kwethluk			
City Administrator	30	52	\$ 7.75/hr
City Clerk	30	52	\$ 6.00/hr
Water Operator	30	52	6.50/hr
Washateria Attendant	30	52	\$ 3.87/hr
Health Clerk	30	52	\$ 6.50/hr
Public Safety Officers (3)	25	52	\$ 8.00/hr
Recreation Director	24	52	\$ 6.75/hr
Librarian	24	52	\$ 5.75/hr
Janitor	24	52	\$ 6.00/hr
Sanitation Worker	24	52	\$6.50/hr
Alternate Health Aide	8	12	\$ 5.75/hr
Jail Guard	variable	(as needed)	\$ 3.87/hr
City Council Members (7)	1-2 meetings/month	\$15 /meeting	
Kwethluk Incorporated			
Business Manager	35	52	\$12.58/hr
Land Planner	35	52	\$11.00/hr
Accountant	35	52	\$11.50/hr
Bookkeeper	35	52	\$ 7.50/hr
Secretary	35	52	\$ 8.47/hr
Storekeeper	35	52	\$ 7.29/hr
Gas Attendant	35	52	\$ 5.25/hr
Generator Operator	20	52	\$11.61/hr
Janitor	20	52	\$ 5.25/hr
Taxi Drivers (2)	variable	approx. 20	commission
Laborers	variable	as needed	\$8 to \$10/hr
Kwethluk Native Store			
Manager	40	52	a
Assistant Manager	40	52	\$ 8.00/hr
other employees (4)	variable	52	variable
Lower Kuskokwim School District			
Certified Teachers (3)	37.5	36	variable ^b
Associate Teachers (3)	37.5	36	variable ^b
Teacher Aides (8)	30 to 37.5	36	\$15,000/yr a
Secretary	37.5	36	
Cooks (2)	30	36	\$15,000/yr
Custodians (2)	30	36	\$14.00/hr a
Maintenance Workers (2)	30	52	
Substitute Teachers (7)	variable	36	\$12.94/hr
Temporary Laborers (8)	variable	36	\$10.68/hr

TABLE 5. -- CONTINUED

Employer and position	Hours per week	Weeks per year	Pay rate
Other Federal/State/Private			
IRA Tribal Administrator	30	52	\$ 6.00/hr
U.S. Postal Clerk	40	52	a
Health Aides (2)	30	52	a
Airport Maintenance Worker	variable	52	a
National Guardsmen (3)	40	52	variable ^c
Health and Social Services Worker	variable	52	a
Construction Camp Cook	36	12	\$ 8.50/hr

^a Pay rate unknown.

^b Teacher salaries varied from \$31,000 to \$52,000 per year.

^c National Guard salaries ranged up to \$29,000 per year.

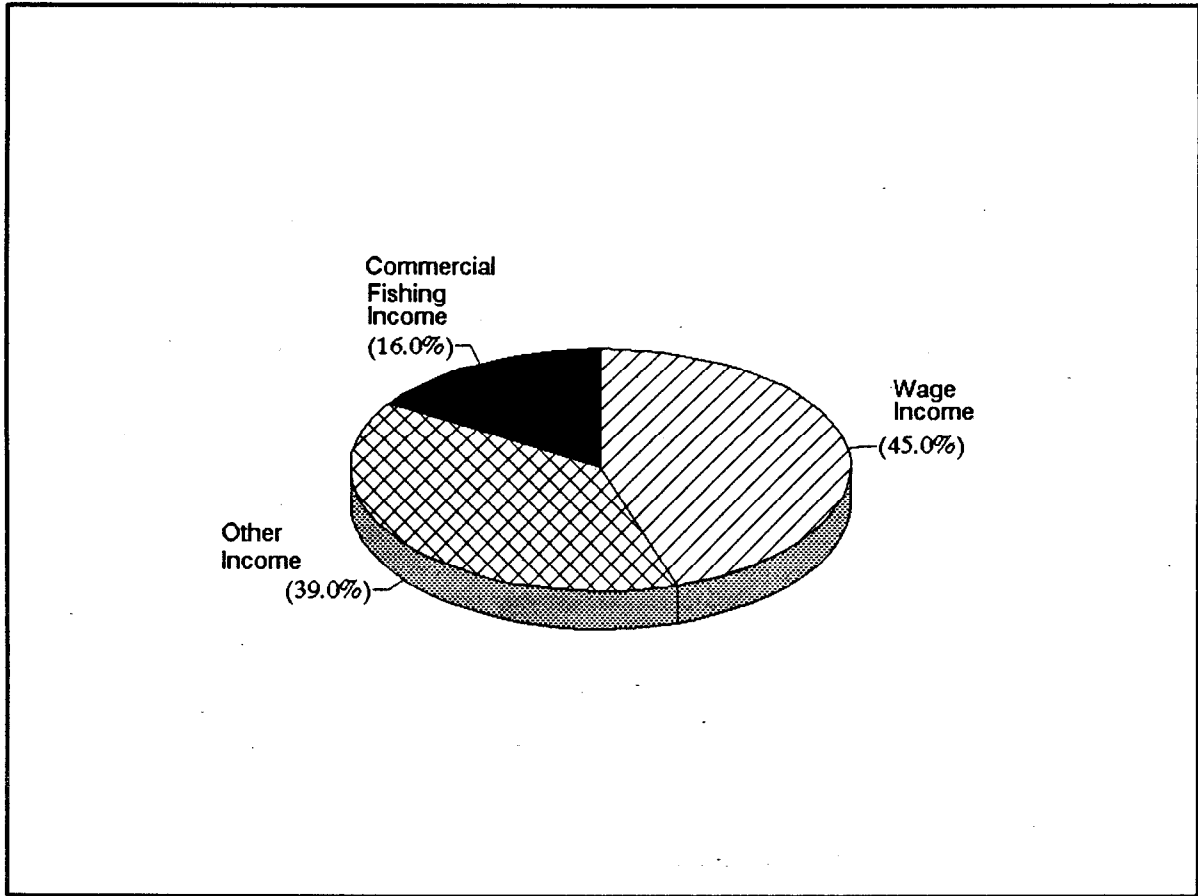


Fig. 5. Proportion of community income from wages, commercial fishing, and other sources, September 1985 - August 1986 (n=36).

There were marked drops in the percentage of households involved in wage-producing activities during June and July (Fig. 6). This drop was due to school district employees not being on contract for the summer months. Summer was also a time when many families were busy catching and processing subsistence salmon and involved with commercial salmon fishing activities. Many moved to their salmon fishing camp for the summer and were not involved in summer wage employment.

From September 1985 through August 1986, 25 percent of the households sampled were not involved in wage employment. Twenty-seven percent had members employed for a full 12-month period, and most (48 percent) had seasonal employment (Fig. 7). Fifty-four percent of the households had at least one member employed and several (21 percent) had either two or three individuals employed at some time during the study period (Fig. 8). Households involved in wage employment earned income from as many as four jobs during the year (Fig. 9). Most of the households receiving wage employment had only one job. Forty-four percent of the households earned less than \$2,500 from wages and about two-thirds (68 percent) had earnings less than \$12,500 (Fig. 10). The average wage income per household was \$9,747.

Commercial Fishing Income

Commercial fishing was another source of income for Kwethluk households and was a seasonal activity, generally occurring over a 10-week period beginning in mid-June and ending in late August or early September. During 1986, the Kuskokwim Area salmon fishery was the only commercial fishery for which Kwethluk residents held permits and licenses. Other than Bethel, residents of Kwethluk accounted for the largest number of Kuskokwim "limited entry" salmon permits of any Kuskokwim River community. In 1986 there were 68 Kuskokwim limited entry salmon permits held by community residents. Commercial fishing provided approximately 16 percent of the total community income (Fig. 5). Gross earnings to the community from commercial fishing during 1986 was \$395,205. Average gross income to the community from commercial fishing from 1980 through 1986 was \$286,273 (Table 6).

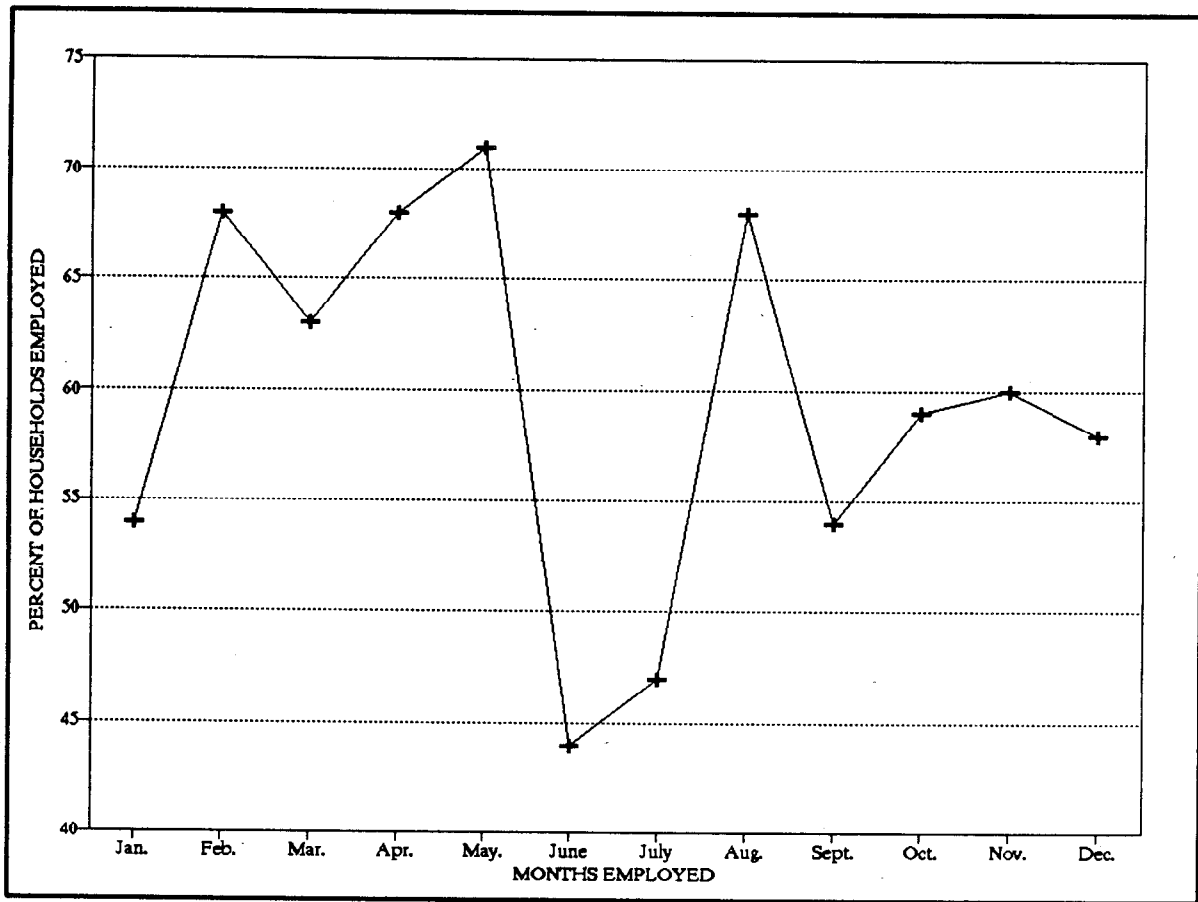


Fig. 6. Seasonality of wage employment for Kwethluk households, September 1985 - August 1986 (n=36).

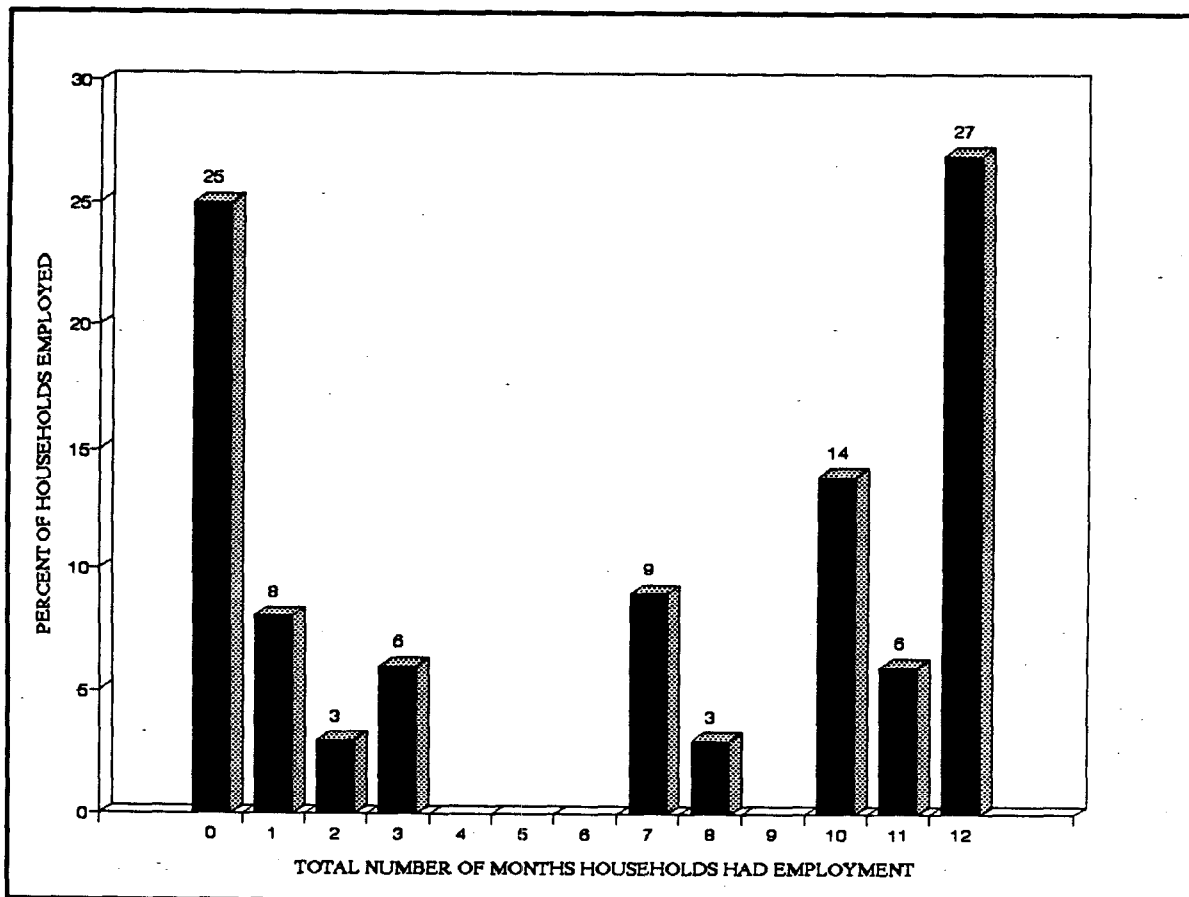


Fig. 7. Number of months of wage employment for Kwethluk household members, September 1985 - August 1986 (n=36).

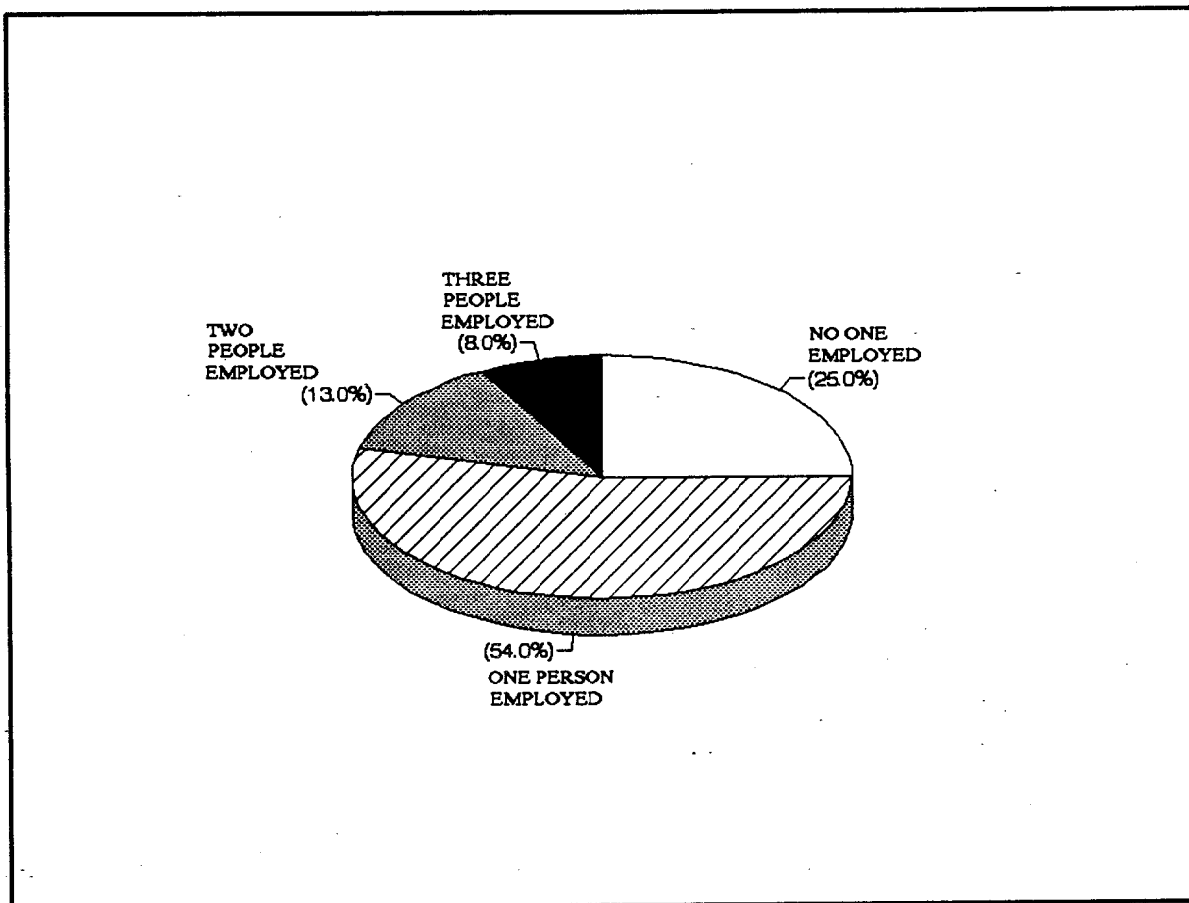


Fig. 8. Number of individuals employed in Kwethluk households, September 1985 - August 1986 (n=36).

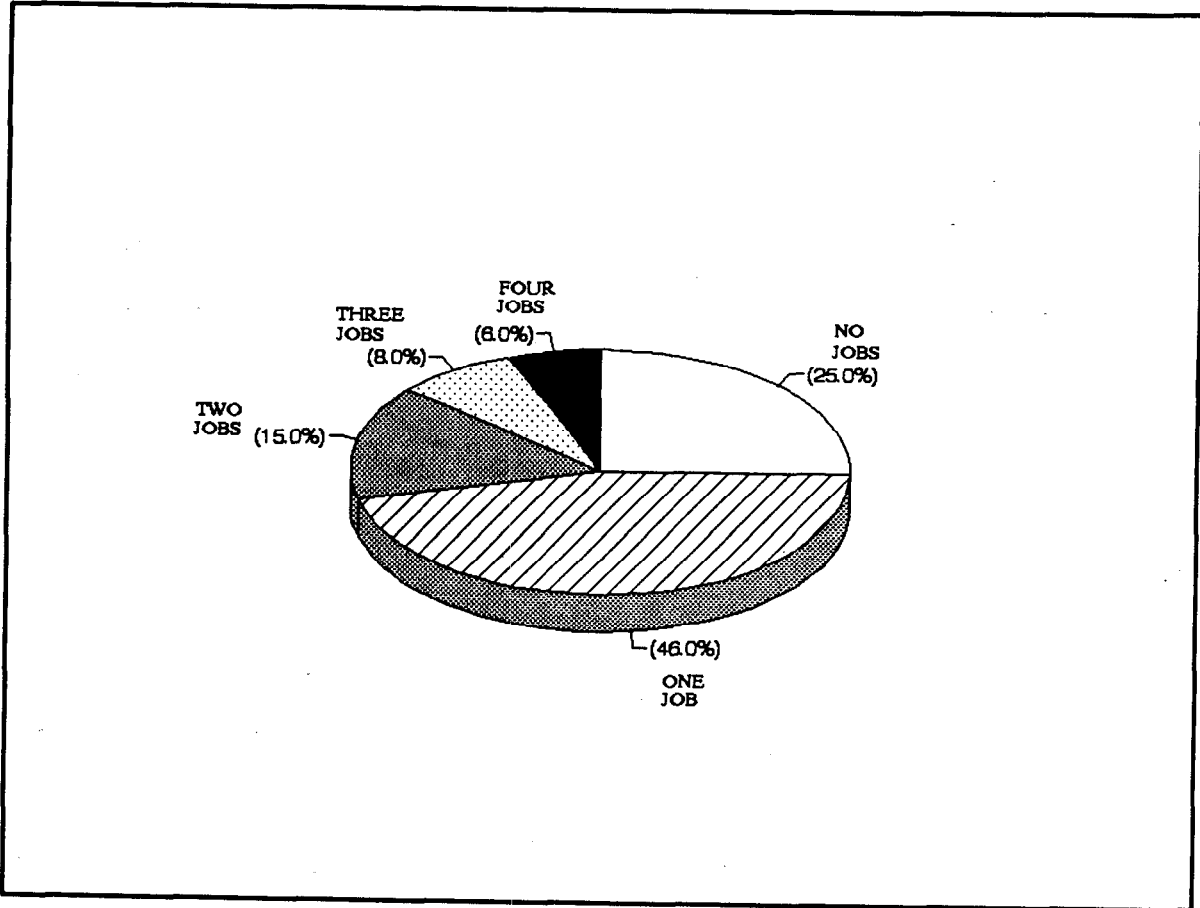


Fig. 9. Number of wage employment jobs held by Kwethluk households, September 1985 - August 1986 (n=36).

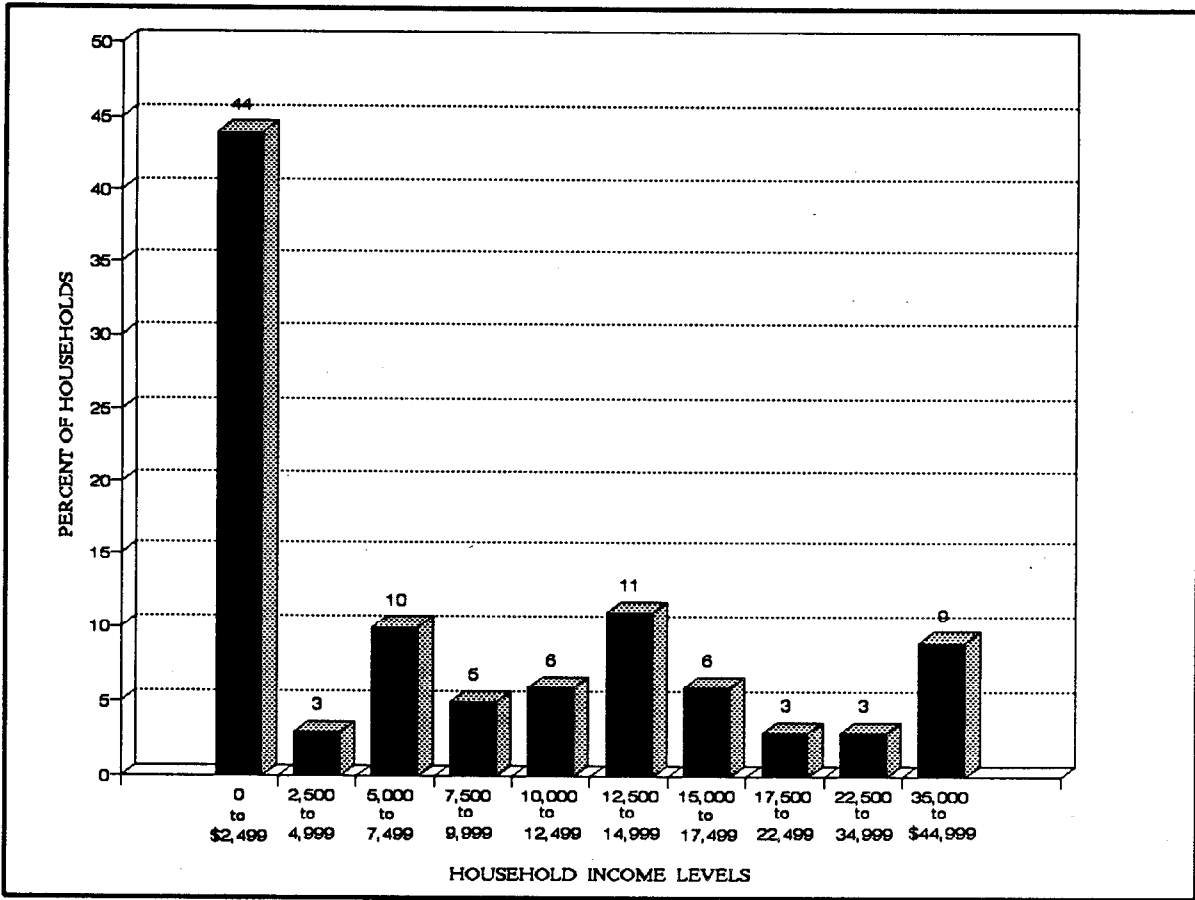


Fig. 10. Income received from wage employment by Kwethluk households, September 1985 - August 1986 (n=36).

**TABLE 6. NUMBER OF KWETHLUK "LIMITED ENTRY"
KUSKOKWIM SALMON PERMITS FISHED AND
ESTIMATED GROSS EARNINGS FROM
COMMERCIAL SALMON FISHING, 1975-1986**

Year	Number of permits fished ^a	Estimated ^D gross income	Average income per permit holder
1975	68	\$ 55,292	\$ 813
1976	71	\$ 91,922	\$ 1,294
1977	66	\$308,681	\$ 4,677
1978	66	\$188,669	\$ 2,858
1979	67	\$308,196	\$ 4,600
1980	69	\$200,718	\$ 2,909
1981	68	\$250,586	\$ 3,685
1982	60	\$323,960	\$ 5,399
1983	64	\$133,280	\$ 2,082
1984	63	\$429,235	\$ 6,813
1985	66	\$270,925	\$ 4,105
1986 ^c	67	\$402,661	\$ 6,010
<hr/>			
1980 to 1986 average	65	\$287,265	\$ 4,429

SOURCE: Commercial Fisheries Entry Commission census report for Kwethluk June 8, 1988.

^a Includes both permanent and interim use permits.

^b Includes income from sale of freshwater fish caught incidental to commercial salmon fishing activities.

^c Preliminary estimates from fish ticket data.

During the study period, 58 households (52 percent) had members with limited entry salmon permits for a community average of .61 permits per household. Not all households had permits. Fifty-four households had no permits, 49 had one, 8 had two, and 1 had three limited entry salmon permits. A few households not having a permit obtained commercial fishing income from household members working as crew members for commercial fishermen. The majority of the limited entry salmon permits were held by men, however, three of the permits were held by women, two of which lived in the same household.

For the 58 households having at least one member with a limited entry permit, the average household income earned by commercial fishing in 1986 was \$6,814. Most of these households (65 percent) earned between \$2,501 and \$7,500 (Fig. 11). Approximately 29 percent of the households with commercial fishing permits earned more than \$7,500. Of the nine households earning more than \$10,000 from commercial fishing during 1986, six were households having more than one permit holder. Income to individually permitted fishermen ranged from \$840 to \$14,520 with an average income per fisherman of \$5,899 (Alaska Department of Fish and Game 1987a). Commercial fishing income for most households was supplementary to income from other sources. Fifty-two percent of the households with commercial fishing income also derived income from other sources. Only eight percent of households reported income from commercial fishing as their sole source of income, compared with three percent of households reporting income only from wage employment (Table 4).

Other Income Sources

Other sources of income included money earned by making and selling homemade crafts, National Guard duty, transfer payments, Alaska Permanent Fund dividends, and trapping. Transfer payments received from federal and state programs such as social security, supplemental social security, aid for dependent children (AFDC), adult public assistance (APA), pensions, Veteran's Administration disability benefits, longevity bonus, and energy assistance comprised a significant portion of the revenue coming into the community. Sixty-two percent of the 36 households sampled received money from one

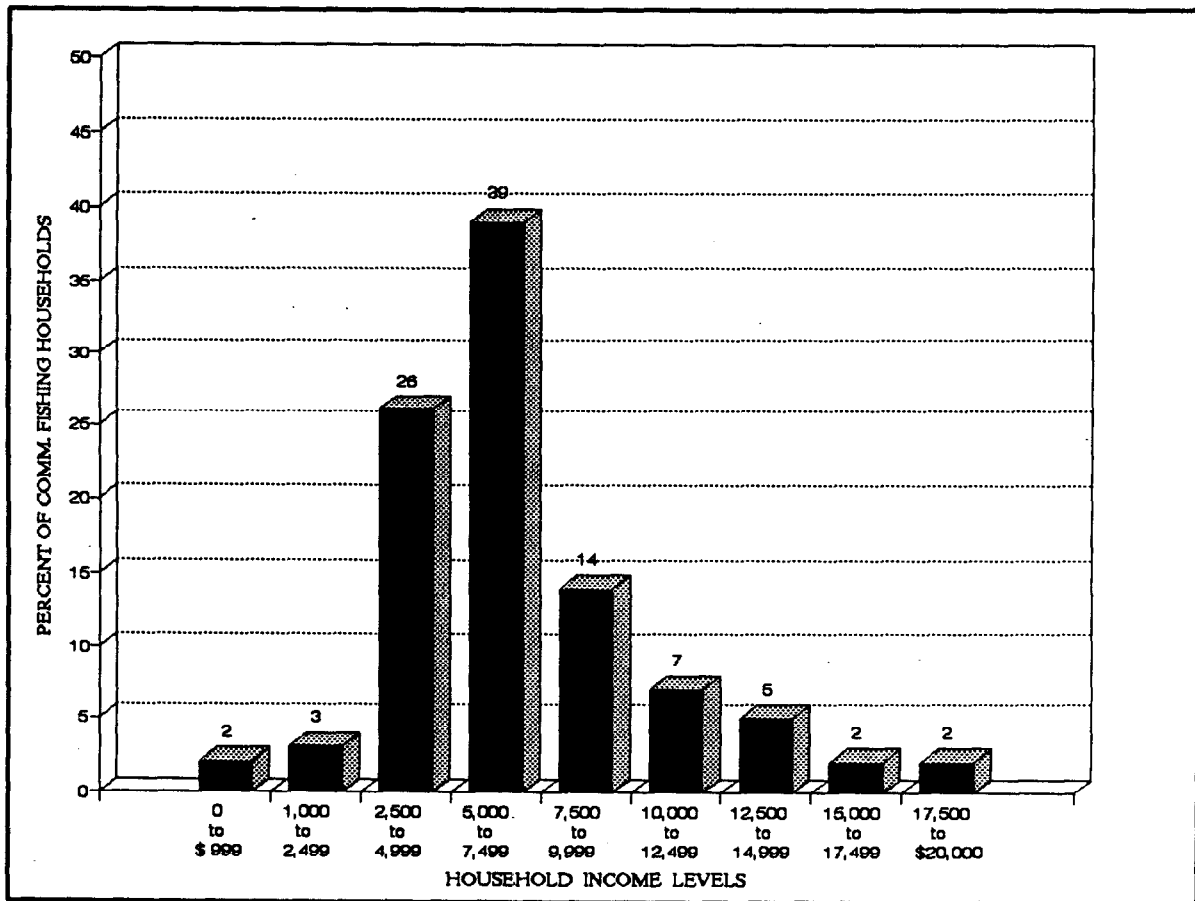


Fig. 11. Commercial fishing income received by Kwethluk households during 1986 (n=58).

or more of the above state or federal programs and 25 percent of the households sampled derived more than half of their income from these programs (excluding energy assistance). Members of all (97 percent) of the households received State of Alaska Permanent Fund dividends in 1985. Alaska Permanent Fund dividend income contributed as much as 32 percent of a household's total annual income. Sixteen percent of the households reported selling furs during the study period, however, none reported receiving income from fur sales. Based on the average price per pelt and the estimated number of furs sold from September 1985 through August 1986, the total community gross income derived from the sale of furs during the study period is estimated to be \$5,219. Household income derived sources other than wage employment and commercial fishing ranged from \$404 to \$32,983 and averaged \$7,531.

Household incomes in Kwethluk ranged from \$1,200 to \$53,000 the year of the study. One-quarter of the households had total annual income of less than \$10,000 and 58 percent of the households had total annual income levels of less than \$17,500 (Fig. 12). Households in the higher income ranges earned a large portion of their total income from wage employment. Households in the lower income ranges derived the most of their income from commercial fishing. During this study, the median income of Kwethluk households was \$16,624, compared with \$10,417 in 1980. This represents a 60 percent increase before it is adjusted for inflation. In 1980 the median household income for Kwethluk was 29 percent less than the median household income for the Lower Kuskokwim Census subarea (\$14,638), but comparable to other lower Kuskokwim River communities, excluding Bethel (United States Department of Commerce 1982).

Cost of Living

Surveys conducted periodically by the University of Alaska Cooperative Extension Service show that the cost of food in western Alaska is among the highest in the state. During March 1987, the cost of feeding a family of four in Bethel was 1.6 times greater than that of Anchorage (Stetson 1987). An identical survey conducted by this researcher in March 1987, using the Cooperative Extension Service

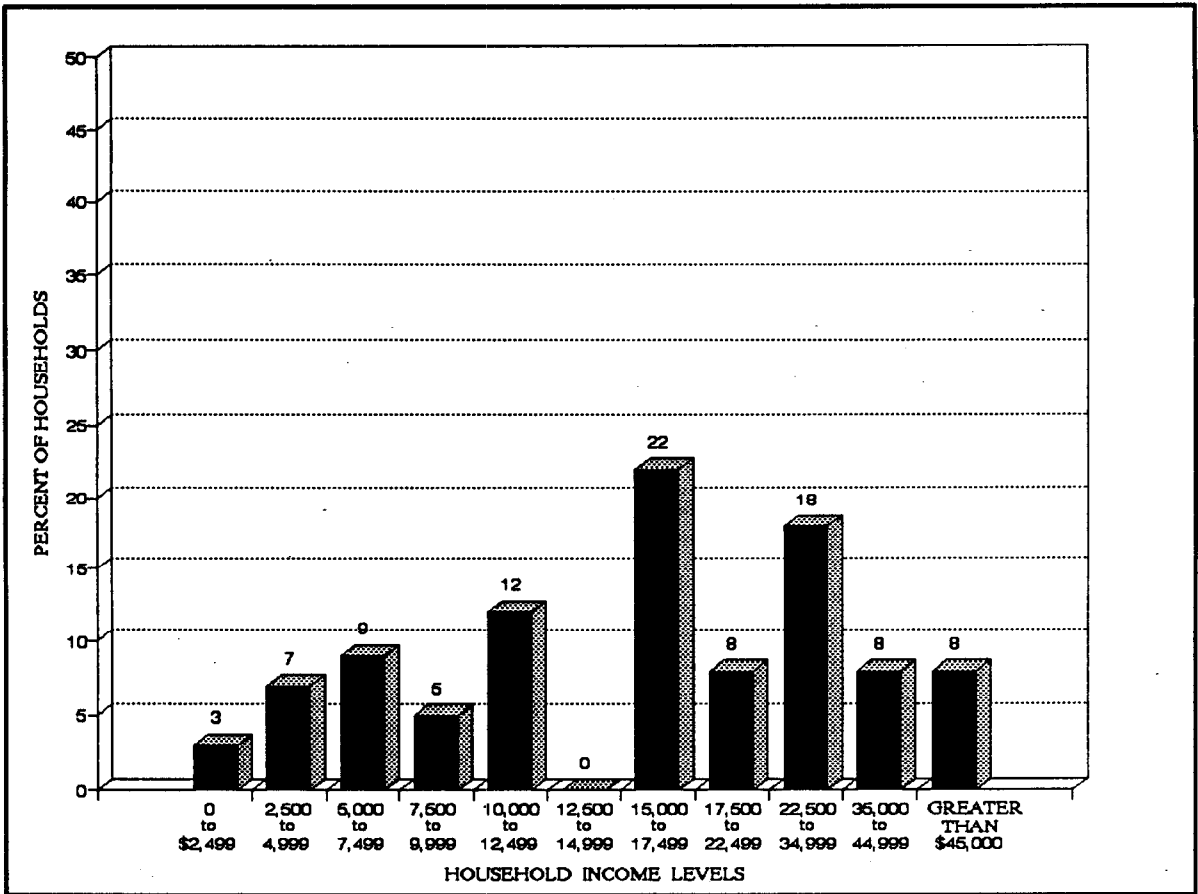


Fig. 12. Total income for Kwethluk households, September 1985 - August 1986 (n=36).

survey form, showed that food costs in Kwethluk were 1.91 times greater than Anchorage and over twice the U.S average (Table 7). Thus, dollars spent in Kwethluk have about one-half of the buying power for food as they do in Anchorage. Non-food essentials are also more expensive. For example, in March 1987, 1000 kilowatts of electricity cost an average of \$62.40 in Anchorage. The same amount of electricity in Kwethluk, after the state's power cost equalization was deducted, cost \$314.60, over 400 percent more than that of Anchorage.

TABLE 7. COST OF SELECTED FOOD ITEMS IN KWETHLUK NATIVE STORE,
MARCH 1987

Item	Cost	Size of package	Item	Cost	Size of package
White potatoes	\$5.75	10 lb.	Soup, chicken noodle	\$.99	10.75 oz.
Dehydrated potatoes	2.55	15.75 oz.	Macaroni and cheese	1.09	7.25 oz.
Cabbage	.85	1 lb.	Dry milk	8.75	4 lb.
Carrots	.99	1 lb.	American cheese	3.49	12 oz.
Celery	3.09	bunch	Ice cream	4.35	.5gal.
Cucumbers	1.19	1 lb.	Sirloin steak	6.59	1 lb.
Lettuce	1.29	1 lb.	Rump roast	5.59	1 lb.
Onions	1.65	1 lb.	Ground beef	2.99	1 lb.
Tomatoes	2.40	1 lb.	Pork chops	4.39	1 lb.
Corn, canned	1.03	17 oz.	Pork spareribs	3.69	1 lb.
Grn.Beans, canned	1.25	16 oz.	Ham, cured, boneless	54.67	12 lb.
Spinach, canned	1.25	16 oz.	Bacon	6.37	2 lb.
Peas, canned	.89	16 oz.	Frankfurters	6.47	2 lb.
Tomatoes, canned	2.13	28 oz.	Bologna	1.95	12 oz.
Beets, canned	1.09	16 oz.	Chicken, whole	7.39	40 oz.
Tomato juice	3.05	46 fl. oz.	Tuna, canned	1.73	6.5 oz.
Potato chips	3.79	10 oz.	Chili, canned	3.19	30 oz.
Catsup	1.59	14 oz.	Eggs, large	1.47	1d oz.
Pickles, dill	3.47	46 oz.	Beans, dry pinto	2.27	32 oz.
Apples	1.59	1 lb.	Beans, canned kidney	1.05	15.5 oz.
Bananas	1.25	1 lb.	Peas, dry split	1.09	16 oz.
Grapefruit	.95	1 lb.	Nuts, shelled	3.59	12 oz.
Oranges	1.09	1 lb.	Peanut butter	5.73	28 oz.
Applesauce, canned	2.65	35 oz.	Butter	3.13	1 lb.
Fruit cocktail	2.33	30 oz.	Margarine	1.97	1 lb.
Peaches, canned	2.39	29 oz.	Shortening	4.19	48 oz.
Pears, canned	2.19	29 oz.	Vegetable oil	3.59	38 oz.
Apple juice	2.63	46 fl. oz.	Sugar, granulated	7.63	10 lb.
Grape juice	2.47	24 fl. oz.	Sugar, brown	1.29	1 lb.
Grapefruit juice	2.99	46 fl. oz.	Syrup, pancake	4.65	24 fl. oz.
Orange juice	3.37	46 fl. oz.	Jelly, grape	3.23	32 oz.
Cornflakes	3.33	18 oz.	Candy, bulk	2.73	1 lb.
Oatmeal	2.25	18 oz.	Soda pop	.79	12 oz.
Flour, enriched	15.49	25 lb.	Tang	5.85	26.4 oz.
Cornmeal	2.93	40 oz.	Coffee, ground	9.25	2 lb.
Rice	6.73	10 lb.	Coffee, instant	6.77	8 oz.
Spaghetti, dry	4.33	40 oz.	Tea bags	7.55	1 lb.
Biscuit mix	4.63	60 oz.			
Cake mix, yellow	2.35	18.25 oz.	Sales tax on food: 1 percent.		
White bread	2.05	22.5 oz.	Electricity: \$.44 per kilowatt-hour (KWH),		
Hamburger buns	1.95	12 oz.	1,000 KWH = \$314.60. (State of Alaska		
Crackers, saltines	2.43	16 oz.	Power Cost Equalization paid \$.1672 per		
Cookies, van. wafers	2.67	11 oz.	KWH of the first 750 KWH).		
Cake, frozen	4.09	10.75 oz.	Heating oil: 55 gal. = \$89.44.		
Pie, frozen	6.03	26 oz.	Gasoline: 55 gal. = \$103.40.		
			Lumber: 2in. x 4in. x 8ft. = \$3.35.		

CHAPTER 5.

CONTEMPORARY RESOURCE USE

SEASONAL ROUND OF SUBSISTENCE ACTIVITIES

Timing of subsistence harvest activities in Kwethluk are a function of several things, many of the same kinds of things that affect everyone's lives. Seasonal weather conditions, such as an "early" spring, or a "late" fall, the amount of snow, a mid-winter thaw; employment obligations or opportunities, city council and school board meetings, the beginning of school in late summer, the ending of school each spring; broken equipment, sickness, accidents, and doctor appointments; holidays, births, and deaths all influence individual and household subsistence activities. There are reoccurring events of Nature such as breakup and freeze-up that affect harvest opportunities. Many of the resources harvested for subsistence are annual or seasonal migrants to the area and are available only during brief periods of the year (Fig. 13). There are also state and federal regulations restricting harvest opportunities to specific times of the year.

Soon after breakup, and usually in late May, smelt ascend the Kuskokwim River. News of the approaching smelt run, which begins downriver and progresses upstream, makes its way ahead of the advancing fish. Reports of where the fish are on a particular day echo through the network of CB and VHF radios at salmon fishing communities and camps along the river. When these fish are expected to be in the area, people use long-handled, fine-meshed dip nets to sweep the Kuskokwim River from riverbanks and drifting boats. Some smelt are boiled and eaten fresh. Smelt are also threaded through the mouth and gills with freshly cut willow sticks and then dried and smoked. The smelt are then placed into bags or kept in the smokehouse for later use. When in the proper location, individuals may harvest several hundred smelt in a matter of minutes. The smelt run is sporadic and short lived, lasting in any one location for maybe a couple of days or perhaps only several hours.

Salmon fishing is the predominant summertime activity and many families move from Kwethluk to their salmon fishing camps, situated along the Kuskokwim, Kwethluk, and Akulikutak rivers,

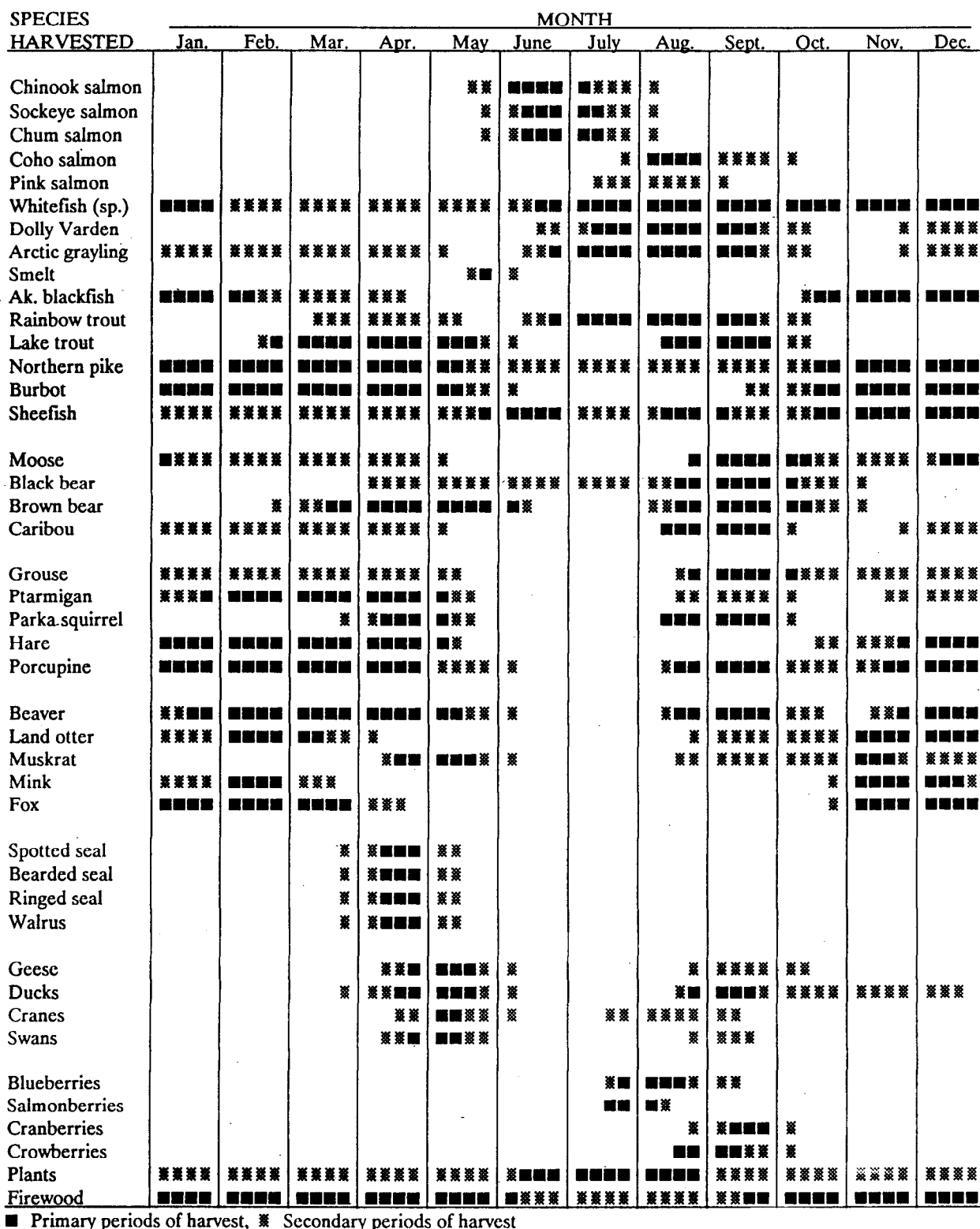


Fig. 13. Seasonal round of harvest effort for Kwethluk, circa 1980s.

during late May or early June soon after their children are out of school. Others take their time getting ready for the intensive subsistence harvesting season to follow. People are repairing and painting wooden skiffs, working on outboard motors, mending nets, and preparing facilities at fish camp. Cabins, smokehouses, wooden tables used when cutting salmon, salmon drying racks, and steam bath houses (*maqivit*) are cleaned and repaired. Some families who do not have a summer cabin at their camp put up canvas wall tents. Firewood is gathered for heating the cabin and steam bath houses. Wood needed for smoking the fish is gathered. Families having dogteams often take them to fish camp where they are kept during summer. Occasionally, families relocate their salmon fishing camps during this time of year because of eroding riverbanks and high water, to improve the logistics of getting to and from their camp, and because of the desire to be near other families for company or mutual assistance with the work involved when processing salmon. A few families maintain their salmon fishing camps along the outskirts of the community within walking distance of their house. Others have their camp several miles away. In 1986 the majority of Kwethluk camps were located within an eight-mile radius of the community. Camp sites often include the facilities of a single household such as a summer cabin, drying racks for the fish, a smokehouse, and sometimes a building for taking steam baths. Other camps have the facilities of as many as six families.

Rain, wind, and sunshine, are major factors affecting salmon harvesting and preservation. June and July are typically the driest months of summer and the best time for drying and smoking salmon. People are especially dedicated to taking advantage of these conditions for catching, processing, and preserving salmon. Getting started too late harvesting, drying and smoking salmon sometimes results in loss of some of the harvest because it does not dry properly or it becomes infested with flies and their maggots. By mid-June, the majority of the salmon fishing camps are in operation and the red-orange flesh of drying salmon, visible at many fishing camps, are evidence that fishing and processing activities are well underway.

Set gill nets are usually the first type of gear put to use each summer for catching salmon. The first set nets are placed at strategic locations in the Kuskokwim River, the Kwethluk River, or Kuskokuak Slough by late May. Sheefish are also often caught in these nets. As the number of salmon caught by

set each day increases, some fishermen remove or relocate their set nets and begin fishing with drift gill nets. Some families set a net and continue fishing with it throughout summer. This is especially true of families having fish camps within the Kwethluk River and a tributary, the Akulikutak River.

Subsistence salmon fishing activities are intense during June and early July, when chinook salmon are available. In 1986, the majority of the chinook harvest occurred between June 8 and June 26. Much of the sockeye and chum salmon harvest occurs during the last part of June and early July, however, subsistence salmon fishing continues throughout August.

Commercial salmon fishing near Kwethluk usually began by the last week in June and continued with five or six commercial fishing periods through mid-July. Prior to 1988 there was usually a 10-to 14-day interval during late July when no commercial fishing occurred until coho salmon were of sufficient abundance to warrant another opening. The first coho salmon commercial fishing period marked the beginning of the coho season during which there are numerous regularly scheduled six-hour periods of commercial fishing. During 1988 and 1989 this pattern changed and commercial fishing occurred periodically throughout July, without the usual 10-to 14-day respite.

In late June, green leafy plants such as wild rhubarb, wild spinach, and sourdock are harvested. During June and July, people take trips up the Kwethluk, Akulikutak, and Kisaralik rivers to harvest grayling, rainbow trout, Dolly Varden, and pike, using rod-and-reel gear. Salmon are also harvested this way. Short gill nets are set for whitefish in small channels and sloughs adjacent to the Kwethluk River, often in close proximity to a fish camp or lake. These nets sometimes catch pike, grayling, and trout. In mid-July, people begin to travel to berry picking areas to harvest salmonberries and blueberries. Some families travel downriver by boat 50 miles or more to harvest salmonberries and other families fly in aircraft to coastal communities, where salmonberries are later in maturing.

Early August traditionally marks the return of the coho salmon. The flesh of these salmon is considered to closely resemble that of chinook salmon. Families, especially those who did not get an adequate supply of chinook for smoking, may direct additional effort to catching and processing coho if more salmon are needed after the chinook, sockeye, and chum salmon runs have passed. Weather conditions during August are characteristically rainy and stormy making proper drying and smoking of

salmon difficult. As a result, most families do not attempt to dry and smoke coho salmon to the same degree they do other salmon, however, some families are successful in their attempts. Most families harvest coho salmon and usually preserve them by freezing or canning. Coho salmon are also harvested for dog food and are buried whole in underground storage pits where they preserve well until needed. Whitefish and sheefish are harvested in August. Some are taken incidentally while commercial salmon fishing. In mid-August, families that were at fish camp move back to Kwethluk so that their children can attend school. From the time school has started, in late August, and when freeze-up occurs, in mid-October, individuals travel back and forth between fish camp and home on a daily or weekly basis to retrieve some smoked fish, put away equipment and fishing gear, pick up items needed for one of the remaining commercial fishing periods, feed the dog team left at the fish camp, or close up the camp for winter.

In late August, hunters begin traveling by boat to moose hunting areas up the Kwethluk, Gweck, Kisaralik, and Kuskokwim rivers. Hunters travel up the Kuskokwim River as far as McGrath and hunt along a variety of tributaries between McGrath and Kwethluk. Depending on the distance they travel and whether or not they are successful, some hunters do not return to Kwethluk until the first of October. Other hunters make several trips in attempts to harvest moose. Many other resources are also harvested on these trips including black and brown bear, beaver, muskrat, otter, ruffed and spruce grouse, ducks, cranes, geese, salmon, several species of freshwater fish, berries, and wood. Much of the fish and game such as grouse, ducks, beaver, muskrat, and otter, are harvested for camp food while in the field. Hunters, especially ones who are unsuccessful in getting moose, sometimes gather logs or driftwood which are tied together and floated back downriver to Kwethluk for use as firewood.

Family groups also use aircraft to fly to camps in the mountains during mid- to late August where they harvest parka squirrel, caribou, brown bear, beaver, porcupine, moose, lake and rainbow trout, Dolly Varden, and grayling. Cranberries and crowberries are harvested during September. Late September and early October are busy times for gathering firewood needed to heat homes during winter. Fishing for whitefish, burbot, and sheefish continues throughout fall. Blackfish traps are set out at strategic locations in small sloughs near lake outlets beginning in October. Following freeze-up

in late October or early November, gill nets set under the ice catch whitefish, burbot, and pike. Salmon are sometimes harvested incidentally during this time. Hooking through the ice for burbot, pike, and sheefish begins in the tributaries and the Kuskokwim River as soon as the ice is of sufficient thickness to permit safe travel.

Trapping for furbearers begins in early November. Adequate ice and snow cover limits trapper mobility during this time of the year. Beaver, fox, otter, and mink are harvested at this time; muskrats are occasionally taken. Some of the furs are sold while others are used locally by people making hats, boots, mittens, and crafts for use by family members, to be given away as gifts, or to be sold. Most of the furbearers (except red fox) also provide valuable fresh red meat to the household diet. Wood gathering continues throughout winter and the harvest of small game such as hare and porcupine often occurs during wood gathering trips. Labrador tea is harvested, as needed, during anytime of the year.

During mid-December through mid-January, families are busy preparing for holiday festivities. Christmas is celebrated during December 25, the traditional Protestant holiday, and again beginning January 7, the Russian Orthodox holiday locally referred to as "Slavic." During each of these Protestant and Russian Orthodox holidays there is much sharing of wild game and fish throughout the community. During "Slavic" especially, many households prepare food that is shared with many people who visit house to house and help celebrate the holiday and share in the food prepared specifically for the occasion. Groups of 50 to 100 people, sometimes more, including relatives and friends from neighboring communities, go from house to house until all of the participating households have been visited. This feasting continues for several days, as each household shares food and gifts with crowds of people who go house to house, singing songs and sharing fellowship in celebration of Christmas. As one might expect, vast quantities of wild game, fish and berries are prepared and consumed at this time. Hunters sometimes try to harvest moose or caribou during December, so that the household has ample meat on hand for these holiday feasts.

Beginning in mid-January, after "Slavic" and as the amount of available daylight increases, people gradually spend more time out hooking for pike and burbot, hunting and snaring hare, looking for small game and furbearers, and resetting their traps and snares for beaver and fox. During early

February, hunters on snowmachines travel north and west to the Yukon River in search of moose. Hunters also travel north and east to the mountains and beyond, looking for moose, caribou, furbearers, and small game. Brown bear are occasionally harvested during this time. During Lent, (mid-February through mid-April) some individuals abstain from eating red meat. During this time freshwater fish and dried or smoked salmon are the main source of protein for some families.

The period from mid-February to mid-April is normally marked by clear blue skies and moderately cool temperatures. Travel conditions on the tributaries near the Kuskokwim River are normally good and a favorite activity is to go hooking for freshwater fish. Pike, the usual catch at this time of year, are cut and hung outside near the house or above a family's cache to dry.

As early as late March or early April, a few families in airplanes fly to traditional camps in the mountains, near the headwaters of the Kwethluk, Kisaralik, Aniak, and Nushagak rivers. There they fish, hunt, and trap for a few weeks, harvesting lake trout, Dolly Varden, grayling, brown bear, caribou, moose, beaver, otter, muskrat, ptarmigan, porcupine, and parka squirrel. Individuals, men and women, from several different households usually make this trip. Men hunt the surrounding countryside on foot, looking for caribou, brown bear, moose and furbearers, while women concentrate on harvesting parka squirrels and small game. Meat from the harvest is dried into jerky and some of it is prepared and eaten in camp. People often remain in the field for a few weeks, returning to Kwethluk as breakup proceeds. Boats like those made by previous generations of Kwethluk hunters described earlier, are made from materials gathered from the land. A boat frame, consisting of planks and ribs made of balsam poplar, is covered with untanned hides of brown bear, caribou, or moose, often sewn together in combination (Coffing 1988). These boats are used to transport the people, camping gear, dried meat, and other items obtained from subsistence hunting, fishing, and gathering activities, back to Kwethluk by floating down the Kwethluk River. One of these boats, built in 1987, measured approximately 14 feet long, 8 feet wide, and was 20 inches deep amidship.

During April, some individuals fly to Eek, Kwigillingok, or Kipnuk where, with their relatives, they hunt seal and walrus. Most of the harvest effort is for seal, however, walrus are taken if an opportunity occurs. Boats, carried on sleds pulled by snowmachines, are transported from one of the coastal

communities to the edge of the shore-fast ice, where they are launched. Also during April, Kwethluk hunters make day trips throughout the lowlands surrounding the community in search of hare and also ptarmigan which have moved from the upland areas near the foothills to the lowland willow scrub areas.

Mid-April is a time when waterfowl begin arriving. This is also a time when caches of dried fish and smoked salmon that was prepared the previous summer are often depleted or running low. The return of the waterfowl, the first spring migrant to return to the area, is evidence that a new season has begun and a reminder that soon it will be time to go to summer fish camp and to pick berries. Shortly after Lent, waterfowl hunting is often in full swing. Men and boys take advantage of the late evening daylight and go hunting for ducks, geese, and swans. Hunters return to their favorite hunting places along the tributaries, lakes, and marshes south and east of the community. Hunters travel by snowmachine, on foot, and by three-wheelers or four-wheelers. Men sometimes pull small aluminum boats 12 to 16 feet long up the frozen Kwethluk River, using snowmachines or all-terrain vehicles, to areas where there are open channels and enough water to use them. As the Kwethluk River melts, narrow channels of open water appear along its edge, permitting hunters in small boats with outboard motors to travel to spring camps and hunting areas along the Kwethluk and Akulikutak rivers. During spring breakup, much of the surrounding lowland floods and becomes accessible by small boats. This is an especially good time for muskrat hunting.

May is an extremely busy month in Kwethluk. During early May, while the Kuskokwim River is covered with rotting ice and unsafe for travel, people are busy preparing for the upcoming salmon fishing season. Boats are repaired and repainted, groups of men help one another move their boats from the riverbank, where they were stored for winter, and into the river. Outboard motors and gill nets are repaired for the busy season to come. When school is finally out for summer and the Kuskokwim River is free of ice, families again prepare for fish camp.

HOUSEHOLD PARTICIPATION IN RESOURCE HARVEST ACTIVITIES

Household participation in specific resource harvesting activities varied greatly (Table 8). The resource categories having the greatest level of household participation included berries and plants, non-salmon fish, small game, waterfowl, and salmon (Fig. 14). Small game, waterfowl, and salmon received about the same level of participation. The resource category harvested by the smallest percentage of households was marine mammals. More than 50 percent of the households harvested from seven resource categories.

Individual households extended their harvest effort across a range of resources. Approximately one-third of the households (29 percent) each tried to harvest from seven of the eight major resource categories (Fig. 15). A few households (9 percent) were active harvesting from all of the eight categories and some households (7 percent) harvested from a single resource group. Households active in a wide variety of categories (5 or more) were often comprised of a married couple between the ages of 35 and 50 which had children 18 years of age or older in the household with them. Households harvesting from only one or two resource groups were usually comprised of single individuals or elderly couples living alone. Households harvesting from a single resource group targeted plants and berries, salmon, big game, and furbearers. In a few instances households harvested from only a couple of the resource categories because the household head was ill or because the household head was a single parent who worked a full-time job. Regardless of the number resource categories harvested, sharing of resources, as discussed later, was very common.

RESOURCE USE AREAS

Kwethluk residents utilize an extensive area for resource harvesting activities. This area extends from the communities of Kipnuk and Quinhagak situated along Kuskokwim Bay, north to McGrath along the upper Kuskokwim River, and from near Paimiute, along the Yukon River west of Kwethluk, east to the Nushagak River located north of Dillingham (Fig. 16). The core use area lays

TABLE 8. ESTIMATED QUANTITIES OF RESOURCES HARVESTED, HOUSEHOLD PARTICIPATION RATES IN HARVEST, SHARING, AND RECEIVING OF WILDLIFE RESOURCES BY KWETHLUK RESIDENTS, 1985-86

Resource	Percent of households attempting to harvest	Percent of households successful	Percent of households giving	Percent of households receiving	Total number harvested	Total pounds harvested	Average household harvest (lbs.)	Per capita harvest (lbs.)
<u>Salmon</u>								
Chinook	70	70	a	a	5,824	99,008	884	193
Sockeye	66	66	a	a	5,423	39,045	349	76
Chum	66	66	a	a	9,738	66,218	591	129
Coho	50	50	a	a	3,545	22,688	203	44
Pink	21	21	a	a	619	2,104	19	4
<u>Freshwater Fish</u>								
Whitefish	47	47	32	56	9,946	29,839	266	58
Dolly Varden	29	29	20	3	608	912	8	2
Grayling	42	42	20	3	1,043	1,564	14	3
Smelt	33	33	20	30	24,899	1,711	15	3
Blackfish	18	18	11	37	56,736	14,184	127	28
Rainbow trout	29	29	20	6	545	1,090	10	2
Lake trout	5	5	3	3	249	498	4	1
Pike	76	76	39	27	9,042	40,693	363	79
Burbot	80	80	48	41	7,496	33,735	301	66
Sheefish	37	37	14	20	2,119	13,775	123	27
<u>Big Game</u>								
Moose	63	29	29	63	32	26,000	232	51
Black bear	15	3	3	37	3	23,258	208	45
Brown bear	17	8	8	25	9	566	5	1
Caribou	5	2	0	28	2	1,847	16	4
						328	3	1

TABLE 8. -- CONTINUED

Resource	Percent of households attempting to harvest	Percent of households successful	Percent of households giving	Percent of households receiving	Total number harvested	Total pounds harvested	Average household harvest (lbs.)	Per capita harvest (lbs.)
<u>Small Game</u>								
Grouse	14	14	3	3	144	144	1	<1
Ptarmigan	55	48	34	25	3,711	3,711	33	7
Parka squirrel	8	8	3	11	421	315	3	1
Hare	37	30	26	14	491	1,229	11	2
Porcupine	60	53	30	16	249	996	9	2
<u>Furbearers</u>								
Beaver	49	49	31	50	715	8,085 ^b	72 ^b	11 ^c
Fox	22	22	2	0	265	222 ^b	2 ^b	<1
Otter	14	14	3	5	96	245	2	<1
Muskrat	26	22	6	11	327	234	19	<1
Mink	9	9	9	0	117			
<u>Marine Mammals</u>								
Spotted seal	9	9	9	d	22	1,274	11	2
Bearded seal	6	6	6	d	9	1,365	12	3
Ringed seal	3	3	3	d	6	409	4	1
Walrus	3	0	0	11	0	0	0	0
Seal oil	12	12	12	63	149 ^e	1,046	9	2
<u>Waterfowl</u>								
Geese	47	36	23	33	302	1,514	13	3
Ducks	72	69	37	61	2,152	3,228	29	6
Cranes	27	17	9	9	31	314	3	1
Swans	47	35	9	31	163	1,635	15	3

TABLE 8. -- CONTINUED

Resource	Percent of households attempting to harvest	Percent of households successful	Percent of households giving	Percent of households receiving	Total number harvested	Total pounds harvested	Average household harvest (lbs.)	Per capita harvest (lbs.)
<u>Berries</u>						13,234	118	24
Blueberries	49	49	14	20	392 ^e	2,352	21	4
Salmonberries	66	66	20	32	962 ^e	6,734	60	12
Cranberries	38	38	16	28	603 ^e	2,713	24	5
Crowberries	34	34	15	29	287 ^e	1,435	13	3
<u>Plants</u>								
Labrador Tea and Greens	45	45	3	2	209 ^e	104	1	<1
Firewood	62	62	30	13	19 ^f			

NOTE: Harvest estimates are for the entire community (112 households) were based on data obtained from 36 households in three sample groups. Data presented here were expanded in proportion to the sampling ratio. See the methodology section of text for a detailed description of the sampling procedure.

a Virtually all households used salmon. Data on giving and receiving of salmon were not obtained.

b Does not include 176 beaver and 22 otter that were sold.

c Pounds of fox are not included because fox were not eaten.

d Sixty-eight percent of the community households received seal meat; households did not identify which species of seal they received.

e Gallons.

f Cords.

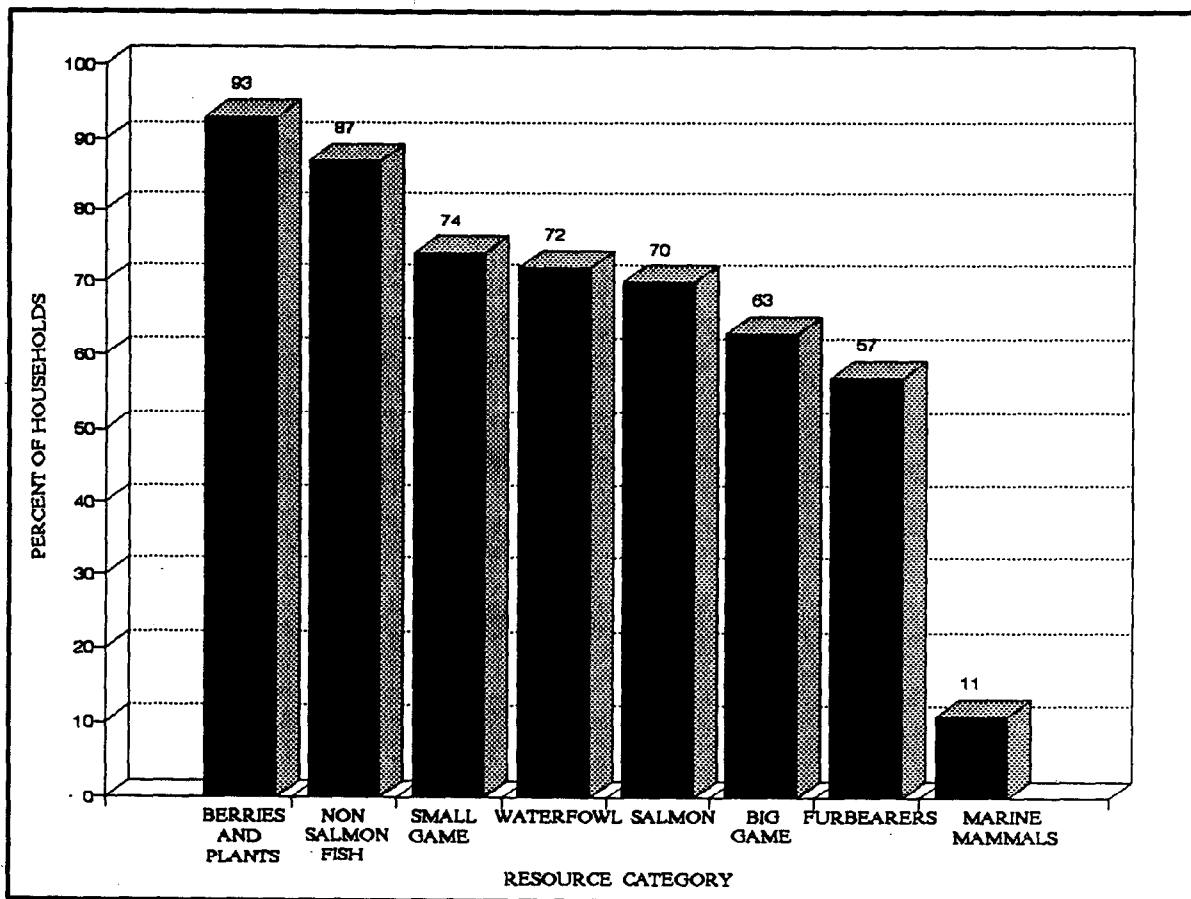


Fig. 14. Percentage of Kwethluk households active in each of eight resource categories, September 1985 - August 1986 (n=36).

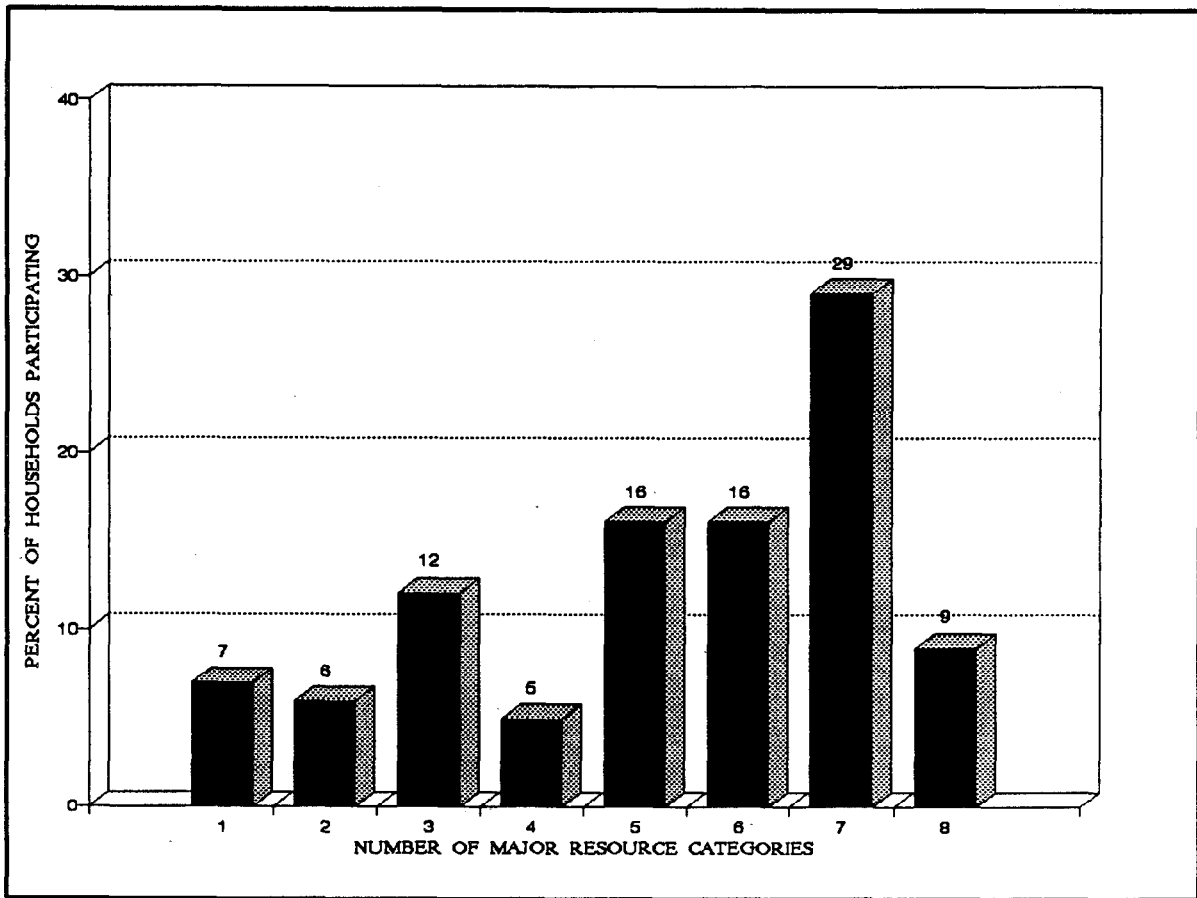


Fig. 15. Number of major resource categories harvested by Kwethluk households, September 1985 - August 1986 (n=36).

Fig. 16.

**AREAS USED BY KWETHLUK RESIDENTS
FOR SUBSISTENCE HUNTING, FISHING,
AND GATHERING, 1920-1987**

----- GAME MANAGEMENT UNITS

○ ALL CATEGORY

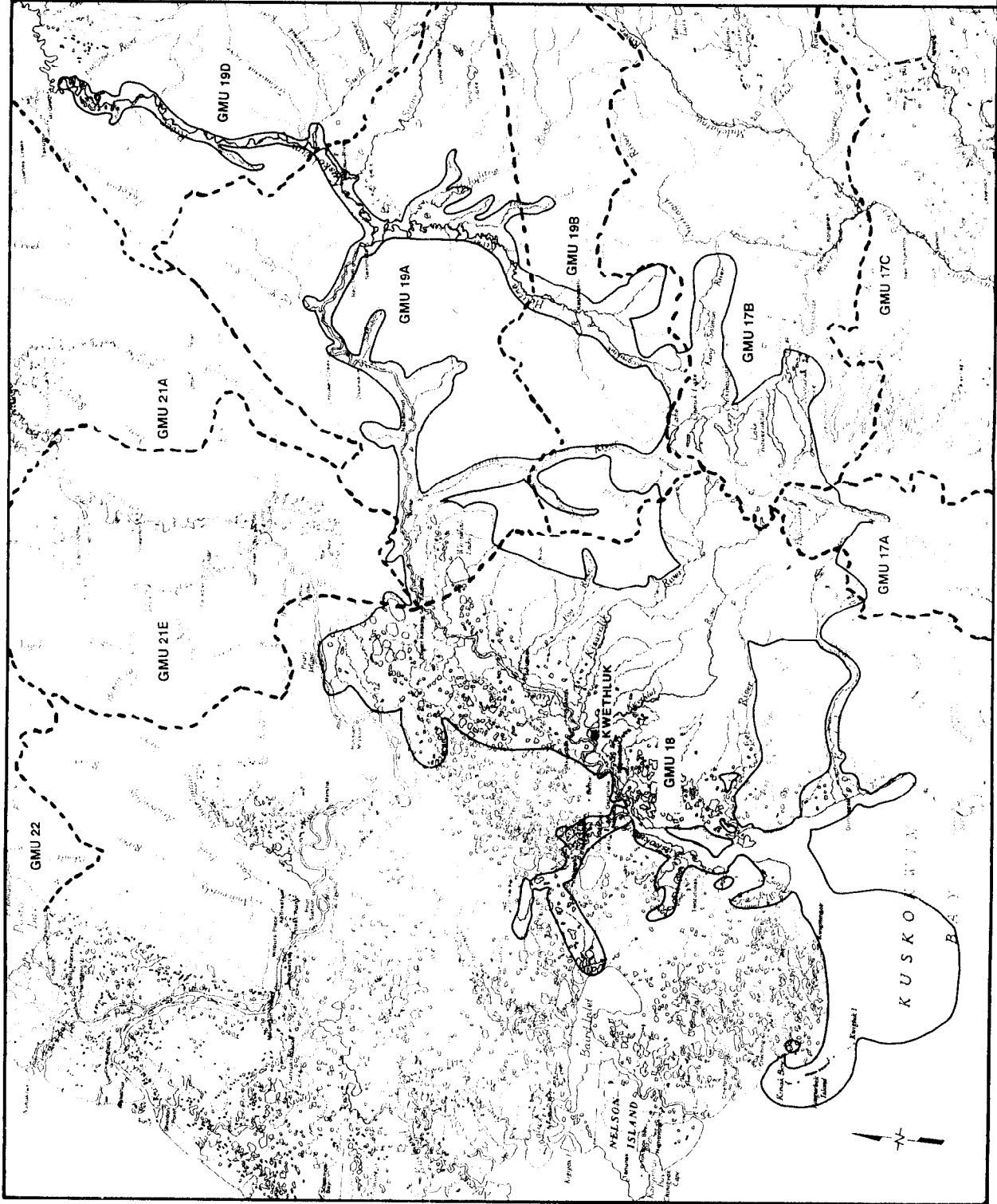
Source: Coffing, Michael W.,
Alaska Department of Fish and Game,
Subsistence Division, Technical
Paper No. 157, Juneau, Alaska

This map depicts areas used between
1920 and 1987 by residents of
Kwethluk. Data were compiled from
interviews with ten key respondent
households during February and March,
1987. Additional information was
added during a community review in
May, 1987. This map represents only
those areas used by people while
domiciled in Kwethluk. Undocumented
use of other areas may occur; consult
with the appropriate community
representatives for definitive
information.

SCALE



STATE OF ALASKA
DEPT. OF FISH AND GAME
Subsistence Division



generally east of Kwethluk and includes the tundra and uplands areas between the Tuluksak and Eek rivers, the mountains including the headwaters of the Holitna, Aniak, Kisaralik, Kwethluk, Eek, Kanektok, and Togiak rivers and along the Kuskokwim River upstream to the Holitna River. Figures illustrating areas used when searching for specific resources and a discussion of subsistence activities associated with those areas are presented in Chapter 6.

HARVEST QUANTITIES

Salmon and freshwater fish combined comprised about 85 percent of the total pounds of resources harvested annually (Fig. 17). Salmon accounted for 53 percent and freshwater fish 32 percent. Of the salmon species harvested, chinook salmon accounted for the greatest percentage (43 percent) (Table 9). Northern pike contributed the most to the freshwater fish category (29 percent). Although significantly lower than fish, big game accounted for the next largest percentage (6 percent). Moose comprised appropriately 90 percent of the big game harvested. Berries and plants contributed approximately three percent of the total harvest; salmonberries accounted for about 50 percent of all plants and berries. Furbearers, primarily beaver, contributed two percent of the total edible weight of resources harvested. Small game, waterfowl, and marine mammals provided a small proportion of the overall harvest. The relative importance of those resources that provided a relatively small proportion of the overall community harvest should not be determined solely by comparing the pounds of each resource harvested. These resources not only help round out the household diet by providing a variety of necessary minerals and nutrients; they also provide protein during times when other resources may not be available. Sometimes, individual households specialize on a single resource for the majority of the subsistence foods harvested (Table 10).

Household harvests of wildlife ranged from 19 to 23,758 pounds edible weight of wild resources and averaged 3,860 pounds per household. Fifty percent of the households each harvested more than 2,000 pounds of wild food (Fig. 18). The per person (per capita) harvest for the community during the study year was 800 pounds.

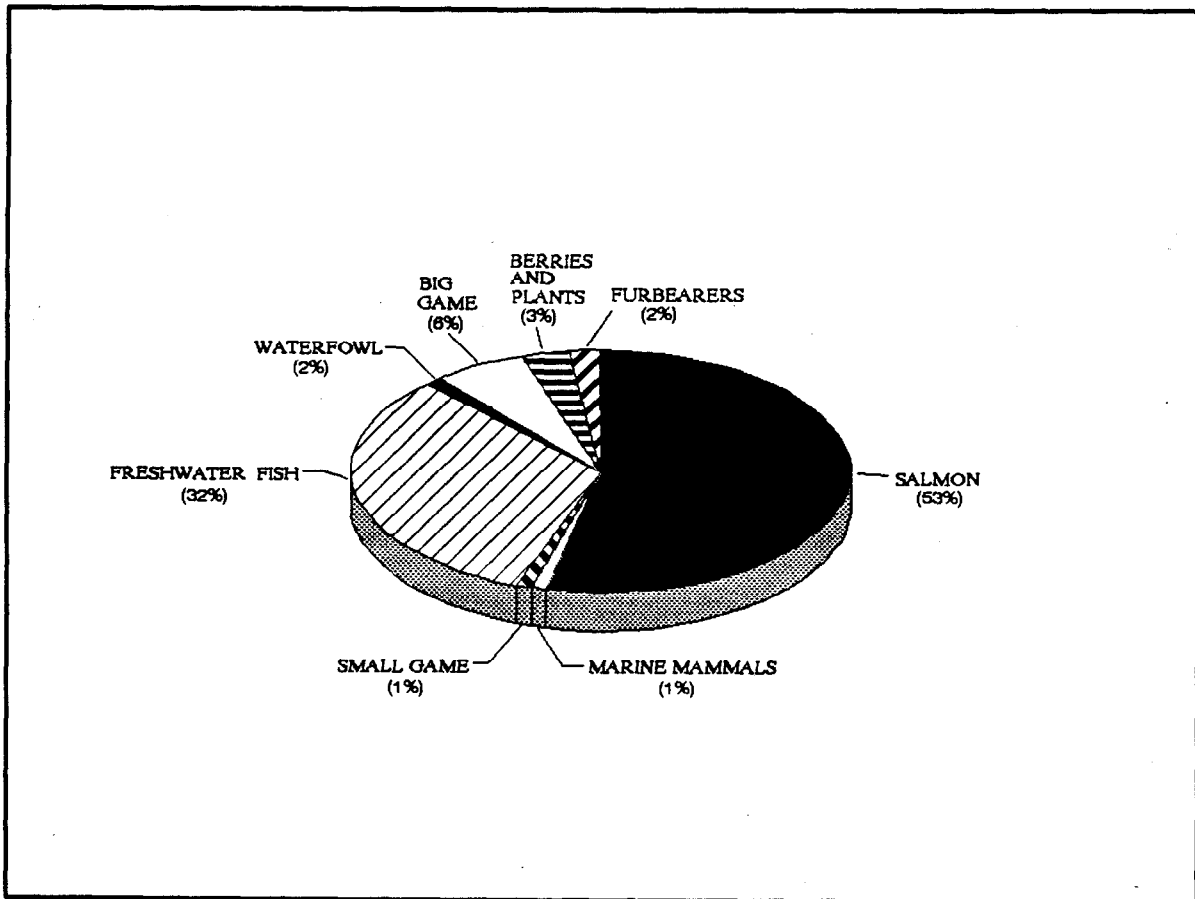


Fig. 17. Proportion of the total pounds edible weight contributed by each resource category (n = 36).

**TABLE 9. CONTRIBUTION OF FISH AND WILDLIFE RESOURCES HARVESTED
FOR SUBSISTENCE USE BY KWETHLUK RESIDENTS,
SEPTEMBER 1985 - AUGUST 1986**

Resource category	Percent of contribution within category	Percent of contribution to overall harvest	Resource category	Percent of contribution within category	Percent of contribution to overall harvest
<u>Salmon</u>		53	<u>Furbearers</u>		2
Chinook	43	23	Beaver	92	2
Sockeye	17	9	Otter	2	a
Chum	29	15	Muskrat	3	a
Coho	10	5	Mink	3	a
Pink	1	a	Fox		
<u>Freshwater Fish</u>		32	<u>Marine Mammals</u>		1
Whitefish	22	7	Spotted seal	42	a
Dolly Varden	a	a	Bearded seal	45	a
Grayling	1	a	Ringed seal	13	a
Smelt	1	a	Walrus	0	a
Blackfish	10	3	<u>Waterfowl</u>		2
Rainbow trout	a	a	Geese	23	a
Lake trout	a	a	Ducks	48	a
Pike	29	9	Cranes	5	a
Burbot	24	8	Swans	24	a
Sheefish	10	3	<u>Berries and Plants</u>		3
<u>Big Game</u>		6	Blueberries	18	a
Moose	90	5	Salmonberries	50	1
Black bear	2	a	Cranberries	20	a
Brown bear	7	a	Crowberries	11	a
Caribou	1	a	Plants	a	a
<u>Small Game</u>		1			
Grouse	2	a			
Ptarmigan	58	a			
Parka squirrel	5	a			
Hare	19	a			
Porcupine	16	a			

NOTE: Percentage of contributions are based on pounds edible weight.
 a Percentages are less than one percent.

**TABLE 10. MAXIMUM CONTRIBUTION OF SELECTED RESOURCES
TO ANY HOUSEHOLD'S TOTAL SUBSISTENCE HARVEST IN
KWETHLUK FROM SEPTEMBER 1985 - AUGUST 1986**

Resource	Percentage of any household's total harvest (n=36)	Resource	Percentage of any household's total harvest (n=36)
Chinook salmon	74.8	Grouse	1.7
Sockeye salmon	25.6	Ptarmigan	7.7
Chum salmon	39.7	Parka squirrel	0.5
Coho salmon	24.4	Hare	6.6
Pink salmon	2.9	Porcupine	2.2
Whitefish	26.1	Beaver	11.4
Dolly Varden	23.8	Otter	0.7
Grayling	38.1	Muskrat	0.9
Smelt	10.7	Mink	0.3
Blackfish	31.8	Spotted seal	32.3
Rainbow trout	38.1	Bearded seal	17.7
Lake trout	0.6	Ringed seal	1.8
Pike	53.4	Geese	5.7
Burbot	52.5	Ducks	8.7
Sheefish	13.7	Cranes	1.3
Moose	100.0	Swans	4.6
Black bear	5.4	Blueberries	62.3
Brown bear	10.9	Salmonberries	57.7
Caribou	2.2	Crowberries	20.6
		Cranberries	9.3

NOTE: Percentages are based on edible pounds of resources harvested.

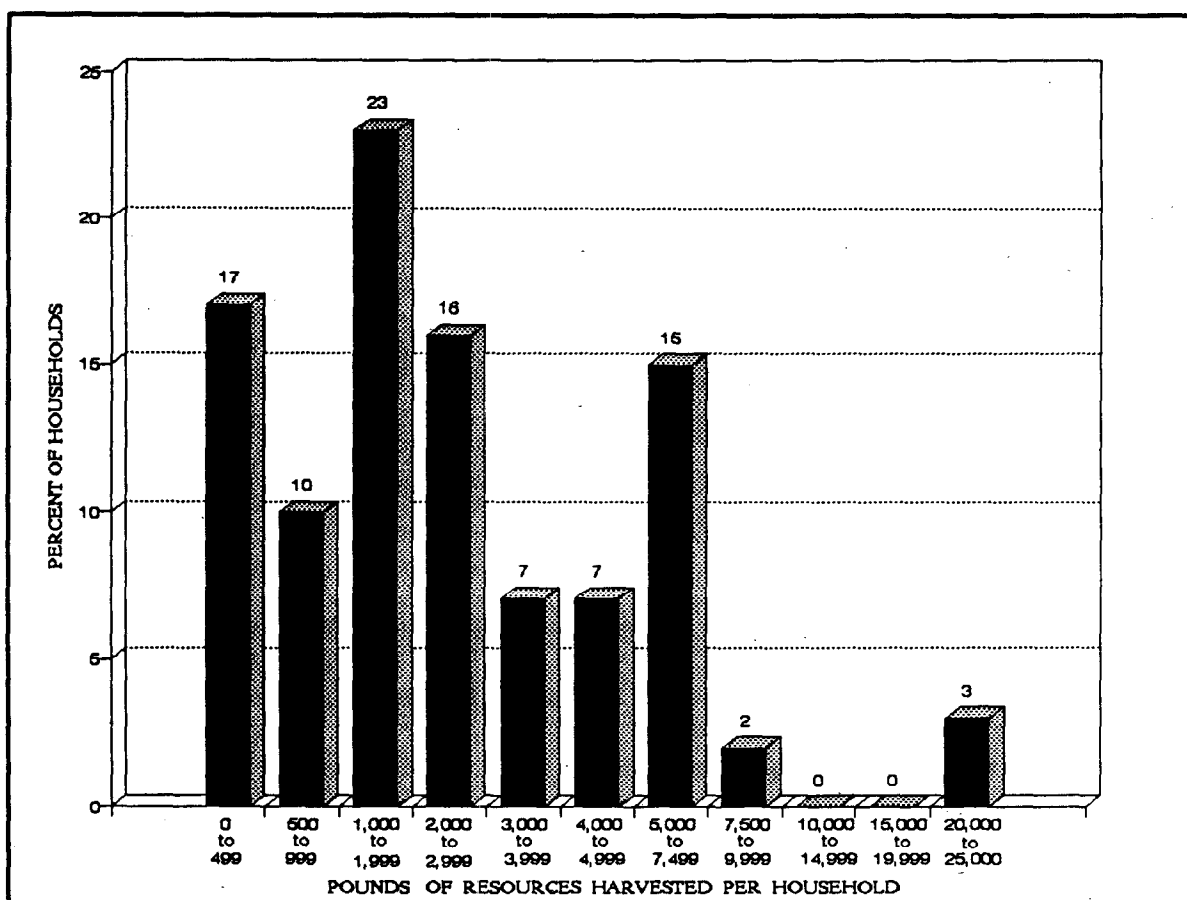


Fig. 18. Pounds of wildlife harvested by Kwethluk households, September 1985 - August 1986 (n=36).

RESOURCE SHARING

Resources harvested for subsistence were shared widely. Not only did sharing occur within the community, but resources were shared between communities. For example, resources were commonly given to households in Bethel, Napaskiak, Togiak, Kasigluk, Akiak, and Kwigillingok and resources were received from households in Bethel, Napaskiak, Togiak, Kasigluk, Akiak, Kwigillingok, Akiachak, Kipnuk, Eek, Napakiak, Chuathbaluk, Tuntutuliak, Goodnews Bay, Tuluksak, Hooper Bay, Fairbanks, and Barrow (Table 11). Food is a universal language: in Yup'ik society, sharing of food with friends and strangers visiting one's house is as frequent as a "hello" or a handshake in western culture. Friends and relatives commonly and frequently shared meals at one another's house or fishing camp. Individuals that were present at mealtime were welcomed to share whatever the table provided. This study did not try to quantify the amount of any wildlife that was given and received, nor did it try to measure the types of resources shared during meals. The data in Table 8 and Table 11, describing wildlife given or received, do not include prepared foods shared with others during meals, such as a pot of caribou soup prepared and delivered by an aunt; seal meat or herring eggs shared by a visiting guest; an eider duck eaten during a memorial feast; or moose eaten at someone's house during "Slavic;" or muktuk brought by visiting children, now grown-up and with children of their own, living in a community along the coast.

Resources such as fish, game, birds, plants, and berries, were also given to those who were unable to harvest for themselves or perhaps "had no luck" when out hunting. Usually this included the elderly and the widows, but resources were also commonly given and received between other types of households, especially those who were related. Some of the more commonly shared resources included whitefish, pike, burbot, moose, beaver, and ducks (Table 8). Other resources, such as grouse, lake trout, rainbow trout, grayling, and Dolly Varden were often consumed at camp while in the field. Greens and plants, other than berries, were usually available to anybody that wishes to harvest them. Other less available resources, notably seal, seal oil, walrus, and caribou were shared by Kwethluk

households who were successful harvesting them or by family and friends in other communities closer to the coast.

TABLE 11. LOCATIONS WHERE RESOURCES WERE GIVEN TO OR RECEIVED FROM KWETHLUK HOUSEHOLDS FROM SEPTEMBER 1985 - AUGUST 1986

Resource	Community given to	Community received from
Chinook salmon	a	a
Sockeye salmon	a	a
Chum salmon	a	a
Coho salmon	a	a
Pink salmon	a	a
Whitefish	Kwethluk, Bethel	Kwethluk, Napaskiak, Kasigluk
Dolly Varden	Kwethluk, Bethel	Kwethluk
Grayling	Kwethluk, Bethel	Kwethluk
Smelt	Kwethluk, Bethel	Kwethluk
Blackfish	Kwethluk, Bethel	Kwethluk, Kwigillingok
Rainbow trout	Kwethluk, Bethel	Kwethluk
Lake trout	Kwethluk	Kwethluk
Northern pike	Kwethluk, Bethel	Kwethluk
Burbot	Kwethluk, Bethel, Togiak, Kasigluk	Kwethluk, Akiak
Sheefish	Kwethluk, Bethel	Kwethluk, Akiak
Moose	Kwethluk, Bethel, Tuntutuliak	Kwethluk, Napaskiak
Black bear	Kwethluk	Kwethluk, Bethel, Chuathbaluk, Napaskiak
Brown bear	Kwethluk, Napaskiak	Kwethluk, Togiak
Caribou	b	Kwethluk, Togiak, Chuathbaluk
Grouse	Kwethluk	Kwethluk
Ptarmigan	Kwethluk	Kwethluk
Parka squirrel	Kwethluk	Kwethluk
Hare	Kwethluk	Kwethluk
Porcupine	Kwethluk	Kwethluk
Beaver	Kwethluk, Akiak	Kwethluk
Otter	Kwethluk	Kwethluk, Akiak
Muskrat	Kwethluk	Kwethluk
Mink	Kwethluk	b
Fox	Kwethluk	b
Spotted seal	Kwethluk	Kwethluk, Kwigillingok, Hooper Bay, Kipnuk
Bearded seal	Kwethluk	Kwethluk, Napaskiak
Ringed seal	Kwethluk	b
Walrus	b	Kwethluk, Napaskiak, Kwigillingok
Seal oil	Kwethluk, Kwigillingok	Kwethluk, Bethel, Napaskiak, Togiak, Goodnews Bay, Eek Kwigillingok, Barrow, Kipnuk

TABLE 11. continued

Resource	Community given to	Community received from
Geese	Kwethluk	Kwethluk
Ducks	Kwethluk	Kwethluk, Kwigillingok, Kipnuk
Cranes	Kwethluk	Kwethluk
Swans	Kwethluk	Kwethluk
Blueberries	Kwethluk, Bethel	Kwethluk
Salmonberries	Kwethluk	Kwethluk, Napakiak, Tuluksak, Akiachak, Kipnuk
Crowberries	Kwethluk, Bethel	Kwethluk, Tuluksak, Akiachak, Kipnuk
Cranberries	Kwethluk, Bethel, Napaskiak	Kwethluk, Kasigluk, Tuluksak, Akiachak, Akiak, Fairbanks
Plants	Kwethluk	Kwethluk
Firewood	Kwethluk, Bethel	^b

^a Specific information on distribution of salmon was not gathered. Salmon are shared among those families who comprise the salmon production units. During 1986 salmon production units consisted of people related either by blood or marriage. This included persons from Kwethluk, Napaskiak, Tuntutuliak, Bethel, and Anchorage. Salmon were also shared with relatives living in other communities who were not part of a Kwethluk salmon production unit.

^b None was reported

CHAPTER 6.

FISH AND WILDLIFE HARVEST AND USE PATTERNS

Descriptions of resource harvest and use patterns for particular types of fish and wildlife are contained in this chapter. Each description focuses on the geographical areas used, the harvest methods employed, food preservation techniques, harvest effort and harvest levels, and regulations. Common names of the various species of fish and game harvested for subsistence are used throughout the text, however, scientific and Yup'ik names are provided in Appendix 6.

People involved in subsistence activities, be it hunting, trapping, fishing, or gathering, harvest from the variety of resources that are available to them. While particular methods and means of harvesting may be best suited to specific resources, some methods are applicable to a variety of resources. For example, a dip net used for harvesting smelt and the small traps used for harvesting parka squirrels have little use for harvesting other resources. Smelt dip nets are stored after the smelt run is over and traps used for parka squirrel are closed, but left near the squirrel hole for use the following year. Likewise, large mesh gill nets (8 inches and larger) used for harvesting king salmon are not practical for harvesting smaller salmon and most freshwater fish.

In contrast, other methods and means have more widespread application and use. Small mesh gill nets used for harvesting whitefish are also used to harvest pike and burbot. Similarly, firearms are used to harvest several species of game, large and small. The .223 rifle used for taking fox and beaver may be the same rifle used to harvest caribou, moose, and bear. Subsistence harvest activities are multifaceted and dynamic. Although the following discussions are organized by resource, many of the subsistence activities, much of the harvest effort, and most of the geographic use areas are closely connected.

SALMON FISHING

Kwethluk residents harvest chinook, sockeye, chum, coho, and pink salmon. Salmon contribute significantly to the local economy, providing food through the subsistence fishery, and providing cash from the sale of commercially-caught salmon. Most households participated in the subsistence fishery and the majority of fishermen involved in the commercial salmon fishery also fished for subsistence use.

In 1986 subsistence salmon fishing began in late May with the arrival of chinook salmon. The first chinook salmon harvested by a Kwethluk fisherman was taken on May 27. Much of the subsistence fishing effort during June was directed towards the harvest of chinook, which were a highly desired food fish. Although there was no directed commercial harvest of chinook salmon in 1986, chinook were harvested incidentally in the sockeye and chum salmon commercial fishery which began on June 26 (Alaska Department of Fish and Game 1987b). Generally, chinook salmon were harvested throughout the summer, however, after July 4 they were not as abundant in the Kuskokwim River near Kwethluk as they were during June. The majority of chinook salmon harvested for subsistence were taken during June. By August 1, relatively few chinook salmon appeared in either the commercial or subsistence catches of Kwethluk fishermen.

Chum salmon first occurred in subsistence catches on May 31 and sockeye salmon were being caught in subsistence gill nets on June 4. In 1986, chum and sockeye salmon were harvested for use both as human food and for dog food. The June commercial fishery targeted the harvest of these two species. The sockeye harvest usually peaks during late June and declines significantly by July 15. Chum salmon harvests continued into August, but peaked in early July. Residents reported that the bright silvery chum salmon caught during August are a different type of chum salmon than those caught earlier in the summer. People further upriver in Aniak and as far as Lime Village also report this. Nevertheless, unlike the chum salmon stocks in the Yukon River, which were managed as two distinct runs, a "summer chum" run and a later "fall" run which also have distinctly different spawning areas, the available biological information did not indicate that the bright chum salmon caught from

the Kuskokwim River in August were a separate run from those caught earlier in the summer. During even numbered years, including 1986, a relatively small run of pink salmon occurred during mid-July. These fish were harvested incidentally with other salmon for both subsistence and commercial use.

The coho salmon run on the Kuskokwim River is one of the major coho runs in the state. Coho salmon were harvested primarily during August, however, a few were reported in the subsistence harvest as early as July 15. In 1986, the harvest of coho for commercial sale ended when the commercial salmon fishery closed on September 1. Kwethluk subsistence fishermen reported that they occasionally harvest coho from the Kuskokwim River as late as October.

Several factors influenced when and where salmon were harvested, the quantity of salmon harvested, the types of harvest gear used, methods used to process and preserve salmon, and distribution patterns. A discussion of these factors are presented below in the context of the community and the "salmon production unit," the social organization or partnership of families cooperating to harvest and process salmon.

Subsistence Salmon Fishing Regulations

During summer 1986, state regulatory restrictions on the harvest of salmon for subsistence uses were primarily restrictions on the types of gear that fishermen could use and the times when fishermen were allowed to fish. Subsistence fishing permits were not required, harvest reporting was not mandatory, and there were no restrictions on the number of fish which could be harvested.

Kwethluk is located in commercial fishery District 1 of the Kuskokwim Area (Fig. 19). Some of the waters near Kwethluk, such as the Kwethluk River and a tributary, the Akulikutak River, were always open to subsistence salmon fishing, and unlike the main Kuskokwim River and sloughs, were not closed to subsistence fishing because of commercial fishing periods. Upstream from District 1 on the Kuskokwim River, all waters, including the main Kuskokwim River, remained open to subsistence fishing at all times.

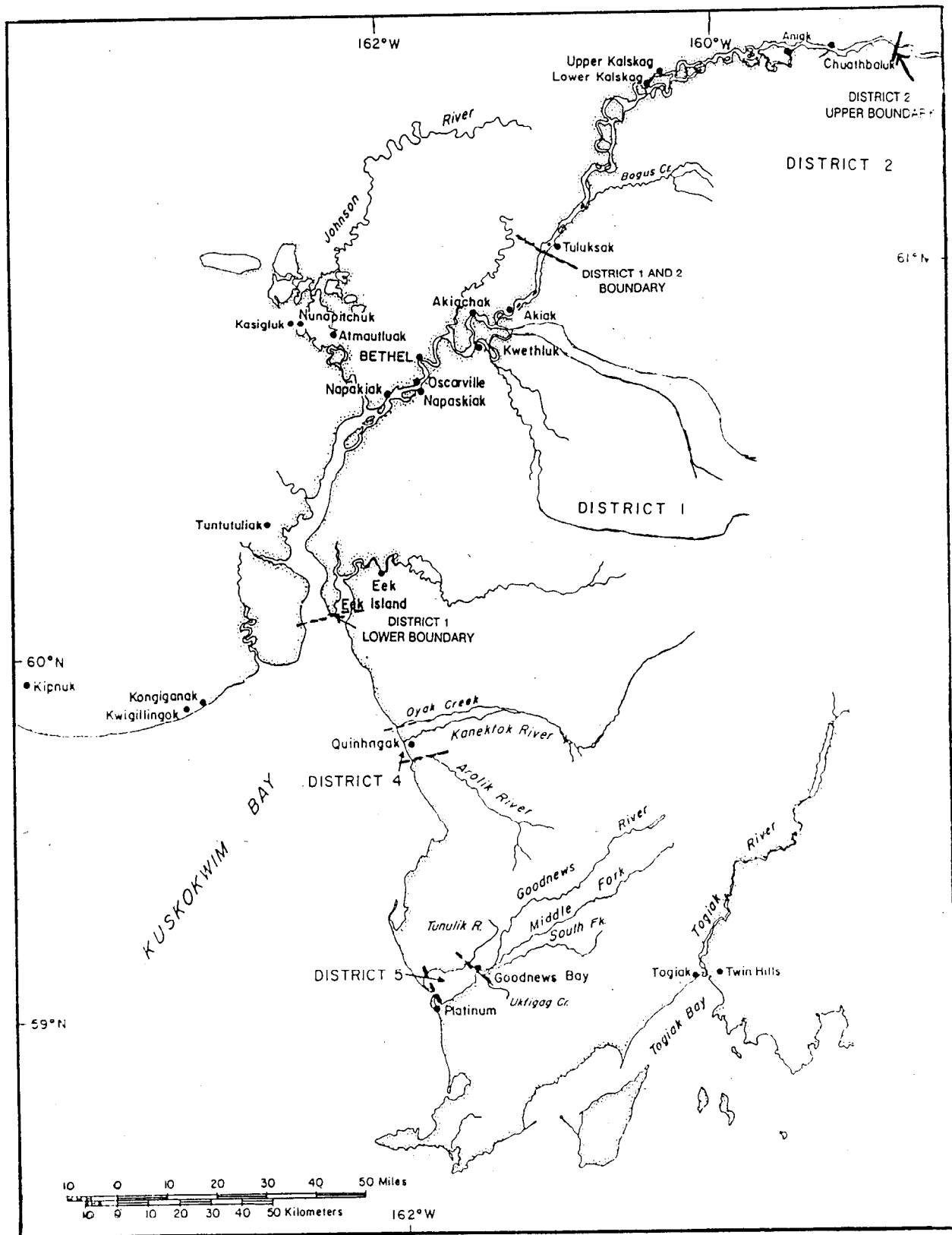


Fig. 19. Commercial salmon fishing districts in the Kuskokwim Area during 1986.

Kuskokuak Slough, Napaskiak Slough, and the Kuskokwim River within District 1 were closed to subsistence salmon fishing periodically during the commercial salmon fishing open periods in the district. In those areas salmon could be harvested for subsistence use at any time except that from June 1 through July 31 salmon could not be taken for 24 hours before, during, and 6 hours after each commercial fishing period. In Kuskokuak Slough, adjacent to Kwethluk, subsistence fishing could resume immediately after each commercial fishing period ended. From August 1 through August 31 subsistence fishing in this area was closed 15 hours before, during, and 6 hours after each commercial fishing period in District 1. Again, Kuskokuak Slough reopened to subsistence salmon fishing immediately after each commercial period closed.

Regulations applying to the subsistence harvest of salmon were more restrictive than regulations affecting other fish species. Most are designed as conservation methods, to make gear less efficient so as to allow some part of the salmon run to escape to spawn. In the Kuskokwim Area, salmon harvested for subsistence use could only be harvested using gill net, beach seine, or fish wheels. Spears were permitted in the Holitna River drainage located 240 miles upstream from Kwethluk. There were no restrictions on the size of gill net mesh that could be used for subsistence fishing, however, there were restrictions on both the length and depth of gill nets used for harvesting salmon (Alaska Board of Fisheries 1986). Gill nets used for catching salmon could not be more than 50 fathoms (300 feet) in length. Gill nets having stretched mesh size of 6 inches or smaller could not be more than 45 meshes deep and nets having stretched mesh size greater than 6 inches could not be more than 35 meshes deep.

Individuals using gill nets to harvest salmon for subsistence use could use as many nets as they wished, provided that the combined length of all salmon nets did not exceed 50 fathoms. Individuals could use 50 fathoms of salmon gill net and an unlimited amount of gill net for fish other than salmon, simultaneously. Similar to the restrictions placed on all subsistence fishing statewide, gill nets could not obstruct more than one-half the width of any fish stream.

Persons involved in commercial salmon fishing could also operate a subsistence net to harvest salmon, or other fish, during a commercial fishing period, in areas where subsistence fishing was open

during a commercial fishing period. The Kwethluk and Akulikutak rivers and other tributaries in District 1 are examples places where this could occur. In such an instance, the combined length of the commercial net and subsistence nets could not exceed 50 fathoms.

Subsistence gill nets operated in the Kuskokwim River had to be at least 300 feet apart. Gill nets operated in the tributaries of the Kuskokwim River, from the Kuskokwim River mouth upstream as far as the Kolmakof River near Chuathbaluk, were required to be at least 150 feet apart, attached to the bank, and fished substantially perpendicular to the bank. All subsistence gill nets used within tributaries of the Kuskokwim River had to be set nets; drift nets in tributaries were not allowed. Each person having a subsistence net in the water was also required to have their first initial, last name, and address inscribed on a keg or buoy attached to the gill net to identify the net's owner.

Commercial Salmon Fishing Regulations

Like all other commercial salmon fisheries in the State of Alaska, direct participation in the Kuskokwim commercial salmon fishery was restricted to those individuals who held Kuskokwim Area "limited entry" salmon fishing permits. Individuals not having permits could assist a permit holder only if they first obtained a commercial fishing crew member license. Restrictions on the commercial fishery were primarily restrictions of gear, time, and area. Permit holders were not limited to the number or pounds of salmon each could harvest, however, commercial salmon harvests, as a whole, were restricted to a guideline harvest range of 15,000 to 30,000 chinook salmon in District 1 (Alaska Board of Fisheries 1986). There were no District 1 harvest guidelines in regulation for chum, sockeye, coho, and pink salmon. The commercial season closed by regulation on September 1. Commercial fishing periods were opened using Emergency Orders issued by the staff of the Department of Fish and Game through the Division of Commercial Fisheries in Bethel.

Several of the gear restrictions regulating the commercial fishery were the same as for the subsistence fishery. The maximum length of gill nets used when commercial salmon fishing was 50 fathoms. One significant difference in gear restrictions was that gill nets used for commercial fishing

were required to have mesh sizes of 6 inches or less. The maximum depth of commercial fishing gill nets was 45 meshes. Commercial fishermen were restricted to using either set gill nets or drift gill nets and could operate only one type of commercial gear at any one time. In 1986, virtually all commercial fishermen used drift nets.

Commercial fishing in District 1 occurred in the main Kuskokwim River between the southern end of Eek Island, located nearly 87 miles downstream from Kwethluk, and the mouth of Mishevik Slough, located 30 miles upriver from Kwethluk. Commercial fishing was also allowed in District 2, upriver from Mishevik Slough to the Kolmakof River; in District 4 near Quinhagak; and in District 5 in Goodnews Bay (Fig. 19). The majority of the commercial fishing activities by Kwethluk fishermen took place within District 1, however, a few residents of Kwethluk fished commercially in districts 2 and 4.

Salmon Fishing Camps

Fishing camps served as the center for many of a family's activities during June, July, and August. It was at these camps that salmon caught for subsistence were cut, dried, smoked, and sometimes stored. During summer 1986, fishing camps served as the summer home for several families and included features such as a cabin or canvas wall tent; fish drying racks; one or more smokehouses for smoking the salmon; a steam bath house; net racks for drying gill nets; an assortment of tubs, buckets and tables used when cutting and processing the salmon; small garden plots; and areas for keeping dogs.

Before the Kuskokwim River was free of ice, fishermen busily began preparing their boats, motors, and other equipment in preparation for the arrival of chinook salmon. The men help one another get their boats into the river and, gradually, people begin traveling back and forth between fishing camp and Kwethluk as they prepare for the summer fishing activities. Because the Kwethluk River is free of ice before the Kuskokwim River, families having camps along the Kwethluk River are generally able to travel to camp to begin preparing for the upcoming fishing season as early as mid-May. Families

having camps along the Kuskokwim River or Kuskokuak Slough are often unable to get to their camp until late May or early June after the ice has gone out.

Preparing the camp for summer use includes setting up a wall tent or making the cabin ready; cleaning out the smokehouse and preparing it for the new catch of salmon; making repairs to the fish cutting tables and drying racks; and cutting firewood for heating. In 1986, some families made the move to their fishing camp over the span of a few days while others took more time to complete their move. In any event, the goal is to have the camp ready by the time the chinook salmon arrived. In 1986, each fishing camp was "owned" by a particular household and served as the center of activity for a salmon production unit.

Location of Salmon Fishing Camps

In 1986 there were a total of 52 fishing camps in use by Kwethluk residents. These camps were located at 35 separate sites. Eight were located along the main Kuskokwim River including those near the mouth of Napaskiak Slough; 7 were located along Kuskokuak Slough; 5 were within an old channel of Kuskokuak Slough which has nearly become an oxbow lake, but is still accessible via the Kwethluk River and Kuskokuak Slough; 27 were along the Kwethluk River; 2 were situated along the Akulikutak River, a tributary of the Kwethluk River; and 3 were located within the community (Fig. 20). Two additional fishing camps, commonly in use, were not used in 1986 because the heads of household were away for summer employment or had temporarily moved to another community.

The majority of the camps were located within eight river miles of the community. The fishing camp most distant from Kwethluk was located 14 river miles from the community along the Akulikutak River. A boat was necessary for accessing most of the camps from Kwethluk. A few camps along the Kwethluk River were close enough to the community that they were accessible by walking. Three households had their fishing camp facilities, including drying racks and smokehouses, in the community near their homes. Some of the fishing camps contained the facilities of a single household. It was not uncommon, however, for several households to have separate cabins, smokehouses, and drying racks at

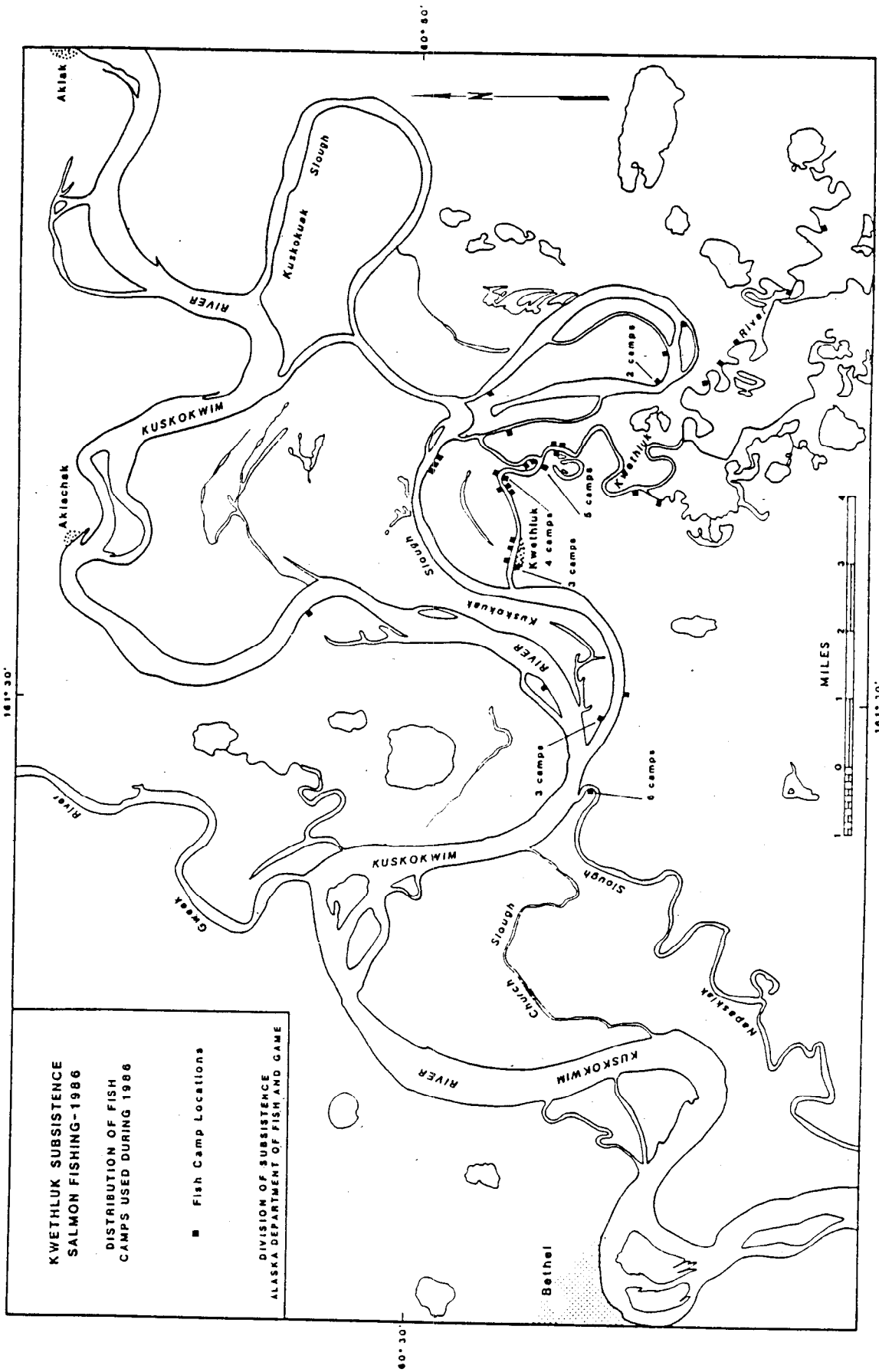


Fig. 20. Distribution of Kwethluk salmon fishing camps used during 1986.

the same site. Six of the 35 subsistence salmon fishing fish camp locations were occupied by more than one salmon production unit or fishing family.

According to Kwethluk residents, one of the primary factors taken into consideration when selecting a site for a fishing camp was that it was situated on relatively dry ground. Experience has taught residents that salmon hung on drying racks built over damp or perpetually soggy ground do not dry properly and preservation is difficult and sometimes impossible to achieve. Sometimes the salmon do not dry, but spoil, and fall on the ground. In the past, camp sites have been abandoned because people found that the site was too damp, preventing their salmon from drying properly. Even when a camp was located on dry ground, other factors such as changing river channels and shifting sandbars could cause the camp site to be eroded away or isolated from the river so that access by boat was no longer possible. Protection from erosion caused by river currents and strong winds were also important considerations. Ideal sites for fishing camps were relatively level, well drained, provided exposure to gentle breezes, and were accessible by boat.

Length of Use of Salmon Fishing Camps

Several of the fishing camps occupied during 1986 have been in use consistently for several years, some longer than 50 years (Table 12). Residents report that as long as they can remember there have been salmon fishing camps along the Kuskokwim River, Kuskokuak Slough, Napaskiak Slough, Kwethluk River, Akulikutak River, and the Kisaralik River. With the exception of the Kisaralik River, each of these areas still have Kwethluk salmon fishing camps.

Over time, erosion of the riverbanks along the Kuskokwim River and Kuskokuak Slough has forced some families to relocate their camps. Erosion was the single greatest factor affecting fish camp stability and longevity. Some areas were eroded away while others became isolated as river channels shifted, depositing sand in front of the camp site, effectively eliminating any boat access. Starting in the late 1950s, there has been a shift of camps, from along the main Kuskokwim River and Kuskokuak Slough, to along the Kwethluk River. The primary reason that people reported for moving their

TABLE 12. NUMBER OF YEARS THAT 1986 KWETHLUK
SALMON FISHING CAMPS HAD BEEN IN USE

Number of years fishing camp used	Number of fishing camps	Percentage of fishing camps	Cumulative percentage
70 or more	1	2	2
50 to 69	2	4	6
31 to 49	3	6	12
21 to 30	7	13	25
16 to 20	7	13	38
11 to 15	10	19	57
6 to 10	3	6	63
3 to 5	8	15	78
0 to 2	11	21	100

salmon fishing camp was erosion. The desire to be close to other families and nearer to Kwethluk for work or due to health-related factors were also given as reasons.

An area that used to harbor one of the largest concentrations of Kwethluk salmon fishing camps was located along the west bank of Kuskokuak Slough, directly west of the mouth of the Kwethluk River. The site has since eroded into Kuskokuak Slough. From the late 1950s through the early 1980s at least 14 camps located there moved to sites along the Kwethluk River. Five additional camps situated at other sites along Kuskokuak Slough or the Kuskokwim River also moved to the Kwethluk River during the same period. Residents reported that the erosion along Kuskokuak Slough worsened following a change in the Kuskokuak Slough channel in the mid-1950s. During the early 1950s, when outboard motors ranged between 5 to 20 horsepower and travel by boat was slower, area residents dug a ditch across a narrow isthmus of land along Kuskokuak Slough, approximately one mile upstream from the mouth of the Kwethluk River, in an effort to create a shorter, more direct travel route. Eventually this ditch widened, deepened, and became part of the main channel of Kuskokuak Slough. As a result, a long bend of Kuskokuak Slough was eliminated and the slough was shortened by approximately eight miles. After this shortcut was created, people began noticing the banks of Kuskokuak Slough eroding more quickly than before. The slough gradually widened and riverbanks where salmon fishing camps were located eroded into the river. Families were forced to relocate their camps and most moved to sites along the smaller Kwethluk River, which offered more security from the effects of the currents, tides, ice, and winds which contribute to erosion and the eventual destruction of salmon fishing camps.

Subsistence Fishing Areas

For the most part, subsistence salmon fishing occurred relatively close to Kwethluk. During the 1986 season, subsistence fishing in the Kuskokwim River proper took place within a 12-mile section between the community of Akiachak and the mouth of the Gweek River (Fig. 21). Subsistence

fishing also occurred in Kuskokuak Slough, Napaskiak Slough, and the Kwethluk and Akulikutak rivers. Areas used for salmon fishing since 1920 by residents domiciled in Kwethluk included the Kisaralik, Kanektok, Holitna, and Hoholitna rivers and lakes located near the headwaters of the Kisaralik, Kwethluk, and Kanektok rivers (Fig. 22). Prior to the 1930s, several families had their salmon fishing camps situated along the middle portion of the Kwethluk River in the vicinity of Three Step Mountain, and fished near their camps. Fishing for salmon along the Kwethluk, Kisaralik, Holitna, and Hoholitna rivers and Titnuk Creek for camp food often occurred in conjunction with other subsistence harvesting activities such as berry picking and moose hunting in September.

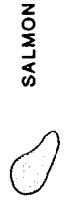
Fishermen were very knowledgeable about the habits of salmon and knew where the most productive fishing areas were. Experience learned while fishing, and knowledge passed down from older more experienced fishermen, helped residents determine where to subsistence fish in 1986. Respect for traditionally used areas of other communities also affected where people from Kwethluk fished. For example, very little if any subsistence fishing by Kwethluk fishermen occurred near Akiak or Akiachak. In addition, selection of fishing areas was dependent on certain geographic features. Places where points of land protrude out into the river, such as at a river bend, and areas where eddies occur, were popular set net sites. Portions of the Kuskokwim River and Kuskokuak Slough where the bottom was relatively free of snags and where the river narrowed were favored by fishermen using drift gill nets.

Fishing Gear

Historically, salmon were harvested using traps, spears, dip nets and gill nets. Traps (*taluyat*) made of wood were used in the Kuskokwim and Kwethluk rivers to harvest salmon. This method is no longer used for catching salmon. Spears were used in the swift clear water tributary streams such as the Kwethluk, Kisaralik, and Kanektok rivers. Residents also reported that large dip nets were once used to harvest salmon in areas near the mouth of the Kuskokwim River. This method was also reported by Zagoskin as early as 1844 (Zagoskin [1847] 1967:219). Fish wheels were reportedly never

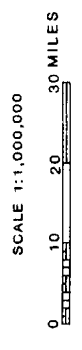
Fig. 22.
SUBSISTENCE SALMON FISHING
AREAS USED BY KWETHLUK
RESIDENTS, 1920-1987

Legend

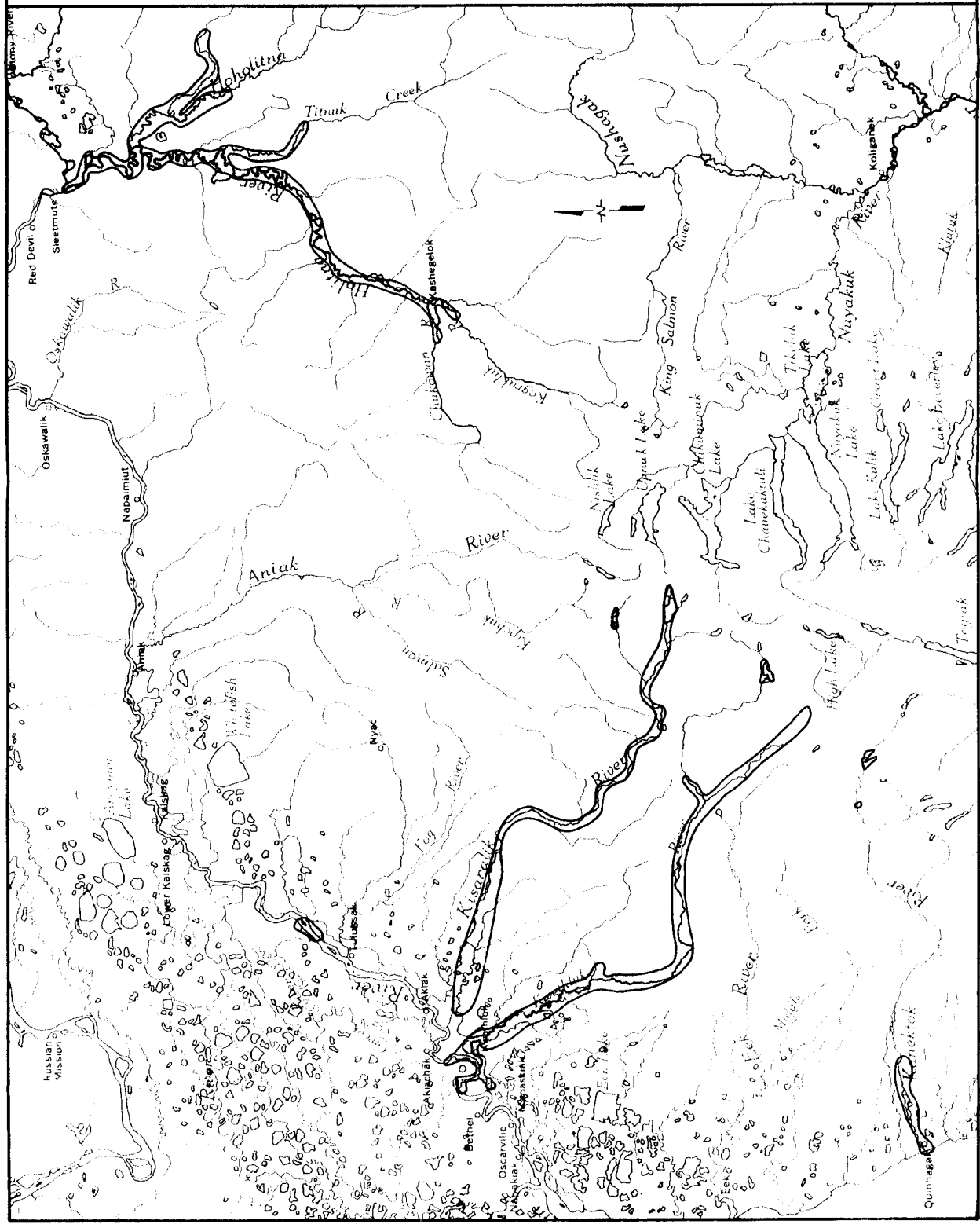


Source: Corffing, Michael W., Alaska Department of Fish and Game, Subsistence Division, Technical Paper No. 157, Juneau, Alaska

This map depicts areas used between 1920 and 1987 by residents of Kwethluk. Data were compiled from interviews with ten key respondent households during February and March, 1987. Additional information was added during a community review in May, 1987. This map represents only those areas used by people while domiciled in Kwethluk. Undocumented use of other areas may occur; consult with the appropriate community representatives for definitive information.



STATE OF ALASKA
DEPT. OF FISH AND GAME
Subsistence Division



used by Kwethluk fishermen, although they were used by people living further up the Kuskokwim River near Lower Kalskag, Aniak, and other communities farther upriver.

Prior to the availability of linen twine, gill nets were constructed from a coarse fiber twine made from willow bark. Linen twine was reportedly available in the Kuskokwim area, however, there is little information which describes how widespread the use of linen gill nets was along the Kuskokwim River. One Kwethluk elder reported using a short drift net made from willow bark sometime before 1920, when he was a young man. He used the net by attaching it to his kayak and drifting with it. Salmon were caught as they got their teeth snagged in the net. To prevent the fish from getting out and to keep the fish from tearing the net, the net was dragged up on a sandbar and the fish were removed. The net was relatively short and had sinkers made from antlers and floats made of wood. Nets also may have been made from other available materials, such as seal skin, as was reported in 1844 by Zagoskin ([1847] 1967:219).

Gradually, as materials became available, gill nets were made from linen. Kwethluk fishermen obtained commercially made linen webbing from Nerby's store and the Northern Commercial Company store in Bethel. Shortly before World War II, some nets were brought to the Kuskokwim River communities from the Bristol Bay area. These linen nets were the type commonly used by cannery fishermen and were very long and shallow and not well suited to the river conditions in the Kuskokwim. Kwethluk fishermen folded the Bristol Bay nets in half lengthwise, so that the net was half as long as the original, but twice as deep. These nets were well worn and most were 4.5 to 5.5 inches stretched mesh. Department of Fish and Game staff stationed in Bethel during the early 1960s reported that these sort of nets were commonly used. The use of larger mesh nets occurred primarily in the section of the Kuskokwim River downstream from Bethel (Alaska Department of Fish and Game 1962).

Linen nets had to be carefully cared for in order to last. Properly taken care of, these nets lasted one and sometimes two fishing seasons. Drift nets were dried after each use to prevent the linen from rotting and weakening. Set nets were usually not left in the water for more than two days before being

taken out and dried on net racks. Linen nets continued to be used for subsistence fishing through the early 1960s until the introduction of nets made from man-made fibers, such as nylon, in the 1960s.

In general, the early linen nets, and the nylon nets that followed, were comparatively shorter than the nylon nets used in the 1980s. Most were no longer than 25 fathoms. Floats were made of cedar or cork and lead-lines were comprised of rope with many individual lead weights attached along the length of the net. Drifting the gill net from a boat was the preferred method of fishing. Most families had only one net and took care in how they used it. As families were able to afford more nets, or as the old, worn drift nets were replaced with new ones, set nets became more common, and were often made from sections of old drift nets.

During 1986, salmon were harvested using nylon gill nets and rod-and-reel gear. Both drift and set nets were used when subsistence fishing. Set nets were often the first type of gear used for harvesting salmon soon after breakup, when the river had cleared of much of its debris that usually accompanied breakup. During late May and early June, before the major part of the salmon runs had reached Kwethluk, set nets placed in the Kuskokwim River and Kuskokwak Slough caught chinook and chum salmon as well as sheefish. Set nets appeared to be an efficient method of fishing when there were relatively few salmon in the river. Prior to commercial fishing openings, set nets were left in the Kuskokwim River or Kuskokuak Slough and were checked in the mornings and evenings. When catches in set nets indicated that salmon were abundant enough that drift net fishing would be productive, gradually people began using drift nets and sometimes removed their set nets. Later in June, after commercial fishing season had begun, set nets were used in the Kuskokwim River and Kuskokuak Slough between commercial fishing periods. By early July, most of the fishing effort using set nets occurred in the Kwethluk River while drift net fishing predominated in the Kuskokwim River and Kuskokuak Slough. Residents having subsistence set nets in Kuskokuak Slough, an area closed to commercial fishing, found it particularly bothersome to have to remove their subsistence fishing gear because of commercial openings in the main Kuskokwim River. Especially affected were some of the elderly who depended more on set net gear than some of the younger who were more able to deploy

drift nets. The effect has been a shift of fishing effort utilizing set nets to the Kwethluk River where subsistence set nets do not have to be removed during commercial fishing periods.

Gill nets used for subsistence fishing varied greatly in length and mesh size. They can be categorized into one of four types: large mesh set net, small mesh set net, large mesh drift net, and small mesh drift net. Large mesh nets were nets having a stretched mesh size greater than 6 inches. These nets were often referred to as "king gear." Small mesh nets had a stretched mesh size of 6 inches or less and were often referred to as chum salmon nets, red salmon nets, or coho salmon nets.

During 1986 much of the subsistence salmon fishing was done using large mesh gill nets. Forty-four percent of the salmon production units used large mesh drift nets and 60 percent used large mesh set nets (Table 13). Small mesh gill nets were also widely used, however, most small meshed nets were used when drifting. Eighty-two percent of the production units used small meshed drift nets and only 36 percent used a small mesh set net. The most common large or "king" mesh size was 8 inches stretched. Small mesh nets were usually 5.5 or 6 inches stretched mesh. All of the salmon production units using a large mesh drift net reported having only one such net. Six percent of the production units had more than one large mesh set net. Sixteen percent of the production units had more than one small mesh drift net and four percent had more than one small mesh set net.

Gill nets used for drifting were almost always 300 feet in length, the maximum length allowed by regulation (Table 13). In many instances the same net was used for both subsistence and commercial fishing. Large mesh set nets tended to be shorter than small mesh set nets and nets used in the Kwethluk River were generally shorter than nets used in Kuskokuak Slough or the Kuskokwim River.

A few production units owned only one net and one production unit depended on a large mesh drift net to harvest all of its salmon for subsistence use. Another production unit used a large mesh set net as its sole method of harvesting salmon. Seven production units (13 percent) used only a small mesh drift net and none depended solely on a small mesh set net for harvesting subsistence salmon during 1986. Thirteen production units (25 percent) used only drift nets and five (10 percent) used only set nets to harvest salmon for subsistence use.

TABLE 13. GILL NETS USED FOR SUBSISTENCE SALMON FISHING BY 52 KWETHLUK SALMON PRODUCTION UNITS DURING 1986

Net type ^a	Percent of production units using net type	Net length		Mesh size		Net depth	
		Range (feet)	Mode (feet)	Range (inches)	Mode (inches)	Range (meshes)	Mode (meshes)
"King" drift	44	90 - 300	300	7.0 - 8.5	8.0	28 - 45	35,45
"King" set	60	10 - 270	60	7.0 - 8.5	8.0	26 - 50	35
"Small" drift	82	30 - 300	300	4.5 - 6.0	6.0	29 - 45	45
"Small" set	36	10 - 300	150	4.0 - 6.0	5.5	20 - 45	45

^a "King" refers to gill nets having mesh size (stretched) of greater than six inches which were used primarily to harvest chinook salmon. "Small" refers to all other salmon gill nets having mesh size of six inches or less.

The lifespan of gill nets varied. Nets used primarily for subsistence fishing were reported to last for five to ten seasons. Nets used for both commercial and subsistence fishing were reported to last for only one to three seasons. Individuals spoke of harvesting salmon from the Kwethluk, Akulikutak, Kasigluk, and Kisaralik rivers for subsistence using rod and reel gear, however, the degree of effort associated with rod-and-reel fishing was not documented by this study.

Boats and Motors

A wide variety of boats were used for salmon fishing. Boats served many purposes and functioned as multiple use vehicles for most families such as for salmon fishing, moose hunting, wood gathering, or basic transportation. Whether intended for use primarily in the main Kuskokwim River, occasional use along the coast, for traveling to the uplands on tributaries such as the Kwethluk and Kisaralik rivers, or simply for use when checking set nets and traveling between Kwethluk and their salmon fishing camp, a variety of boat designs, construction materials, and dimensions were used to serve the purpose. Boats used when subsistence salmon fishing ranged in length from 16 to 24 feet and 58 percent were 20 feet or more in length. The majority (86 percent) of the boats 20 feet or longer were wooden and overall, 56 percent of the boats were made of wood. The remainder were aluminum. Almost all of the boats 18 feet and less were aluminum. Wooden boats were built by individuals, often assisted by others known to be experienced boat builders. Wooden boats were constructed from plywood and lumber purchased from the Kwethluk Native Store or from Swanson's in Bethel. Some boats had plywood sides and bottoms; some had plywood sides and wooden plank bottoms; others had plank sides and plank bottoms. Aluminum boats, some of which were welded, others riveted, were usually purchased from one of the stores in Bethel, Kwethluk, or one of the surrounding communities. Locally made wooden boats cost less than an aluminum boat of comparable size. Residents reported that wooden boats last between four and ten years. Aluminum boats required a higher capital investment, but reportedly lasted up to 20 years. In addition to their longer life, aluminum boats were relatively maintenance free. Purchasers of aluminum boats had a limited selection, in terms of boat length,

width, and depth, to choose from. Homemade wooden boats offered the owner more flexibility in design and various combinations of length, width, and depth. When repairs were necessary, wooden boats were repaired in Kwethluk. Repairs to aluminum boats, such as welding, had to be done in Bethel or some place having specialized equipment.

The sizes of outboard motors used varied depending on the size of boat used. Outboard motors owned by households having salmon fishing camps ranged in size from 10 to 115 horsepower. Thirty-two percent of the motors used were 30 horsepower or smaller, 24 percent ranged between 31 and 66 horsepower, and 40 percent ranged between 66 and 100 horsepower. There were only four motors of 100 horsepower or greater. The most popular sized motors were 25, 40, and 70 horsepower. Residents reported that outboard motors usually lasted from one to ten years. On the average, motors were expected to last approximately four years.

Harvest Timing

Kwethluk residents made a concerted effort to harvest, dry, and smoke salmon during June and early July. Environmental conditions which affected salmon drying and smoking were optimum during these two months and gradually deteriorated during late July and August as summer progressed. Data gathered while conducting interviews with individuals at their camps during June indicate that people began fishing for salmon on May 20. By the end of May, 12 percent of all production units were busy with salmon harvesting and processing activities and by June 10, 74 percent of the salmon production units were in operation.

Twenty-two of the 52 production units used the salmon harvest calendars they received in the mail or from the researcher. Analysis of the salmon harvest data from those calendars revealed that harvest effort peaked on June 17 when 73 percent of the production units reported harvesting salmon (Fig. 23). Harvest effort gradually declined during late June and continued to decline during July. Throughout August, daily harvest effort ranged from five to nine percent of the production units. The majority of the chinook salmon subsistence harvest had been completed by the end of June (Table 14).

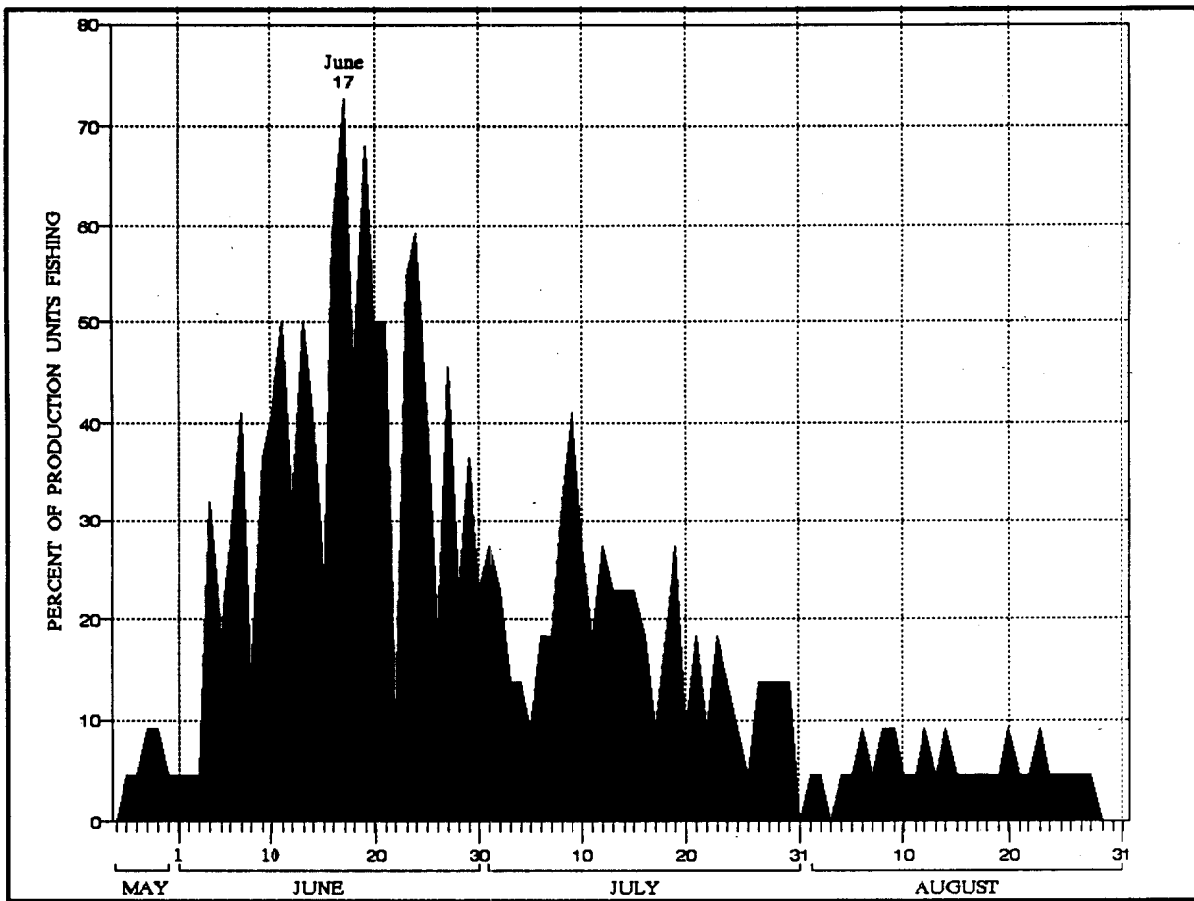


Fig. 23. Subsistence salmon harvest effort during 1986 by Kwethluk households returning salmon harvest calendars (n=22).

TABLE 14. PROGRESSION OF KWETHLUK SUBSISTENCE SALMON HARVESTS DURING 1986

Percent of total harvest ^a	Dates when 25, 50, 75, and 100 percent of total harvest were achieved				
	Chinook	Sockeye	Chum	Coho	Pink
25	June 14	June 20	June 19	July 30	July 21
50	June 19	June 25	June 25	August 9	July 26
75	June 24	July 7	July 9	August 9	July 29
100	July 9	July 21	July 16	August 23	July 30

^a Based on data from salmon harvest calendars of 22 salmon production units.

Seventy-five percent of the sockeye and chum salmon harvest had been completed by July 10, and by August 10, 75 percent of the subsistence coho harvest was completed.

Throughout the summer, harvest effort varied weekday to weekday. During June and August harvest effort was lowest during Sundays (Fig. 24), however, salmon were harvested during each weekday. Even though salmon fishing effort declined on Sundays, the degree of effort was still significant; in June, 50 percent of the production units reported harvesting salmon on Sundays. Based on observations, it appears that the majority of salmon harvest activities occurring on Sunday were associated with set net fishing primarily within the Kwethluk and Akulikutak rivers. Overall, most people did make a conscious effort to reduce physical activities on Sundays. People did, for example, cut back on drift net fishing for salmon on Sunday, an activity requiring the person to be directly involved in the harvesting. In contrast, however, the checking of gill nets that were already set for fishing was viewed as necessary and also allowed families to have fresh salmon for weekend meals while observing the "Day of Rest."

Salmon Production Unit Composition

Harvesting and preserving enough salmon to last a family for an entire year requires the hard work and cooperation of several people. During 1986, it was common for individuals from one or more households to work together, as part of a production unit, to harvest and process salmon for subsistence. These salmon production units can be best described as family units, often comprised of multiple households, that worked collectively to harvest and preserve salmon which was shared among them. During 1986, there were 52 production units, each headed by a household that was primarily responsible for establishing and maintaining a salmon fishing camp. Twenty-two production units were made up of single households. The remaining 30 units (58 percent) were comprised of multiple households. In addition to the 52 households having camps, 26 other Kwethluk households also belonged to one of the salmon production units and provided assistance in harvesting or processing

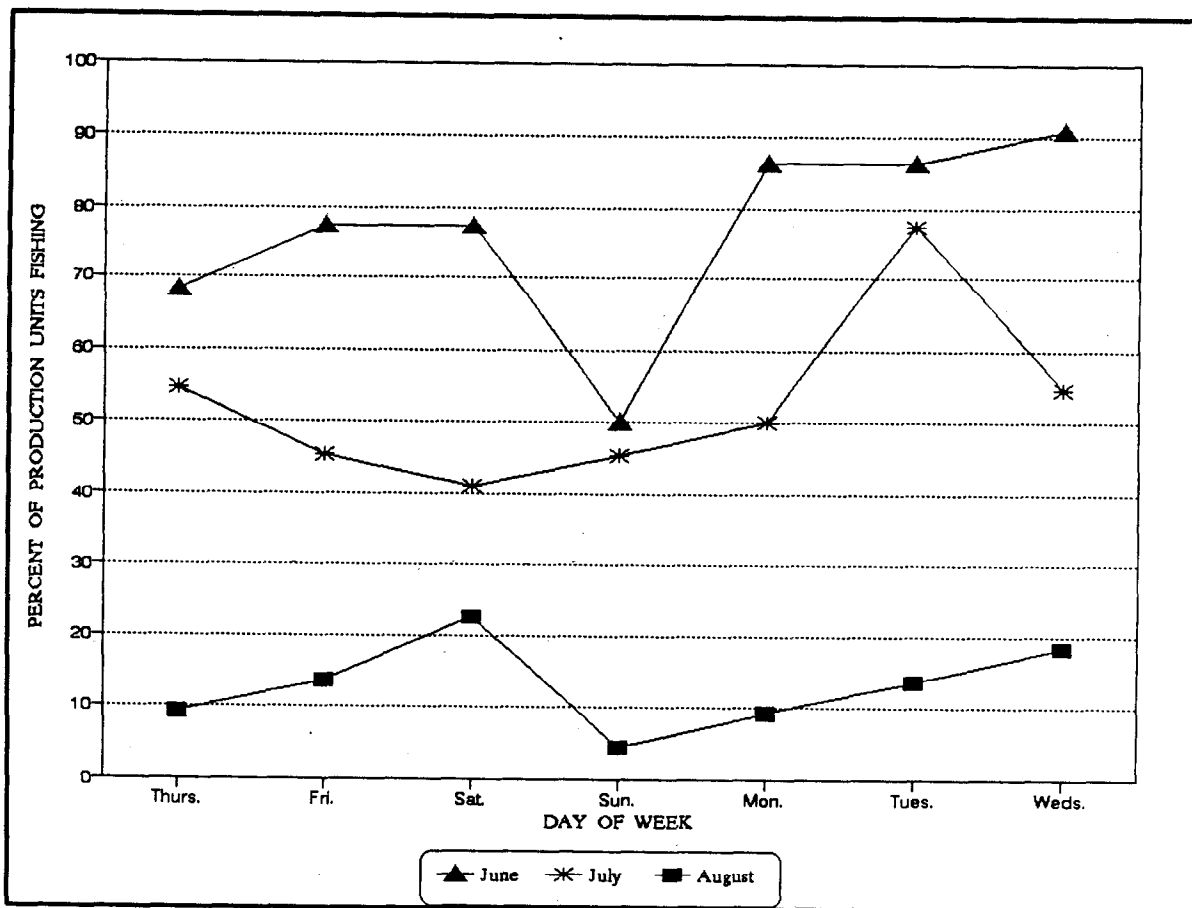


Fig. 24. Weekday subsistence salmon harvest effort during 1986 by Kwethluk households returning salmon harvest calendars (n=22).

salmon. Salmon production units ranged in size from 1 to 5 households and averaged 1.9 households each. Twelve of the salmon production units had members that also participated in another production unit.

Forty of the production units were comprised totally of individuals residing in Kwethluk. In the remaining 12 salmon production units, relatives from Lower Kalskag, Akiak, Napaskiak, Bethel, Nunapitchuk, Fairbanks, or Anchorage assisted. In all cases where salmon production units were comprised of multiple households, the members were closely related through kinship or marriage.

Most (85 percent) of the salmon production units were headed by married couples; the man supervised the harvest activities and the woman supervised the processing activities. Three production units were headed by widows, three by widowers, and two by single males. The average age of heads of households "owning" a salmon fishing camp was 54.25 years.

A total of 120 fishers were involved in salmon harvesting activities. Twenty fishers were from households not owning camps and two were from households from other communities. The number of fishers per production unit averaged 2.3 and ranged from 1 to 5. Each production unit had at least one male fisher and 95 percent of all fishers were male. The majority of the fishers (45 percent) were sons of household heads or were themselves male household heads (32 percent). Nephews, brothers, brothers-in-law, cousins, and wives of household heads comprised the majority of the remaining fishers. Eleven percent of the units each had at least one female fisher.

A total of 126 processors were involved in salmon processing activities. Twenty-three of the processors came from households not owning camps and 11 came from other communities. The number of processors per salmon production unit averaged 2.4 and ranged from 1 to 5. Forty-eight of the 52 production units included female processors and 87 percent of all processors were female. Most of the processors were daughters (37 percent), wives (30 percent), or sisters (5 percent) of heads of households owning the camp. The remaining female processors were either sisters-in-law, mothers-in-law, granddaughters, or nieces. Male processors were either heads of households, sons, or brothers-in-law of heads of households. Twenty-one percent of the salmon production units included male processors. Three production units had no female processors.

Processing, Preservation, and Preparation Methods

Salmon harvested for subsistence use were preserved by a variety of techniques including drying, smoking, freezing, salting, and canning. All 52 salmon production units cooked and ate freshly caught salmon and also dried and smoked salmon for later use (Table 15). Drying and smoking were the primary preservation methods used, however, methods differed species to species and during different times of the fishing season. During June and July, months when drying conditions were best, salmon were usually cut for drying and smoking. Salmon were also preserved by salting at this time and salmon heads were prepared as *tepa*, commonly called "stink heads," by burying in the ground until fermented. August tends to be a month of frequent overcast and rainy weather which impedes drying of salmon for smoking. Consequently, salmon harvested during August and September for family consumption, primarily coho, were frequently frozen and sometimes canned or salted. Chum salmon harvested during August for use as dog food were usually dried, even though it took longer to dry salmon than it would have during June or July because of the rainy weather typical during August. Between late August and early October, coho salmon harvested for dog food were preserved by burying whole in earthen pits.

Except when freezing, salmon preserved or prepared for human food first had to be cut up. Processing of dried and smoked salmon in Kwethluk during 1986 was similar to that described for Chuathbaluk and Sleetmute along the middle Kuskokwim River a few years earlier (Charnley 1984). Chinook salmon were processed into "slabs" or cut into strips. The backbones with the attached rib sections were cut away from the flesh from each side of the fish and were then tied together in pairs at the tail, hung over a pole of the drying rack, and dried. Although backbones were also cut away from the flesh of chum and sockeye salmon, they were usually left attached to the main body at the tail throughout the drying and smoking process. One method of processing coho salmon late in the season involved first gutting the fish and then making several vertical cuts on the outside of the fish from the

TABLE 15. METHODS OF PROCESSING SALMON FOR SUBSISTENCE USE BY KWETHLUK SALMON PRODUCTION UNITS DURING 1986

Salmon Species	Number of production units harvesting	Number of production units using particular processing method									
		Cooked and eaten	Smoked strips	Smoked "dry fish"	Salted heads	Salted whole salmon	Dried split heads	Tepa	Frozen	Canned	Dog food
Chinook	52	36	36	48	23	18	14	28	22	3	1
Sockeye	50	29	3	47	0	0	0	14	1	0	3
Chum	50	12	0	50	0	0	0	18	9	0	4
Coho	36	11	1	12	1	2	0	1	19	1	5
Pink	17	5	0	9	0	0	0	0	1	0	4
Overall participation	52	41	40	50	24	18	14	34	32	4	8

back to the belly. The heads were often left on coho salmon processed this way before the fish were hung to dry.

After the cutting process, salmon were hung outside on wooden racks constructed specifically for drying salmon. After two to four days of drying, depending on the weather, they were then moved into a smokehouse where they were hung up and smoked using a smudge fire made from locally gathered willow and cottonwood. Care was taken to regulate the fire to create the proper amount of smoke and circulation over the hanging fish while, at the same time, maintaining a relatively cool temperature in the smokehouse to avoid overheating the fish and cooking them. During periods of very warm weather, people often avoided building fires to smoke fish during the middle of the day when the heat from the sun was its warmest. Instead, they built smudge fires during the early morning, allowing the fire to burn itself out by late morning, and again in late evening after the day had cooled down. When the weather was cold and cloudy or wet, smoking of the fish could continue whenever needed. The fish were cool smoked in this manner for several days until the desired result was achieved. The precise amount of time necessary to smoke the salmon varied with the amount of fat in the fish, their water content, the frequency with which the smudge fires were rekindled, the temperature, the species of fish, and the manner in which the fish were cut prior to smoking. For example, strips cut from chinook salmon were often smoked for two to two and one-half weeks while chum and sockeye salmon, which were not usually cut into strips, were smoked for three to four weeks. Approximately 73 percent of the salmon harvested for subsistence use was preserved by drying and smoking (Table 16). Most of the salmon that was dried and smoked was eaten without any further preparation. One exception was "half-dried" salmon (*egamaartuk*) which was cooked after being partially dried. Dried salmon was sometimes eaten with seal oil.

Salting was another method used for preserving salmon. Heads of chinook and coho salmon were packed in plastic buckets or wooden kegs holding 5 to 15 gallons each, alternating layers of salt and heads. During 1986, the heads of 549 chinook and 6 coho salmon were preserved this way. A second method of salting salmon involved cutting the salmon into fillets and packing them with layers of salt in containers similar to the way heads were preserved. A few heads were sometimes included in the

TABLE 16. NUMBER OF SALMON PROCESSED FOR SUBSISTENCE USE BY KWETHLUK HOUSEHOLDS DURING 1986

Species	Harvested	Number of salmon						Dog food
		Cooked	Smoked strips	Smoked "dry fish"	Frozen	Salted	Canned	
Chinook	5,824	417	654	4,294	120	142	12	2
Sockeye	5,423	276	136	3,153	5	0	0	1,790
Chum	9,738	77	0	8,031	84	0	0	1,543
Coho	3,545	94	30	1,984	330	157	12	902
Pink	619	16	0	84	5	0	0	484
Total salmon^a	25,149	880	820	17,546	544	299	24	4,721

^a The total number of salmon harvested is greater than the sum of processed salmon reported here. Additional harvest data, without the accompanying processing information, were received after interviews to collect processing data were completed. Processing information is not known for 183 chinook, 63 sockeye, 3 chum, 36 coho, and 30 pink salmon.

containers with salted fillets. A barrel of salted fish prepared by one salmon production unit contained 15 chinook salmon, without the heads. One-hundred forty-two chinook and 157 coho salmon were preserved using this method. Salmon preserved in salt was rinsed in warm water to remove most of the salt before being cooked.

In addition to salting, salmon heads were also preserved or prepared in other ways. Chinook salmon heads were split and dried. Heads of chinook, sockeye, chum, and occasionally, coho salmon were prepared by burying them in the ground and allowed them to ferment before eating. Earthen pits lined with grass were used for this process. Salmon milt and salmon eggs were added to the heads which were then covered with another layer of grass before being covered over with earth. The fermenting process took from one to two weeks depending on temperature of the ground. Heads prepared this way were referred to locally as "stink heads" or *tepa*. One salmon production unit prepared four pits of *tepa*. The pits measured approximately 18 inches deep and 2 feet square and contained approximately 75 salmon heads each. The heads of 1,000 chinook, 726 sockeye, 1,246 chum, and 41 coho salmon were prepared as *tepa*.

Salmon eggs were prepared for food and were also used for dog food. When a freshly caught salmon was cooked, the eggs were usually prepared along with the rest of the fish. Salmon eggs were also dried for later use. After about two weeks of drying, the eggs were placed inside plastic, wooden, or metal containers and buried. During late fall or early winter (October), the eggs were then dug up and eaten without further preparation. These dried eggs were known for their ability to keep a person warm during winter. When preserved for dog food, dried eggs were added to fish heads inside a grass lined 55-gallon drum which was then buried. It was preferred that the dried eggs be buried early in the summer, so that they had enough time to ferment before being used.

Preserving salmon by canning was used by three production units. Chinook and coho salmon were the only salmon species reportedly preserved by canning. At one salmon fishing camp, salmon were canned by placing glass jars packed with coho salmon in a bath of water that was then heated over a fire in the smokehouse. Freezing of chinook and particularly coho salmon was relatively common.

Chinook salmon were usually cut up into smaller pieces before being placed into plastic Ziploc[®] bags for freezing. Smaller species, such as chum, sockeye, coho, and pink salmon were frequently frozen uncut and whole.

Fresh, frozen, and salted salmon was prepared in a variety of ways including boiling, baking, frying, and in soups. Dried smoked salmon was eaten without any further preparation, sometimes with seal oil and sometimes without. Salted heads were eaten after being rinsed, sometimes cooked and sometimes not. More than 10,000 pounds of salmon were eaten fresh during the summer (Table 17).

A total of nine salmon production units harvested salmon specifically for dog food. Chum, coho, and pink salmon were the species most frequently processed for dog food. In addition to dried salmon processed for dog food, whole uncut salmon and the heads, entrails, and backbones, not preserved or prepared for food, were also used as dog food. The remaining 43 salmon production units fed salmon parts to dogs throughout the summer. Any salmon leftover from the previous year of fishing were sometimes fed to dogs as people cleaned out smokehouses in preparation for newly processed salmon. Those who did not have dogs were careful to bury the leftover dried fish so that it would not become scattered about, an act considered disrespectful to the fish. Approximately 31,000 pounds of salmon were harvested for dog food.

Distribution and Storing

Salmon were generally distributed among the 78 households which comprised the various salmon production units. This represented 70 percent of the households in the community. It is likely that many households not involved with salmon harvesting or processing also received salmon from one or more of the production units. Information on the specific number of households receiving salmon from one or more of the Kwethluk salmon production units was not collected.

Dried and smoked salmon were usually stored in smokehouses, freezers, or caches belonging to the head of the salmon production unit. Salted fish were kept in buckets or wooden barrels and were stored in the house, entryway, cache, or smokehouse. Frozen salmon were kept in household freezers.

TABLE 17. POUNDS OF SALMON PROCESSED FOR SUBSISTENCE USE BY KWETHLUK HOUSEHOLDS DURING 1986

Species	Harvested	Processing method						Dog food ^b
		Cooked	Smoked strips	Smoked "dry fish"	Frozen	Salted ^a	Canned	
Chinook	99,008	7,089	11,118	72,998	2,040	2,414	120	34
Sockeye	39,045	1,987	979	22,701	36	0	0	12,888
Chum	66,218	523	0	54,611	571	0	0	10,492
Coho	22,688	601	192	12,697	2,112	1,005	77	5,773
Pink	2,104	54	0	285	17	0	0	1,645
Total pounds ^c	229,063	10,254	12,289	163,292	4,776	3,419	197	30,832

NOTE: Pounds were calculated using 1986 season average round weights of salmon harvested commercially with gill nets having mesh size of 6 inches or smaller (Alaska Department of Fish and Game 1987b). Parts of salmon such as the heads, gills, and entrails were sometimes used for dog food.

^a This category represents salmon which were cut specifically for salting. Not included are containers of 549 chinook and 6 coho salmon heads removed from salmon preserved primarily by drying or smoking.

^b These estimates are based on the number of salmon harvested specifically for dog food. Not included in this estimate are heads, entrails, and backbones removed from salmon that were cut for drying, smoking, or freezing, that were frequently used for dog food.

^c The total pounds of salmon harvested is greater than the sum of processed salmon reported here. Additional harvest data, without the accompanying processing information, were received after interviews to collect processing data were completed. Processing information is not known for 183 chinook, 63 sockeye, 3 chum, 36 coho, and 30 pink salmon.

Whole frozen coho salmon, used for dog food, were sometimes stored outside in underground pits. Other members of the production unit, such as the brothers, sisters, and older children of the production unit head, had access to these stores of salmon and could obtain what they needed. In some instances, such as when a household that participated in the production unit was from another community, the processed salmon was divided up at the end of the season. Whether it was by eating salmon at meals at the home of one of the 78 households involved in salmon production, or by receiving salmon given to them, virtually every Kwethluk household consumed salmon.

Harvest Levels

During 1986, 5,824 chinook, 5,423 sockeye, 9,738 chum, 3,545 coho, and 619 pink salmon were harvested for subsistence use. Unlike the data for previous years (Appendix 4), which were expanded estimates of the subsistence harvests, the 1986 data collection was an actual census of the subsistence salmon harvested. Harvest levels varied greatly between production units. Production units averaged 112 chinook, 104 sockeye, 187 chum, 68 coho, and 12 pink salmon each (Table 18). Seventeen of the production units (33 percent) harvested all five species of salmon available. All 52 production units harvested chinook salmon, 50 harvested sockeye and chum salmon, 36 harvested coho salmon, and only 17 harvested pink salmon. For the majority of the production units, harvest efforts were aimed at chinook, sockeye, and chum salmon. Two production units harvested only chinook salmon. Production units which reported harvesting the greatest number of sockeye, chum, coho, and pink salmon harvested these species primarily for dog food. Completed harvest calendars gathered from the 42 percent of the production units that used them accounted for 53 percent of the chinook harvest and 35 percent of all other salmon harvested.

Chinook contributed 43 percent of the total pounds of salmon harvested. Chum salmon contributed 29 percent, sockeye salmon contributed 17 percent, and coho salmon contributed approximately 10 percent of the total pounds of salmon harvested during 1986. Pink salmon

TABLE 18. KWETHLUK SUBSISTENCE SALMON HARVEST LEVELS DURING 1986

Species	Production unit harvests (N=52)		Number of salmon		Pounds of salmon ^a	
	Average	Range	Per household harvest (N=112)	Per capita harvest (N=540)	Per household harvest (N=112)	Per capita harvest (N=540)
Chinook	112	7 - 502	52	11	884	183
Sockeye	104	0 - 2,000	48	10	349	73
Chum	187	0 - 1,500	87	18	591	123
Coho	68	0 - 600	32	7	202	42
Pink	12	0 - 300	6	1	19	4
Total pounds					2,045	425

^a Pounds calculated using average round weight of salmon caught in the commercial fishery in District 1 of the Kuskokwim River during 1986 (Alaska Department of Fish and Game 1987b).

represented approximately one percent of the total harvest. The overall harvest per household was 2,045 pounds while the overall harvest per capita was 425 pounds of salmon.

The chinook harvest in 1986 was seven percent below the 1980 through 1985 five-year average harvest for the community (Table 19). Unfortunately, because species specific harvest information was not collected prior to 1985, it is impossible to compare specific harvest levels of sockeye, chum, and pink salmon during 1986 with those of previous years. It is also difficult to compare coho salmon harvests over time because during some years coho harvest data were not collected and other years data were collected before subsistence fishing had ended for the season. For those reasons, all species of salmon except chinook have been combined, for comparison with earlier years' harvest data. In 1986, the combined harvest of sockeye, chum, coho, and pink salmon was 10 percent greater than the 5-year average from 1980 through 1985.

Subsistence harvest levels were no doubt somewhat affected by the strength of the various salmon runs each year. In spite of the "extremely weak chinook salmon run" during the 1986 season, however, subsistence fishermen harvested close to the average number of chinook salmon based on harvests over the previous 15-year period (Alaska Department of Fish and Game 1987b:16). Harvests of coho and sockeye salmon remained relatively close to the 1985 harvest level even though the 1986 runs for those species were noticeably stronger. Of course, the link between subsistence harvest levels and run strength will be better understood over time if thorough and complete subsistence harvest data are gathered. Nevertheless, it appears that year-to-year subsistence harvest levels for the community may be influenced more by fishing effort, timing, and the collective knowledge and experience of subsistence fishermen and their resulting ability to adapt to a variety of environmental and biological conditions, than by mere run strength.

Participation in the Commercial Salmon Fishery

Although a commercial salmon fishery in the Kuskokwim River area has been operating periodically since 1913, the fishery appears to have been relatively small with little directed

TABLE 19. KWETHLUK HISTORIC SUBSISTENCE SALMON HARVEST DATA, 1934-1986

Year	Number of salmon					
	Chinook	"Small salmon"	Chum	Sockeye	Coho	Pink
1934	1,200		61,520			
1935	2,000		53,830			
1936	2,500		53,830			
1938	1,065		24,385			
1960	2,692	32,975	24,033	8,942		
1961	3,763	21,106	12,519	8,587		
1962	2,329	22,788	18,361	4,427		
1963	5,050	13,188				
1964	3,262	19,186				
1965	2,887	22,869				
1966	6,551	23,610				
1967	6,993	24,294				
1968	2,848	35,090				
1969	3,187	24,084			621	
1970	7,932	31,052			3,350	
1971	5,564	14,979			1,038	
1972	5,137	12,013			292	
1973	3,444	21,654			2,089	
1974	2,694	43,615			3,868	
1975	3,179	19,183				
1976	4,193	27,120			677	
1977	5,563	28,193			2,788	
1978	3,172	14,038			2,727	
1979	6,919	16,861			2,688	
1980	7,627	24,564			6,376	
1981	6,167	11,506			770	
1982	5,897	21,494			4,657	
1983						
1984	6,732	14,516				
1985	4,937	15,517	6,866	5,584	3,041	26
1986	5,824	19,323	9,736	5,423	3,545	619
Average harvest 1980 thru 1985	6,272	17,519	8,301	5,503	3,711	322

SOURCES: Pennoyer *et al.* 1965; Walker and Brown 1988. 1986 data were collected by M. Coffing during this study.

NOTE: During 1934 through 1938, only harvest data for chinook and chum salmon were collected. During 1960 through 1984 subsistence salmon harvest data were categorized into two basic groups: 1) chinook salmon and, 2) other salmon, referred to here as "small salmon." "Small salmon" includes all sockeye, chum, coho, and pink salmon. In 1983, subsistence salmon harvest data were not collected from Kwethluk. Other blanks indicate that harvest data were not collected on a species by species basis.

management until approximately 1959 or 1960 after the State of Alaska took over management (Pennoyer *et al.* 1965). During the first decade following statehood (1959 through 1968), the commercial fishery concentrated primarily on chinook and coho salmon; prior to August 1, only chinook salmon were permitted to be harvested commercially. Chum and sockeye salmon constituted the majority of the subsistence salmon harvest and, consequently, were managed primarily for subsistence uses and were not targeted for commercial harvest. During the 1960s, commercial fishing periods were simply scheduled openings set primarily by regulation. Since 1969, fishing periods have been opened by Emergency Order issued by the Alaska Department of Fish and Game.

In 1960, 111 individuals were licensed to fish commercially for salmon in the Kuskokwim Management Area. By 1969 that number of individuals licensed for commercial salmon fishing had increased to 601. Following the trend set by other salmon fisheries in the state, in 1976 the Kuskokwim salmon fishery (and other salmon fisheries in the Arctic-Yukon-Kuskokwim Region) was limited in participation to individuals holding a Kuskokwim "limited entry" salmon fishing permit. In that year, the number of Kuskokwim limited entry salmon fishing permits was 838 (688 permanent and 150 interim). All but one of those permits were issued to local Kuskokwim area residents (Alaska Commercial Fisheries Entry Commission 1990). In 1986, when research for this technical paper was in progress, 829 permanent limited entry salmon permits had been issued for the Kuskokwim Area. The median value of a Kuskokwim permit at that time was \$10,000 (Alaska Commercial Fisheries Entry Commission 1987). Andrews (1989:154) provides a discussion of the Kuskokwim commercial salmon fishery as it developed up to the early 1980s.

Seventy-two Kuskokwim limited entry salmon permits were issued to Kwethluk residents in 1976. In 1977, and again in 1982, three additional limited entry salmon permits were issued, bringing the total number of permits issued to Kwethluk residents from 1976 through 1986 to 78 (Alaska Commercial Fisheries Entry Commission 1988). By the end of 1986, the number of limited entry salmon permits in the community had declined to 68. Transfer of five permits to individuals residing outside of the community and the move of four permit holders out of the community were the primary reasons for

the decline. One permit was forfeited in 1986 because the renewal fees had not been paid for two consecutive years.

Participation by Kwethluk residents in other limited entry fisheries has been relatively low. By 1976, two Bristol Bay limited entry salmon permits had been issued to Kwethluk residents. By 1980, however, both had been transferred to individuals living elsewhere. In 1986, all 68 limited entry salmon fishing permits held by community residents were for the Kuskokwim Area. During that year, Kwethluk ranked third amongst Kuskokwim area communities in the number of Kuskokwim limited entry salmon permits held per community. Only Bethel and Quinhagak had more permits, with 201 and 89 respectively.

In 1986, 58 households (52 percent) had at least one permit holder. Forty-five of the 68 limited entry salmon permits were held by individuals of households owning a subsistence salmon fishing camp. Fourteen additional limited entry permits were owned by individuals of households who did not have salmon fishing camps, but were part of a salmon production unit. Thus, 87 percent of the commercial fishing permits were owned by individuals from households belonging to a salmon production unit and involved in subsistence salmon fishing. Nine of the limited entry permits belonged to individuals in households who did not participate in the production of salmon for subsistence uses.

The Kuskokwim Area is divided into four salmon fishing districts. During 1986, residents of Kwethluk fished commercially primarily in District 1, however, some fishermen also traveled to District 2, located upriver near Tuluksak, and District 4, located near Quinhagak along Kuskokwim Bay (Fig. 19). Residents fished commercially throughout District 1. Much of the commercial fishing effort was concentrated on the Kuskokwim River relatively close to Kwethluk. Areas of the Kuskokwim River used by Kwethluk fishermen when subsistence fishing with drift gill nets were also used when commercial fishing. Commercial fishing regulations allowed the use of either set or drift gill nets. During 1986, Kwethluk fishermen used only drift gill nets when commercial fishing.

In 1986, as in previous years, commercial fishing activities were frequently based from subsistence salmon fishing camps. This is especially true for individuals having camps along the main Kuskokwim River or Kuskokuak Slough. Nets, buoys, gasoline cans, boats, and other essentials were often kept at

the salmon fishing camp between fishing periods. Because many of the individuals involved in the commercial fishery were also members of a salmon production unit, it was not unusual that much of their time was spent at camp. Maintenance of boats and outboard motors, mending of fishing gear or hanging of new gear, and resting between commercial fishing periods often occurred at salmon fishing camp. When not involved with activities related to commercial fishing, there were other tasks that needed to be done such as maintenance of the camp facilities, subsistence fishing and processing, and tending to the dog teams and gardens, to name a few.

Commercially harvested salmon were often delivered and sold to tender boats anchored near the fishing areas such as near the confluence of Kuskokuak Slough and the Kuskokwim River downstream from Kwethluk. If tenders were not available locally, or if fishermen wanted to sell their catch to a particular processor, fishermen would sometimes travel downriver to Bethel where they delivered at a processor's dock.

The first commercial fishing period on the Kuskokwim River in 1986 was June 26 (Table 20). In 1986 Kwethluk commercial salmon fishermen harvested and sold 2,418 chinook, 11,710 sockeye, 24,817 chum, 89,262 coho, and 571 pink salmon (Alaska Department of Fish and Game 1987a). Over twice as many chinook were harvested for subsistence use than for commercial sale. The total salmon harvest, commercial and subsistence combined, by Kwethluk residents in 1986 was 8,242 chinook, 17,133 sockeye, 34,555 chum, 92,807 coho and 1,190 pink salmon.

FRESHWATER FISHING

Freshwater fish provide about 32 percent of the total pounds of edible resources harvested by community residents. A wide variety of freshwater fish were harvested including whitefish, Dolly Varden, Arctic grayling, smelt, Alaska blackfish, rainbow trout, lake trout, northern pike, burbot, sheefish, and longnose sucker. Harvest areas ranged from the Kanektok River near Quinhagak north to the Holitna River and included many tributaries adjacent to the Kuskokwim River as well as headwater tributaries and several lakes in the mountains east of Kwethluk (Fig. 25).

TABLE 20. COMMERCIAL SALMON FISHING PERIODS WITHIN THE KUSKOKWIM RIVER DISTRICTS DURING 1986

Date	Duration of fishing periods (hours)	
	District 1	District 2
June 26	6	6
June 30	6	6
July 3	6	6
July 7	6	6
July 10	6	6
July 31	6	a
August 4	6	a
August 7	9	6
August 11	6	6
August 13	6	6
August 15	6	6
August 18	6	6
August 21	6	6
August 25	6	a
August 28	6	a
September 1	6	a
Total hours	99	66

SOURCE: Alaska Department of Fish and Game 1987b.

^a Not open to commercial fishing.

Fig. 25.

**SUBSISTENCE NON-SALMON
FRESHWATER FISHING AREAS USED
BY KWETHLUK RESIDENTS,
1920-1987**

Legend
NON-SALMON

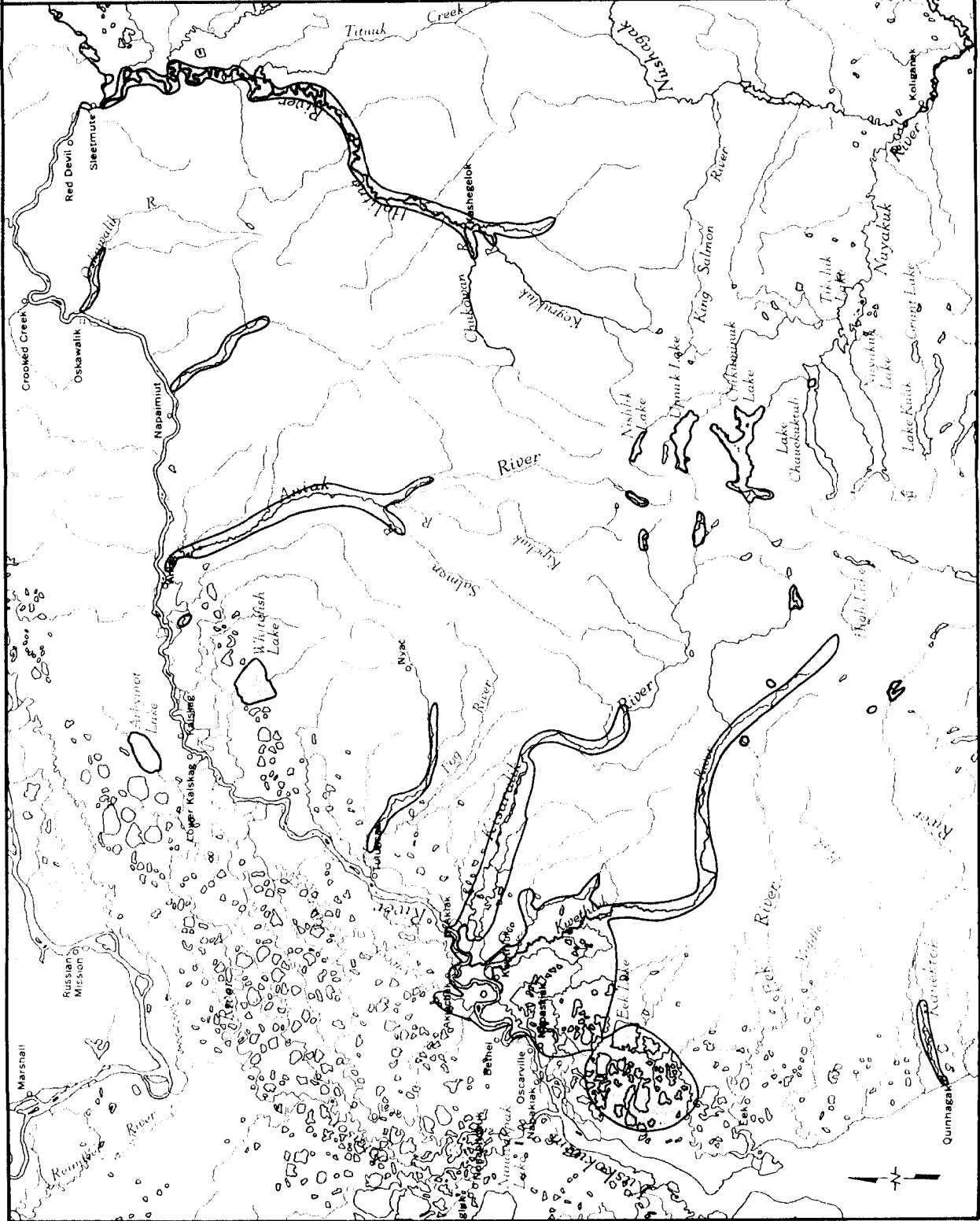
Source: Coffing, Michael W.,
Alaska Department of Fish and
Game, Subsistence Division,
Technical Paper No 157, Juneau,
Alaska

This map depicts areas used
between 1920 and 1987 by
residents of Kwethluk. Data were
compiled from interviews with ten
key respondent households during
February and March, 1987.
Additional information was added
during a community review in
May, 1987. This map represents
only those areas used by people
while domiciled in Kwethluk.
Undocumented use of other areas
may occur; consult with the
appropriate community representa-
tives for definitive information.

SCALE 1:1,000,000
0 10 20 30 MILES



STATE OF ALASKA
DEPT. OF FISH AND GAME
Subsistence Division



Historically, freshwater fish were harvested using a variety of methods including traps, hook and line, gill nets, dip nets, and spears. With the exception of spears, which were used primarily in the tributary streams, and dip nets, used primarily in the Kuskokwim River, these harvest methods were employed in the main Kuskokwim River, its tributaries, and adjacent sloughs and lakes. Residents report that they have also caught fish by hand in shallow-water mountain streams.

Prior to the introduction of cotton twine nets, and even after, freshwater fish were harvested from the Kuskokwim River and its tributaries primarily by using traps (*taluyat*) and by hooking through the ice. *Taluyat* were used both in open water and under the ice to harvest a variety of fish including whitefish, burbot, sheefish, and blackfish. *Taluyat* were also used to harvest selected species of fish, depending on where they were placed, the time of year they were used, and the size of the opening at the trap's entrance. When placed in the main Kuskokwim River, these traps caught primarily whitefish, sheefish, burbot, and salmon. *Taluyat* placed in tributary streams and sloughs harvested whitefish, salmon, and other species that were present. A wing or fence was often built in front of the trap to help guide fish towards the trap entrance. When set under the ice, the *taluyaq* was most effective when placed in areas unaffected by the constant raising and lowering of ice due to tides. The water also had to be deep enough to prevent the *taluyaq* from freezing to the surface ice. *Taluyat*, used for catching whitefish and burbot, measured approximately five to six feet in length and three feet in diameter at the large end and were made of spruce. *Taluyat* of this size were quite heavy when full of fish and were about all that one man could efficiently lift, check, and reset.

Although the use of *taluyat* became less common during the 1950s as gill nets became more popular, these traps were still in use along the Kuskokwim River. *Taluyat* were used by Kwethluk residents for catching burbot from the Kuskokwim River until the early 1960s. Kwethluk residents report that following the 1964 Good Friday earthquake, the land near the Kuskokwim River and the Delta sank or lowered and that, as a result, the affect of the tides near Kwethluk were magnified. This tidal influence then interfered with the operation of the *taluyat*, and made them difficult to use effectively. Residents of Akiak and Tuluksak, located upriver from Kwethluk, continue to use *taluyat* for harvesting burbot. Blackfish were harvested almost exclusively by fishermen using small *taluyat*

made of wood or small wire mesh. These traps were set in areas unaffected by tides such as narrow, usually shallow, tributaries connecting lakes with the main Kuskokwim River where blackfish were known to swim.

Fishing through the ice with hook and line were methods commonly used for catching northern pike, burbot, sheefish, and lake trout. Prior to the availability of commercially made hooks and lures, hooks were constructed of antler and bone. Later, lures made from antler, bone, or animal hoof were made primarily for attracting fish to take a metal hook. Lures were also used in mountain streams and lakes during periods of open water when harvesting northern pike, Dolly Varden, Arctic grayling, rainbow trout, and lake trout. Some very small fish (including salmon smolt) were harvested using a small hookless feather-lures attached to a line. Fish harvested this way had to be pulled quickly out of the water while the fish clinched the feather in its mouth. Blackfish, placed on hooks and lures were especially effective when "hooking" for burbot.

Gill nets have long been used by Kwethluk fishermen. Residents report that prior to the availability of twine, short drift gill nets made from willow bark were used. At least one resident recalled using a willow bark drifted when he was a young man. As early as 1884 netting twine was being traded by Alaska Commercial Company agents to residents of the lower Kuskokwim River in exchange for squirrel skins (Jackson 1886), however, it is not known how widespread or common the use of twine nets was during the turn of the century. Perhaps as twine and other materials, such as rope and burlap bags, which could be taken apart and used for making smaller twine, became more readily available, the use of gill nets for harvesting freshwater fish became more widespread.

Historically, gill nets were used primarily as drift gill nets. Because of the nature of the materials used for constructing nets (cotton or linen fibers which rotted quickly relative to modern synthetics) and the labor and time investment associated with making each net, set nets were not commonly used. Set nets, if left to soak in the river, tended to rot and wear out sooner than drift nets. Fishermen were careful where they placed their nets, so the nets would not be unnecessarily subjected to damage by drifting debris. Residents recalled that prior to the 1950s, families owning gill nets usually had only one

net, one that was in relatively poor condition. Some of the first commercially made gill nets residents recall seeing used on the Kuskokwim River reportedly came from the Bristol Bay region around 1920.

The commercial salmon fishery in Bristol Bay was more advanced than commercial fishing in the Kuskokwim River area and Kwethluk residents who traveled to the Bristol Bay area to work in canneries would sometimes bring used cannery gill nets back with them when they returned to Kwethluk. Dip nets were used primarily for harvesting smelt from the Kuskokwim River, however, dip nets were also used for harvesting salmon along the banks of the lower Kuskokwim River. Spears were used for harvesting trout, Arctic grayling, and Dolly Varden primarily in the tributary streams where the water was too shallow or swift for traps or gill nets.

Harvest and Use

Harvest methods employed at the time of this study included gill nets, dip nets, hooking, rod-and-reel, and *taluyat* (Table 21). Gill nets, employed as either set nets or drift nets, were used for harvesting whitefish, sheefish, and burbot. They also occasionally caught northern pike, Dolly Varden, rainbow trout, Arctic grayling, and longnose sucker. Set nets were used year-round by some fishermen, however, other fishermen used drift nets during periods of open water then used set nets following freeze-up. Men were primarily responsible for drift-netting, however, women and children also assisted with operating set nets.

Fishing with a hook and line occurred during periods of ice cover, primarily early November through late April. During March and April when the days are longer and the temperatures are mild, people of all ages, men, women, and children, can be found "hooking" at several locations along the Gweek, Kuskokwim, Kwethluk, Kisaralik, and Akulikutuk rivers.

Fishing with rod-and-reel gear took place from mid-May through early October. During June and July families traveled up the Kwethluk and Akulikutak rivers and also up the Kasigluk and Kisaralik rivers, located north of Kwethluk, where they fished using rod-and-reel gear. During late spring and

TABLE 21. METHODS AND TIMING OF HARVESTING SUBSISTENCE FRESHWATER FISH BY KWETHLUK RESIDENTS,
 SEPTEMBER 1985 - AUGUST 1986

Month	Harvest Method			
	Gill net open water	Gill net under ice	"Hooking" Rod and reel	Fish trap (<i>Taluyat</i>)
January		Pike Burbot Grayling Sheefish Whitefish	"Hooking" Pike Burbot Sheefish	
February		Pike Whitefish	Pike Burbot Grayling Sheefish Lake trout	Blackfish
March		Pike Burbot Grayling Sheefish Whitefish	Pike Burbot Grayling Sheefish	Blackfish
April		Pike Grayling Sheefish Whitefish	Pike Burbot Sheefish	Blackfish
May	Pike Sheefish Whitefish		Pike	Smelt

TABLE 21. CONTINUED

Month	Harvest Method					
	Gill net open water	Gill net under ice	"Hooking"	Rod and reel	Dip net	Fish trap (<i>Taluyat</i>)
June	Pike Grayling Sheefish Whitefish Dolly Varden			Grayling Dolly Varden	Smelt	
July	Pike Grayling Sheefish Whitefish Dolly Varden			Pike Grayling Dolly Varden Rainbow trout		
August	Pike Grayling Sheefish Whitefish			Grayling Dolly Varden Rainbow trout		
September	Pike Sheefish Whitefish			Grayling Lake trout Dolly Varden Rainbow trout		
October	Pike Burbot Sheefish Whitefish	Pike Burbot Sheefish Whitefish	Pike Burbot Sheefish	Grayling Dolly Varden		Blackfish

TABLE 21. CONTINUED

Month	Harvest Method					
	Gill net open water	Gill net under ice	"Hooking"	Rod and reel	Dip net	Fish trap (<i>Tatuyat</i>)
November		Pike	Pike			Blackfish
		Burbot	Burbot			
		Sheefish Whitefish	Sheefish			
December		Pike	Pike			Blackfish
		Burbot	Burbot			
		Grayling	Grayling			
		Sheefish Whitefish	Sheefish			

early fall, individuals at hunting and trapping camps in the mountains fished for lake trout, Arctic grayling, Dolly Varden, and rainbow trout using rod-and-reels.

Taluyat, used primarily during the ice-covered months to catch blackfish, were set in small tributaries near tundra lakes beginning in October. As the ice thickens and water levels drop, the blackfish move to areas of deeper water to avoid being frozen in. When this happens, the traps, which were then not effective, were put away until next season. Harvest estimates for freshwater fish are presented in Table 8.

Whitefish

Whitefish were harvested year-round and were taken primarily with gill nets. The majority of the whitefish were harvested during periods of open water (Table 22). The species of whitefish available include broad, humpback, Alaska, round, and least cisco. Following spring breakup, fishermen set gill nets in tributary streams at points of the stream bank, such as on a bend in the tributary, or where a second stream flows from a small lake. Set nets used for harvesting whitefish were typically less than 30 feet in length and most were between 15 and 25 feet long. These nets were often made by individual fishermen who use commercially made web and lead line, a float-line made of rope and floats made of empty plastic milk jugs or outboard oil containers. This type of set net is also often taken along on other subsistence outings when overnight camping is expected. Whitefish are harvested and used as camp food while hunters are at moose hunting camps during fall. In August, whitefish were frequently caught in drift gill nets by people commercial salmon fishing and subsistence salmon fishing in the Kuskokwim River. These whitefish were usually brought home by commercial fishermen, although sometimes they were sold to buyers who purchase salmon from the commercial fishermen or to retail grocers in Bethel. The harvest of whitefish using drift nets and set nets in the Kuskokwim River and Kuskokuak Slough and set nets in the Kwethluk and Akulikutak rivers continues through much of September and into October. After freeze-up, when the ice is thick enough to walk on, residents put set nets under the ice. During mid-November through early April, often 8 to 15 set

TABLE 22. PERCENTAGE OF FRESHWATER FISH HARVESTED BY
 KWETHLUK RESIDENTS USING VARIOUS GEAR TYPES,
 SEPTEMBER 1985 - AUGUST 1986

Species	Percent harvested with gill net open water	Percent harvested with gill net under ice	Percent harvested by hooking	Percent harvested with rod and reel
Pike	2	18	79	1
Smelt	100 percent harvested with dip nets			
Burbot	4	8	88	0
Sheefish	94	3	3	0
Grayling	5	3	2	89
Whitefish	71	29	0	0
Blackfish	100 percent harvested with fishtraps			
Lake trout	0	0	2	98
Dolly Varden	3	0	0	97
Rainbow trout	0	0	0	100

nets were placed in Kuskokuak Slough and the Kuskokwim River between the mouth of the Kwethluk River and the upstream mouth of Napaskiak Slough. Whitefish were harvested in this manner until fishermen took their nets out in late April before the ice weakened to the point where it was unsafe for them to check their nets. Whitefish were also caught sometimes while hooking through the ice for pike and burbot and also by hook and line after breakup when salmon eggs were available for bait.

August through November were months when a high percentage of the whitefish were harvested (Table 23). Generally, men were responsible for setting and checking nets or drifting for the fish. Young adults and women also often assist in this chore. Whitefish were preserved by drying, smoking, or freezing. They were often eaten fresh and were cooked by boiling and baking. Whitefish were widely distributed throughout the community especially during the fall of the year when they were abundant.

Burbot

Burbot were harvested primarily between the months of October through April. Hooking for burbot begins as soon as the river ice is strong enough to walk on and continues until breakup. Other harvest methods include the use of drift gill nets, set nets, and hooking. During the study period 88 percent of the burbot harvested were caught by hooking. Eighty percent of households harvesting burbot did so during the month of November. Harvest locations were situated primarily on Kuskokuak Slough and the Kuskokwim River, but include the area between the mouth of the Gweek River upstream to near Akiachak (Fig. 25). During winter it was not unusual to see groups of two to six people hooking at one locality. Blackfish were a favored bait for people hooking for burbot. When blackfish were not available, people sometimes use meat for bait. As with most hooking activities, people of all ages participated. October, November, and December were busy months for people trying to catch burbot. Burbot were preserved by drying and freezing. Cooking methods included boiling and baking.

TABLE 23. MONTH BY MONTH SUMMARY OF FISHING ACTIVITY FOR KWETHLUK HOUSEHOLDS HARVESTING VARIOUS SPECIES OF FRESHWATER FISH, SEPTEMBER 1985 - AUGUST 1986 (n = 36)

Month	Northern pike	Smelt	Burbot	Sheefish	Grayingling	Whitefish	Blackfish	Lake trout	Dolly Varden	Rainbow trout
January	31		13	13	7	26				
February	35		9	13	12	15	30	46		
March	43		13	13	12	15	16			
April	37		10	19	7	15	14			
May	8	92		23		16				
June	10	26		30	11	21			18	
July	10			13	18	26			35	35
August	7			28	41	40			42	44
September	4			14	37	40		54	53	42
October	25		30	21	7	29	46		10	
November	49		80	42		25	73			
December	49		44	26	7	31	30			

NOTE: Percentages are based on sampled households which harvested freshwater fish. For example, 31 percent of the households that harvested pike during the study year reported catching pike during January.

Sheefish

Sheefish were harvested occasionally throughout the year. June and August were productive times to harvest sheefish with set nets and drift nets. Sheefish were also caught with set nets placed under the ice and by hooking. November was the month when the highest percentage of households participated in harvesting sheefish. As soon as the ice goes out in spring, fishermen set gill nets in the Kuskokwim River and Kuskokuak Slough for sheefish and king salmon. Over 90 percent of the sheefish harvested were caught with either set nets or drift nets during periods of open water (Table 22). Preservation methods included drying, smoking, and freezing. Sheefish were also eaten fresh; cooking methods included boiling and baking.

Northern Pike

Northern pike were harvested year-round. Harvest methods included set nets, hooking, and rod-and-reel gear. During summer, set nets placed in tributary streams for whitefish also caught pike. Hooking areas included the lower sections of the Kwethluk, Akulikutak, Kasigluk, Kisaralik, and Gweek rivers as well as portions of the Kuskokwim River and Kuskokuak Slough. During the study year, 79 percent of the pike harvested were caught by hooking. Pike were also harvested with rod-and-reel in the Kwethluk, Akulikutak, Kasigluk, and Kisaralik rivers and in the Holitna, Holokuk, and Oskawalik rivers. Artificial lures were most often used when hooking or fishing for pike with a rod-and-reel. Once the first pike was caught, typically one of eyes of the fish was removed and put on the hook for bait. In terms of harvest levels, northern pike contributed the largest proportion of edible weight of all freshwater fish. Seventy-six percent of all households sampled reported harvesting pike (Table 8). Household participation rates in pike fishing were highest from October through April. Northern pike were normally preserved by drying and were usually eaten without any further preparation. Pike were sometimes cooked and eaten while fresh.

Dolly Varden, Arctic Grayling, Lake Trout, and Rainbow Trout

Dolly Varden, grayling, and rainbow trout were harvested most often during periods of open water using rod-and-reels within the drainages of the Kwethluk, Akulikutak, Kasigluk, and Kisaralik rivers (Fig. 25). Tributaries of the Kuskokwim River upstream from Kwethluk, such as the Tuluksak, Aniak, Holokuk, Oskawalik, and Holitna rivers have also been accessed for harvesting these fish. The Holokuk River is located on the south side of the Kuskokwim River upstream from Napaimute. Residents did not report harvesting rainbow trout in the Tuluksak River. Grayling and Dolly Varden were occasionally caught in whitefish nets or while drifting for salmon in the Kuskokwim River and Kuskokuak Slough. Both were also occasionally caught by hooking. Although not reported by the households surveyed, residents reported they harvest rainbow trout by hooking during March and April along the Kisaralik, Kasigluk, and Kwethluk rivers. Lake trout were harvested by hooking in the mountain lakes during February through May and also by rod-and-reel during from mid-August through September. These fish were usually cooked fresh and eaten at camp, dried, or brought back to Kwethluk.

Smelt

Smelt were harvested from the Kuskokwim River and Kuskokuak Slough during late May or early June as they migrate upriver. Small meshed dip nets with a hoop 15 to 30 inches in diameter on a handle 12 to 15 feet long were used for harvesting smelt. Harvest quantities varied among fishermen. Some individuals reportedly harvested several hundred smelt in a few hours. Smelt were cooked by frying and roasting when eaten fresh. Many residents preferred to dry them. To do this, the fish were threaded, one after the other, through their gills and mouths, onto slender willow whips. They were then hung outdoors to dry. Some fishermen who harvested smelt consider these fish as "emergency food," to be kept in the smokehouse or cache and used if supplies of dried salmon ran out or if food shortages occurred.

Alaska Blackfish

Blackfish were harvested using *taluyat*. These homemade wooden splint or wire-meshed funnel traps were placed in small streams, usually located within a couple of miles of Kwethluk, that flow from tundra lakes to the Kuskokwim River. To work effectively, a *taluyaq* had to be placed in the stream in a fashion that restricted the passage of blackfish to only the funnel of the trap. Harvest of blackfish generally occurred between October and April. Most households that harvested blackfish did so in October and November (Table 23). Although a relatively small percentage of all community households reported harvesting blackfish (Table 8), blackfish were widely distributed throughout the community. The mean household harvest of blackfish was 125 pounds, slightly more than sheefish, but much more than Dolly Varden, Arctic grayling, rainbow trout, lake trout, and smelt combined (15.3 lbs). Blackfish were cooked by pouring boiling water intermittently into a pot containing the fish and letting them steam for several minutes. They were one of the few species of fish that were usually not dried. As mentioned above, live blackfish were considered to be excellent hooking bait for burbot.

Other Freshwater Fish

Residents reported that they sometimes harvest other species of fish including longnose sucker and sturgeon. Longnose sucker have been incidentally harvested in the Kwethluk River using whitefish nets. Households surveyed during this study did not report harvesting suckers from September 1, 1985 through August 31, 1986, however, one household surveyed reported that sucker have been harvested in the past. Sturgeon may sometimes be harvested in the Kuskokwim River when fishing for salmon using drift gill nets. Informal conversations with Kwethluk residents revealed that at least three individuals have harvested sturgeon within the last 10 years. Residents reported that they did not harvest lamprey eels.

Information from Kwethluk fishermen indicates that other species of freshwater fish are occasionally harvested from the lakes and tributaries adjacent to the Kwethluk River east of Kwethluk.

Although residents know where these fish are found and what they look like, the question as to what species of fish these are remains unanswered.

Regulations

During the study period, fishing regulations prohibited residents from taking rainbow trout and steelhead for subsistence use. Subsistence fishing for all other freshwater non-salmon fish was always open and there were no daily bag limits, possession limits, or size restrictions. Gear types allowed for subsistence fishing were restricted to the use of gill nets, jigging or "hooking" through the ice, beach seines, fishwheels, pots, fyke nets, dip nets, longlines, spears, leads, and a line attached to a rod or pole.

Fishermen using rod-and-reel gear to catch freshwater fish were regulated by sport fishing regulations which included daily bag and possession limits and size restrictions. Rainbow trout, Dolly Varden, lake trout, and Arctic grayling were limited to a combined daily bag limit of 15 fish and a possession limit of 30. Only three fish over 20 inches long could be harvested per day and only 6 over 20 inches could be in possession in 1986. There were no daily bag or possession limit or size restrictions for northern pike. Residents do not usually fish for sheefish, burbot, or whitefish during periods of open water using rod-and-reels. Gill nets with mesh of 6 inches or smaller were required to be no more than 45 meshes deep. Nets with mesh greater than 6 inches could not be more than 35 meshes deep. Subsistence permits were not required for subsistence fishing and fishermen were not required to report their catch.

MOOSE HUNTING

Kwethluk elders recalled first seeing moose in the upper reaches of the Kwethluk, Kisaralik, and Eek River drainages during the mid-1930s and that moose were not usually seen in the lower Kuskokwim River drainage until the early 1940s. Prior to that, moose were occasionally harvested by Kwethluk hunters who traveled extensively by dogteam and on foot throughout the mountains south

and east of Kwethluk, including the upper reaches of the Holitna, Aniak, King Salmon, Nuyakuk, and Togiak rivers, trapping beaver and hunting. Moose were also harvested by hunters near traditional spring and fall camps, located in the mountains. Before sightings of moose became more common to the area, they were harvested primarily in March, April, May, and mid-August through October when people found them while involved in trapping and other subsistence activities. As encounters with the animals increased during the 1950s through the 1970s, hunters harvested them opportunistically from mid-August through April. Hunters at spring mountain camps would sometimes harvest animals during late May and early June, using the animal skin when building a skin covered boat, bringing the meat back with them to Kwethluk as they floated home on the Kwethluk River. Residents reported that moose expanded into the headwaters of the Kisaralik, Kasigluk, Kwethluk, Eek, and Kanektok rivers from the Bristol Bay area. The Kasigluk River is located between the Kwethluk and Kisaralik rivers.

In the early 1940s, hunters from Kwethluk traveled by boat up the Kuskokwim River as far as the Holokuk and Oskawalik rivers to hunt moose (Fig. 26). By the late 1940s and early 1950s, Kwethluk hunters were boating up the Holitna River drainage, and also hunted along several other tributaries including the Aniak, Kolmakof, Holokuk, and Oskawalik rivers. These fall hunting trips were made in boats measuring up to 24 feet long, constructed from wooden planks. Outboard motors available during the 1940s and 1950s were relatively low horsepower compared to the motors available in 1986. Most ranged from 5 to 22 horsepower and were not as compact and streamlined as modern outboards. Travel upriver was slow. For example, one elder reported that it took approximately three days and about one drum (55 gal.) of gasoline to travel from Kwethluk to the Oskawalik River. Over the years, although moose have expanded their range over the Yukon-Kuskokwim Delta since the 1930s, the prime moose hunting areas used during the 1980s and 1986 were still located up the Kuskokwim River from Kwethluk.

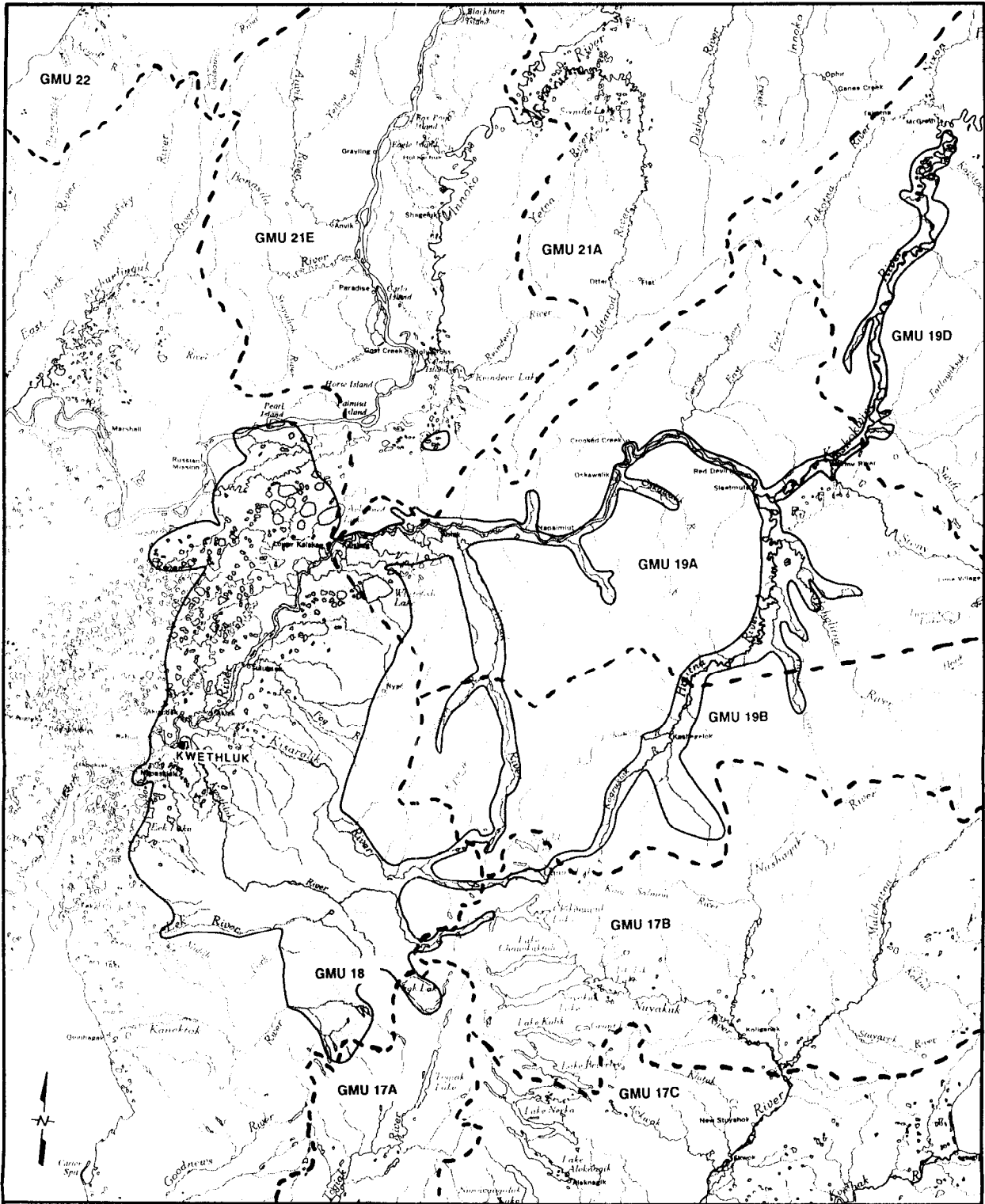
Harvest and Use

Moose were hunted in fall all along the Kuskokwim River and numerous tributaries between Bethel and McGrath. Moose hunting during December through March occurred over an area generally downstream of Aniak, but extended from the mountains areas east of Kwethluk, westward to near Russian Mission on the Yukon River (Fig. 26). During April and May, hunters having camps located in mountains east of Kwethluk occasionally harvested moose. Most of the moose hunting effort in 1985-86 occurred in Game Management Units (GMUs) 18, 19A, and 19D. In some years, moose hunting also occurs in GMUs 17A, 17B, 19B, 21A, and 21E.

Fall moose hunting activities began in late August and continued through September. This was when most households hunted moose. Some households attempted moose hunting during December through March if ice and snow conditions were favorable and if the household needed meat. Hunters out looking for other game and trappers checking their traplines also watched for moose during this time. Moose was a food that was served at many houses during Christmas and Slavic celebrations and families try to have meat on hand for those occasions.

Moose hunting was an activity involving primarily men, however, some women accompanied their husbands on moose hunting trips. Family members, both male and female, and young and old, were involved in some aspect of harvesting, processing, preserving, or preparing moose for the table. During the September moose hunt, parents often took their children out of school, especially teenage sons, to go on moose hunting trips. These trips provided valuable opportunities for youth to learn the skills necessary to become successful hunters and to gain experience in a variety of subsistence gathering activities. When there were smaller children to take care of, as was often the case with younger households, the wife usually stayed at home to care for them. Other wild resources, including many species of fish, grouse, ptarmigan, hare, black and brown bear, beaver, waterfowl, berries, and plants were harvested and used during moose hunting.

During the September season, some hunters stayed out for a couple of weeks or more. This was especially true of hunters going to areas up the Kuskokwim River. Others, hunting relatively close to



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Fig. 26. SUBSISTENCE MOOSE HUNTING AREAS USED BY KWETHLUK RESIDENTS, 1920-1987

Legend



Moose

----- Game Management Units

SCALE

0 20 40 Miles

Source: Coffing, Michael W., Alaska Department of Fish and Game, Technical Paper No. 157, Juneau, Alaska

This map depicts areas used between 1920 and 1987 by residents of Kwethluk. Data were compiled from interviews with ten key respondent households during February and March, 1987. Additional information was added during a community review in May, 1987. This map represents only those areas used by people while domiciled in Kwethluk. Undocumented use of other areas may occur; consult with the appropriate community representatives for definitive information.



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DEPT. OF FISH AND GAME
Subsistence Division

Kwethluk, such as along the Kwethluk or Kasigluk rivers, may be hunting for a week or for a few days at a time, returning periodically to replenish supplies or take care of personal business before going out again. Hunters flying to camps in the mountains often left Kwethluk in mid-August and stayed out for two to three weeks at a time. Based on data gathered during this study, during the 1985-86 regulatory season Kwethluk moose hunters were in the field an average of 8 days, ranging from 3 to 28 days afield.

As hunters traveled upriver during the September season, they kept a sharp lookout for moose, stopping to investigate tributaries, sloughs, and meadows which were productive on past hunting trips. Hunters did not always attempt to shoot a moose when they found one, particularly if there were other hunters camped in the vicinity or if they were planning to travel further upriver to favored hunting areas. Experienced hunters often returned to the same hunting areas year after year, but also hunted new areas, especially if they found other hunters already hunting their familiar areas.

When the hunters arrive at a suitable hunting area, they usually set up a temporary camp and concentrated on hunting the immediate area. Kwethluk hunters were quite knowledgeable about the habits and behavior of the animals they hunted. They studied tracks to determine whether or not there appeared to be many moose in the area as well as to determine the sex and relative age of moose in the vicinity. Some hunters were very adept at identifying the sex of a moose by examining the tracks. Moose were hunted primarily by watching and listening for the animals. Early mornings and late evenings were particularly productive times. Hunters traveled up and down tributaries by boat, looking for moose while other hunters were situated at a site where they monitored a particular meadow or scanned the adjacent countryside. Camps were often situated strategically along the rivers where there was good visibility allowing hunters to scan up and down the river. In this way, moose could be easily spotted as they approached the river or swam across it. If an area appeared to be "hunted out" and no animals were seen, hunters moved and looked for other areas to hunt. During the September hunt, most of the moose were harvested relatively close to a river, tributary, slough, or lake. The closer to the hunter's boat an animal was killed, the less work required to pack the animal out. When necessary, hunters harvested moose several hundred yards from boat access. Hunters used a variety of rifle calibers and actions when hunting. Some of the more commonly used calibers for moose hunting were

the .270, .30-30, and .30-'06. A few hunters used rifles equipped with telescopic sights, however, the majority preferred to use open iron sights. Bolt action and semi-automatic rifles were common. Hunters who had flown into remote mountain camps hunt moose on foot and scan the countryside to locate the animals. If caribou had already been harvested, hunters returning home by aircraft passed up opportunities to kill a moose because of the limited availability of space on their return flight. During some years, if not enough caribou were available, moose were sometimes harvested.

From November through April, moose often congregate in dense stands of willow which provide food and protection from the elements. During this time of year, fresh tracks and well-used trails are often more obvious indicators of where moose can be found. In some years, access to moose hunting areas during winter is sometimes hampered by the overall lack of snowcover or open water in many of the tributary streams, making them unsafe to cross. Some of the tributaries flowing from the mountains are fed by warm springs or are swift enough that they remain open throughout even the coldest winters.

Once an animal was harvested, it is cut into pieces small enough to be carried by one person. The procedure followed for field butchering an animal depended on how large the animal was, how far the meat must be packed, and whether or not the meat would be hung to dry or transported back to Kwethluk immediately. Usually moose were cut into pieces consisting of each of the four legs, head, neck, brisket, two rib sections (with backbone attached to one rib section), the pelvis, and the internal organs including the heart, liver, kidneys, and stomach. If the meat was to be transported back home immediately, the hide was often left on the front and rear legs in order to help keep sand and dirt off of the meat. If, on the other hand, it was expected to be several days before the meat was transported, all of the pieces were skinned and the meat was hung on a horizontal pole, covered to protect it from the rain and sun, and allowed to dry until the meat cooled and was dry to the touch. If two hunters, traveling together in one boat, assisted one another in getting moose, they waited until returning to Kwethluk before dividing up the meat. When the hunters were traveling in separate boats, each hunter usually took his share of the animal after the field butchering was completed, or one of the hunters transported most of the camping gear while the other transported the meat.

After the hunters returned home, the women and men cut and packaged the meat. The butchering and processing duties after the meat was in the house was primarily the responsibility of the women. Usually the meat was cut up and packaged in the house. The wife of the hunter sometimes called upon other women, often relatives, to assist her with the final processing. If the hunter was not married, his mother or sisters may assume these responsibilities. Meat that was to be given to other households may be cut into cooking-sized portions and put into plastic bags. It was also common for a household to receive a large unprocessed section such as a leg, or a side of ribs. Much of the meat was distributed throughout the community by these methods and in the end, the household harvesting the moose may have distributed most of the meat to other households. When meat was in short supply in the community, it was distributed widely to many households and consumed almost immediately. Virtually all of the households which harvested moose in 1985-86 gave meat to other households in the community. Although only 29 percent of the households successfully harvested a moose, 63 percent reported receiving moose meat (Table 8).

Moose meat was preserved by freezing and drying. Rarely was moose meat preserved by smoking or canning. The majority of households had electric freezers and some had outside meat caches where game and fish were stored during the coldest months. Hunters who harvested moose at spring camps in the mountains preserved meat by cutting it into strips and hanging it on racks or bushes to dry in the sun, making jerky. This jerky was eaten without further preparation, or it was boiled. Virtually all of the moose was used. Bones were cracked and the marrow was removed. Fat from the back and rump was cut into small pieces and eaten uncooked along with meals at home and when in the field. Part of the stomach was cleaned and prepared, and the heart, liver, and kidneys were also eaten. The whole head was usually kept so that the muscles, brain, tongue, and nose could be removed and cooked. The feet and hooves were also cooked and eaten. Moose was cooked in a variety of ways including boiling, roasting, stewing, frying and in soups. Families at spring camps in the mountains continued to use moose hides as boat coverings when building boats used to float hunters down the Kwethluk River in late spring. Antlers were occasionally used for making crafts or tools such as handles for knives.

Families frequently pooled their resources of equipment, labor, cash, and experience to be able to hunt moose. Some of the most productive moose hunting areas used by Kwethluk hunters were located north of the community in GMUs 18, 19A, 19B and 19D. These fall hunting trips sometimes consumed between one to four drums (55 gallons each) of gasoline to get hunters into productive hunting areas. Overall, the relative cost of hunting moose was still considerably less than what a family would have to pay for an equal amount of meat at the local store. For example, in spring 1987, reindeer meat sold for \$2.99 per pound in Bethel stores. Beef and other red meat were more expensive; prices in Kwethluk were even higher. The approximate usable weight of food from one moose, prepared along Kwethluk standards, is 715 pounds. Thus, the estimated value of one moose, using reindeer meat prices as a comparable substitute, was approximately \$2,100. In March 1986, the cost of gasoline in Kwethluk was \$1.86 per gallon. Thus, hunters using four drums of gasoline (220 gallons) to harvest one moose spent approximately \$410 on gasoline for a return of meat worth \$2,100, significantly less expensive than obtaining store-bought meat. Hunters sharing expenses on these hunts often tried to harvest two moose which made the hunt even more cost effective. Food and camping gear were additional expenses, however, many hunters depended largely on dried smoked salmon prepared during the summer, and game, fowl, and fish harvested during the trip, to sustain them.

On occasion, a hunter without major equipment, such as a boat and outboard motor, or without experience, asked another hunter to accompany him on a trip and paid for the gasoline and other expenses. Under this arrangement, the person paying expenses also provided a share of the meat to the person helping him.

Knowledge and skills associated with hunting moose, as well as processing and preserving the meat, were learned primarily through participation and observation. Many experienced hunters were young men when they first hunted moose with their fathers and uncles. They, in turn, took their sons and other young men hunting so that they could assist in the hunt and learn skills necessary to become competent hunters.

During the 1985-86 regulatory year (July 1, 1985 through June 30, 1986) 63 percent of Kwethluk households hunted for moose and only 29 percent of households were successful (Table 8). Less than

one-half (46 percent) of the households that hunted for moose harvested an animal. Based on survey data obtained during this study, an estimated total of 32 moose were harvested by Kwethluk hunters during the 1985-86 season. In comparison, direct observations while doing fieldwork in Kwethluk between August 1986 and April 1987 indicated that between late August 1986 and late March 1987, approximately 33 moose were harvested by Kwethluk residents. The majority (90 percent) of the moose harvest during both regulatory years occurred during September.

Regulations

During the 1985-86 regulatory year, all of the Game Management Units (GMUs) where Kwethluk hunters hunt moose had open moose seasons except for GMU 17A (Table 24). Of the GMUs having seasons, all had a September season of various duration and GMUs 17B, 18, 19A, 19D, and 21E also had winter seasons. The season in GMU 17B was the earliest fall season, opening August 20 but also closed the earliest, September 15. A special registration permit was required to hunt during the August 20 - September 4 portion of that season.

Since the time the fieldwork for this project was conducted in 1986 and 1987, and 1991, there have been several changes to the moose hunting seasons. One of these changes was moving the February season in GMU 18 (bulls only) to December 20-30, effective during the 1988-89 regulatory year. The change was in response to a proposal submitted by a Kwethluk resident which was supported by the community. The reason for the change was to allow hunters to harvest moose during mid-winter, before the Russian Orthodox holiday, when families are often in need of meat. Department of Fish and Game staff felt that an earlier season hunt would allow hunters to more easily distinguish bulls from cows, since the bulls would still have their antlers, and also supported the proposal. Another change was the elimination of the February season in GMU 21E which took effect July 1, 1989.

Several impacts occurred with the adoption of the customary and traditional use findings by the Alaska Board of Game prior to the 1987-88 regulatory year. During winter 1986-87, the Alaska Board of Game adopted customary and traditional determinations which identified those communities or

TABLE 24. SUMMARY OF 1981-1989 MOOSE HUNTING SEASONS AND BAG LIMITS IN GAME MANAGEMENT UNITS HUNTED BY KWETHLUK RESIDENTS

Regulatory year	Game Management Unit						
	17A	17B	18	19A	19B	19D	21E
1981-82	No open season	Sept.5-15, Dec.10-31. One bull	Sept.1- Dec.31. One bull	Sept.1-25, Nov.20-30, Feb.1-10. One moose; antlerless moose allowed only during the Nov. and Feb. seasons.	Sept. 1-30. One bull	Sept.1-30, Nov.25- Dec.10. One bull	Sept.5-30, Nov.1-30. One bull
1982-83	No open season	No change	Sept.1-30, Nov.15- Dec.31. One bull	No change	No change	Sept.1-30, Dec.1-15. One bull	No change
1983-84	No open season	No change	No change	No change	No change	No change	No change
1984-85	No open season	Aug.20- Sept.15, Dec.10-31. One bull; Registration permit re- quired during Aug.20 to Sept.4.	No change	No change	No change	No change	No change

TABLE 24. -- CONTINUED

Regulatory year	Game Management Unit						
	17A	17B	18	19A	19B	19D	21E
1985-86 ^a	No open season	No change	Sept.1-30, Feb.1-10. One bull	No change	No change	No change	Sept.5-25, Feb.1-10. One moose; antlerless moose allowed only during Feb.
1986-87 ^a	No open season	No change	No change	No change	No change	No change	No change
1987-88 ^b	No open season	Sept.1-15 One bull	No change	Sept.1-20, Nov.20-30, Feb.1-10. One moose; antlerless moose allowed only during Nov. and Feb.	No change	Sept.1-30. One bull	No change
1988-89 ^b	No open season	Sept.1-15 One bull	Sept.1-30 Dec. 20-30 One bull	No change	No change	Sept.1-30. One bull	Sept.5-25 One bull

SOURCE: Alaska Board of Game 1981-1989.

^a During 1985-'86 and 1986-'87 regulatory years, Kwethluk residents qualified under both subsistence and general hunting regulations in all units.

^b Determinations by the Alaska Board of Game qualified Kwethluk residents for subsistence hunts in Game Management Units 18, 19A, and 19B.

areas whose residents were eligible to participate in specific subsistence hunts. The areas having hunts which were restricted to subsistence moose hunters included GMUs 19A and 17B. GMU 19A had November and February subsistence seasons and residents of Kwethluk were qualified to participate in those hunts. However, Kwethluk residents no longer qualified for the August and December hunts in GMU 17B because they were not included in the list of communities having customary and traditional uses of moose in GMU 17B. That situation continued through the 1988-89 regulatory year, but changed with the start of the 1989-90 regulatory year when, in response to a regulatory proposal submitted jointly by the Kwethluk IRA, City, and Corporation for the March 1989 meeting of the Alaska Board of Game, the Board determined that residents of Kwethluk did have customary and traditional uses of moose in a portion of GMU 17A and 17B. These regulations were later adopted by the federal subsistence Board to apply to subsistence hunting on federal public lands in these GMUs.

CARIBOU HUNTING

Historically, caribou at times were distributed over much of the lower Yukon-Kuskokwim Delta (Skoog 1968). Archaeological evidence suggests that migrating caribou were found throughout much of the Kuskokwim Mountains east of Kwethluk and that they were hunted by people living in the areas adjacent to the Kwethluk, Kisaralik, Aniak, and Kanektok rivers. Prehistoric camps and numerous lookouts scattered throughout the Kuskokwim Mountains near the Kwethluk and Kisaralik rivers; near Trail Creek and Heart Lake, located in the headwaters of the Kwethluk River; near Kisaralik Lake, located at the headwaters of the Kisaralik River; near Kagati Lake, at the head of the Kanektok River, and near Aniak Lake, at the head of the Aniak River. Ancient stone fences, once used to guide the animals to areas where they could be harvested, have also been identified (Ackerman 1980, 1981). Kwethluk residents recall that during the early part of this century, caribou were found only in the Holitna River area and were rarely seen in the upper Kwethluk River valley. During the 1920s and 1930s, animals were occasionally seen mingling with reindeer that were being herded in the area.

Residents also reported that caribou were once abundant in the Crooked Creek drainage, a tributary of the Kwethluk River.

During the early 1960s, sightings of caribou west of the Tikchik Lakes area became more commonplace. Since that time, caribou have been found scattered throughout the upper Kisaralik, Kwethluk, and Eek River valleys. Some Kwethluk residents reported that the caribou herds currently found in these areas also include remnants of reindeer which were once numerous in the area. Residents also reported that they have been seeing more caribou in the area than ever before. Caribou tracks have been seen as far west as Three Step Mountain, located along the middle Kwethluk River approximately 25 airmiles from Kwethluk. The reasons for the increase in caribou numbers are unclear, however, residents think that caribou from the Mulchatna herd are moving into the region from the Bristol Bay area or possibly from the upper Holitna River area.

Caribou calving in the mountain areas near the Kisaralik and Kwethluk river drainages was first documented by the Alaska Department of Fish and Game in 1984. In April 1987 the Department and U.S. Fish and Wildlife Service placed collars on nine caribou captured near the mountains east of Kwethluk for tracking their movements using radiotelemetry. Nine more caribou were collared in February 1988 and 15 more were collared with radio transmitters in 1990. The use of radiotelemetry has helped biologists locate and count caribou which otherwise may have gone undetected. The recent increasing population trend is probably due, in part, to better counting techniques and survey methods facilitated by having radio-collared animals in the area. Some caribou from the Mulchatna herd appear to move in and out of the area, and part of the increase is possibly due to in-migration from that herd. Caribou were present in the area year-round and biologists continue to observe caribou cows with newborn calves during spring, indicating that at least some of the animals were resident. In May 1991, 268 cows and 156 calves were counted on the calving grounds near the headwaters of the Kisaralik River in GMU 18(U. S. Department of Interior 1991). This group of caribou is commonly referred to as the Kilbuck caribou herd. On November 16, 17, and 18, 1991 the Alaska Department of Fish and Game and the U. S. Fish and Wildlife Service conducted an aerial census and counted 2,584 caribou in the area (Alaska Department of Fish and Game 1991).

Harvest and Use

The core caribou hunting area used by Kwethluk hunters lies at the headwaters of the Kwethluk, Akulikutak, Kasigluk, Kisaralik, Eek, and Aniak rivers and includes the drainages flowing into Chikuminuk Lake, one of lakes draining into Bristol Bay (Fig. 27). The Akulikutak and Kasigluk rivers are located between the Kisaralik and Kwethluk rivers. Caribou hunting also occurs along tributaries of the Kuskokwim River, such as the Holitna, Holokuk, Kolmakof, and George rivers. The hunting areas includes portions of Game Management Units (GMU) 18, 17A, 17B, 19A, 19B, and 19D. Since June 1985, when the Alaska Board of Game closed caribou hunting south of the Yukon River in GMU 18, most of the reported hunting effort has occurred in GMUs 17B and 19B. Some subsistence hunting of caribou the Kilbuck herd has continued in the foothills and mountains east and south of Kwethluk.

During the 1980s, caribou were harvested from mid-August through mid-May with principal harvesting occurring mid-August through September and mid-December through April. During both April and August, families returned to hunting camps located in the upper Kwethluk and Kisaralik River valleys or in the vicinity of Heart Lake. From these camps people harvested a variety of wild resources, including caribou. The combination of broad valleys and gently rolling hills bordered by steep rugged mountains provide a variety of habitat for hunting caribou. The high hills and low mountains scattered throughout the area from Chikuminuk Lake westward to Three Step Mountain, along the Kwethluk River, and Spein Mountain, located between the Kisaralik and Kasigluk rivers, provided lookouts where hunters can watch for caribou. In the past, hunters traveled to the mountain areas by dogteam or on foot. During the 1980s, snowmachines and small charter aircraft were used to move hunters to mountain camps. In spring, hunters at mountain camps sometimes returned to Kwethluk using skin boats which they built using hides of caribou, brown bear, or moose. This mode of transportation, which has been used by people hunting in the mountains for many years, was still sometimes used in spring from 1986 to 1991. Between one to three skin boats were built each year, however, in some years skin boats were not used. During August and September, families returned to Kwethluk from mountain camps via small charter aircraft. Charter costs were minimized by sharing

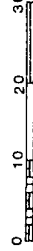
Fig. 27.

**SUBSISTENCE CARIBOU HUNTING
AREAS USED BY KWETHLUK
RESIDENTS, 1920-1987**

Legend
----- Game Management Units
 CARIBOU

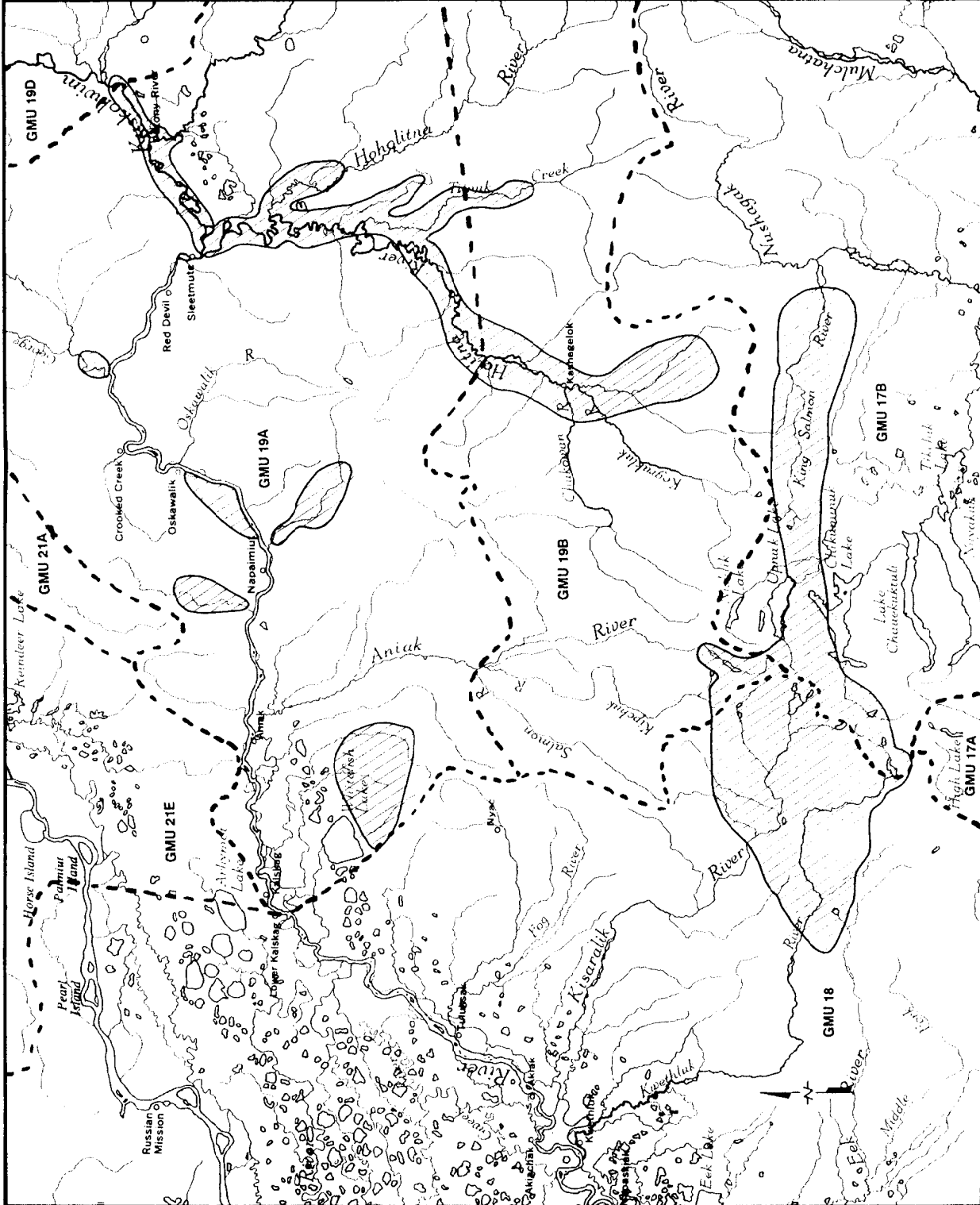
Source: Coffing, Michael W., Alaska
Department of Fish and Game,
Subsistence Division, Technical
Paper No. 157, Juneau, Alaska

This map depicts areas used
between 1920 and 1987 by
residents of Kwethluk. Data
were compiled from interviews
with ten key respondent
households during February
and March, 1987. Additional
information was added during
a community review in May,
1987. This map represents
only those areas used by
people while domiciled in
Kwethluk. Undocumented use
of other areas may occur;
consult with the appropriate
community representatives
for definitive information.

SCALE 1:1,000,000




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expenses between several families. People pursued a variety of subsistence activities on these trips and did not go only for the purpose of caribou hunting.

Hunters also harvested caribou when traveling by boat in fall. Areas where residents accessed caribou by boat include the tributaries in the central Kuskokwim River area from the Kolmakof River, located downstream of Napaimute along the central Kuskokwim River, to the Tatlawitsak River upstream of the community of Stony River. The Holitna River drainage and Titnuk Creek were also hunted. Hunters have traveled as far as Lime Village, located along the Stony River, to hunt with acquaintances there. Most of the caribou hunting involving boats was along the Kuskokwim and Holitna rivers. Boat access to fall hunting areas such as the upper Holitna River is very dependent on water levels which fluctuate widely year to year. During years when water levels in the headwater streams are high, access is easier, and more area is available to hunters. Caribou are generally not available to hunters using boats along rivers which empty into the Kuskokwim River near Kwethluk, such as the Kwethluk, Kasigluk, or Kisaralik rivers, however, that may change if caribou herds increase and expand their range.

In years past, from December to mid-April, if rivers and tributaries were frozen and there was ample snowcover, hunters traveled by snowmachine to the mountains, the upper Holitna and King Salmon River areas, and north, near Whitefish Lake southwest of Aniak, for caribou hunting (Fig. 27). Caribou were sometimes harvested by hunters while searching for moose and furbearers during winter. Weather conditions were primary factors affecting hunter access and prey availability.

Rifles such as .222, .223, .22-250, .270, and .30-'06 were used to harvest caribou. Many hunters preferred the smaller calibered rifles because less meat is damaged than when using the larger caliber rifles. Depending on the time of year and the method of transportation used, the meat was cared for in a variety of ways. After an animal was harvested it was butchered at the kill site or hauled back to the camp by snowmachine and butchered there. The goal of the initial butchering was to cut the animal into pieces that were manageable, easily handled and transported. Few tools were necessary for butchering and only a sharp knife was needed to accomplish this. If the hunter wished to keep the hide for a camp mattress, the animal was skinned first. Otherwise, the skin was left on the legs to protect

the meat from sand and dirt. Once this was decided, both front legs, including the scapulae, were cut away from the body. The rear legs were removed by cutting through the hip joints. With the animal on its back, the flank was cut mid-ventrally from the last rib to the pelvis and the sternum or brisket was removed by cutting the cartilage joining it to the ribs. After that was completed, the trachea and esophagus were pulled up to the rear while the diaphragm was cut to allow the stomach, intestines, lungs, and organs to be pulled out of the body cavity. Next, one side of the ribs was cut away from the vertebral column by severing the joints to the ribs. The vertebrae were often left attached to one side of ribs. In some instances, the backstraps were first removed and both sides of ribs were then severed from the bare vertebral column. The head was cut away from the neck at the atlas and the neck and pelvis were then severed from the spinal column.

Hunters traveling by boat away from home cared for the meat the same way as moose, by butchering the animal into several manageable pieces, described above, and hanging it from a horizontal pole near camp where it cools and dries to the touch for a few days before returning home. Hunters traveling by snowmachine found it easier to care for the meat because the cool temperatures helped preserve it. Once the animal was cut up, it was loaded onto sleds and hauled home. Hunters based out of remote mountain camps in spring and fall either hung the sections of the butchered animal on a frame made of poles lashed together specifically for the purpose, or cut the meat into strips and hung them to dry into jerky in the wind and sun. When animals were harvested several miles from camp, it might take several days to pack the meat back to the main camp for hanging. In some instances the meat may be cut and hung on drying racks away from the main camp. The meat was then retrieved several days later after it has dried and become much lighter to carry. If the temperatures remained cool and the meat could be protected from the sun and rain, no further processing was required before the meat is taken home. If the temperatures were warm and the meat could not be taken home relatively soon, it was cut into strips and made into jerky. Depending on the length of time hunters planned to stay in the field and weather conditions, sometimes all processing occurred in the field. During the spring when people at mountain camps plan to float downriver to Kwethluk in skin boats, meat was often made into jerky. Utilization, distribution patterns, and preservation and

preparation methods were very similar to those described above for moose. The stomach contents, such as sedges and other greens, were eaten. Antlers, which were usually left in the field, were sometimes used for making knife handles and other tools. Virtually all of the edible parts of the animal was utilized.

Regulations

Caribou hunting seasons and bag limits in areas used by Kwethluk residents vary from GMU to GMU (Table 25). Since 1981-82, the trend has been toward more liberal bag limits in GMUs 17B, 19A, and 19B and more restrictive seasons and bag limits in GMU 18 south of the Yukon River. There has been no change in the caribou seasons and bag limits in GMU 19D during this period. Regulations have provided for an early fall caribou opening season in GMUs 19A, 19B, and 17B which continued through March.

Prior to July 1985, there was a caribou season in all of GMU 18. In June 1985, in an emergency meeting to adopt subsistence regulations in response to the *Madison* and *Eluska* court decisions, the Alaska Board of Game closed the portion of GMU 18 south of the Yukon River at the recommendation of Department of Fish and Game biologists. In January 1986, the Board chose to maintain the closed caribou hunting season in the GMU. In 1987, the area management biologist informed local community officials that caribou hunting would be allowed in this area when the resident caribou population reached approximately 1,000 animals, although the Board of Game had not specified any management plan for the herd (Alaska Department of Fish and Game 1987c). Meanwhile, the Alaska Department of Fish and Game Department and the U.S. Fish and Wildlife Service continued to monitor the growth and distribution of the herd.

In April 1990, after the Alaska Board of Game decided not to open the area to caribou hunting in response to an emergency petition submitted by the Kwethluk IRA, a suit was filed in U.S. District Court in Anchorage. The court ordered 50 special registration permits be issued to Kwethluk residents for taking 50 antlerless caribou between April 5 and April 15 in a designated area between the upper

TABLE 25. SUMMARY OF 1981-1989 CARIBOU HUNTING SEASONS AND BAG LIMITS IN GAME MANAGEMENT UNITS HUNTED BY KWETHLUK RESIDENTS

Regulatory year	Game Management Units				
	17	18 ^a	19A ^b	19B	19D ^c
1981-82	Aug.10-Sept.5 Dec.1-Feb.28 3 caribou; No more than 1 per day; only 1 during Aug.10-Sept.5.	Feb.1-Mar.31 1 caribou	Aug.10-Sept.30 Nov.1-Feb.28 2 caribou	Aug.10-Mar.31 2 caribou, No more than 1 per day; only 1 during Aug.10-Oct.31.	Aug.10-Sept. 30 Nov.1-Jan. 31 1 caribou
1982-83	Aug.10-Sept.5 Dec.1-Mar.31 3 caribou; No more than 1 per day; only 1 during Aug.10-Sept.5.	Feb.1-28 1 caribou	Aug.10-Sept.30 Nov.1-Feb.28 2 caribou	Aug.10-Mar.31 2 caribou, No more than 1 per day; only 1 during Aug.10-Oct.31.	Aug.10-Sept.30 Nov.1-Jan.31 1 caribou
1983-84	Aug. 10-Sept. 4 Sept. 16-Sept. 30 Dec. 1-Mar. 31 3 caribou; only 1 may be taken Aug.10-Sept.4; only 1 may be transported from this unit.	Feb. 1-28 1 caribou	Aug. 10-Sept. 30 Nov. 1-Feb. 28 2 caribou	Aug. 10-Mar. 31 2 caribou, No more than 1 per day; only 1 during Aug. 10-Oct. 31.	Aug. 10-Sept. 30 Nov. 1-Jan.31 1 caribou

TABLE 25. -- CONTINUED

Regulatory year	Game Management Units				
	17	18 ^a	19A ^b	19B	19D ^c
1984-85	Aug. 10 -Mar. 31 3 caribou; only 1 before Nov.1.	Feb. 1-28 1 caribou	Aug. 10-Mar. 31 3 caribou; only 1 before Nov.1.	Aug. 10-Mar. 31 3 caribou only 1 before Nov.1.	Aug. 30-Sept. 30 Nov. 1-Jan.31 1 caribou
1985-86	Aug. 10 -Mar. 31 3 caribou; only 1 before Nov.1.	Feb. 1-28 1 caribou	Aug. 10-Mar. 31 3 caribou only 1 before Nov.1.	Aug. 10-Mar. 31 3 caribou only 1 before Nov.1.	Aug. 30-Sept. 30 Nov. 1-Jan. 31. 1 caribou
1986-87	Aug. 10 -Mar. 31 3 caribou; Only 1 before Nov. 1.	Closed	Aug. 10 -Mar. 31 3 caribou; Only 1 before Nov. 1.	Aug. 10 -Mar. 31 3 caribou; Only 1 before Nov. 1.	Aug. 10 -Sept. 30 Nov. 1 -Jan. 31 1 caribou
1987-88	Aug. 10 -Mar. 31 ^d 3 caribou; Only 1 before Nov. 1.	Closed	Aug. 10 -Mar. 31 3 caribou; Only 1 before Nov. 1.	Aug. 10 -Mar. 31 3 caribou; Only 1 before Nov. 1.	Aug. 10 -Sept. 30 Nov. 1 -Jan. 31 1 caribou

TABLE 25. -- CONTINUED

Regulatory year	Game Management Units				
	17	18 ^a	19A ^b	19B	19D ^c
1988-89	Aug. 10 -Mar. 31 ^d 4 caribou; Only 1 before Nov. 30.	Closed	Aug. 10 -Mar. 31 4 caribou; Only 1 before Nov. 30.	Aug. 10 -Mar. 31 4 caribou; Only 1 before Nov. 30.	Aug. 10 -Sept. 30 Nov. 1 -Jan. 31 1 caribou

SOURCE: Alaska Board of Game 1981-1989.

a Unit 18 south of the Yukon River.

b Unit 19A south of the Kuskokwim River.

c Unit 19D south and east of the North Fork of the Kuskokwim River.

d Unit 17B only; caribou hunting was closed in 17A and western 17C.

Kwethluk and Kisaralik rivers in GMU 18 (Coffing 1990). Thirty-nine male caribou were harvested during that hunt. Since December 1990, the Department of Fish and Game and the U.S. Fish and Wildlife Service have been working in cooperation with residents of several communities in the Kuskokwim River area, including Kwethluk, who use the Kilbuck caribou herd, as well as with other agencies, to prepare a cooperatively developed management plan for the herd. Residents of Kwethluk have contributed significantly with ideas and suggestions that have been included in drafts of the plan prepared during 1991. As of December 1991, the management plan for the Kilbuck caribou herd was still in draft form, however, more meetings between the Department of Fish and Game, the U.S. Fish and Wildlife Service, and the users were anticipated during 1992.

BEAR HUNTING

During the study period, both black and brown bear were harvested for food. Black bear are generally found in the wooded lowland, often within the riparian corridors along the Kuskokwim River and adjacent tributaries. Brown bear are more common in the foothills and mountains east of Kwethluk. Bear hunting is an activity that Kwethluk hunters have been involved in for generations. Although the community is located near the lower Kuskokwim River, an area not generally thought of as brown bear habitat, several families maintain strong ties with the mountain areas east of Kwethluk where many Kwethluk families have traditional camps, where several old settlement sites are located, and where a variety of subsistence activities continue to take place. One of those activities is brown bear hunting.

Harvest and Use

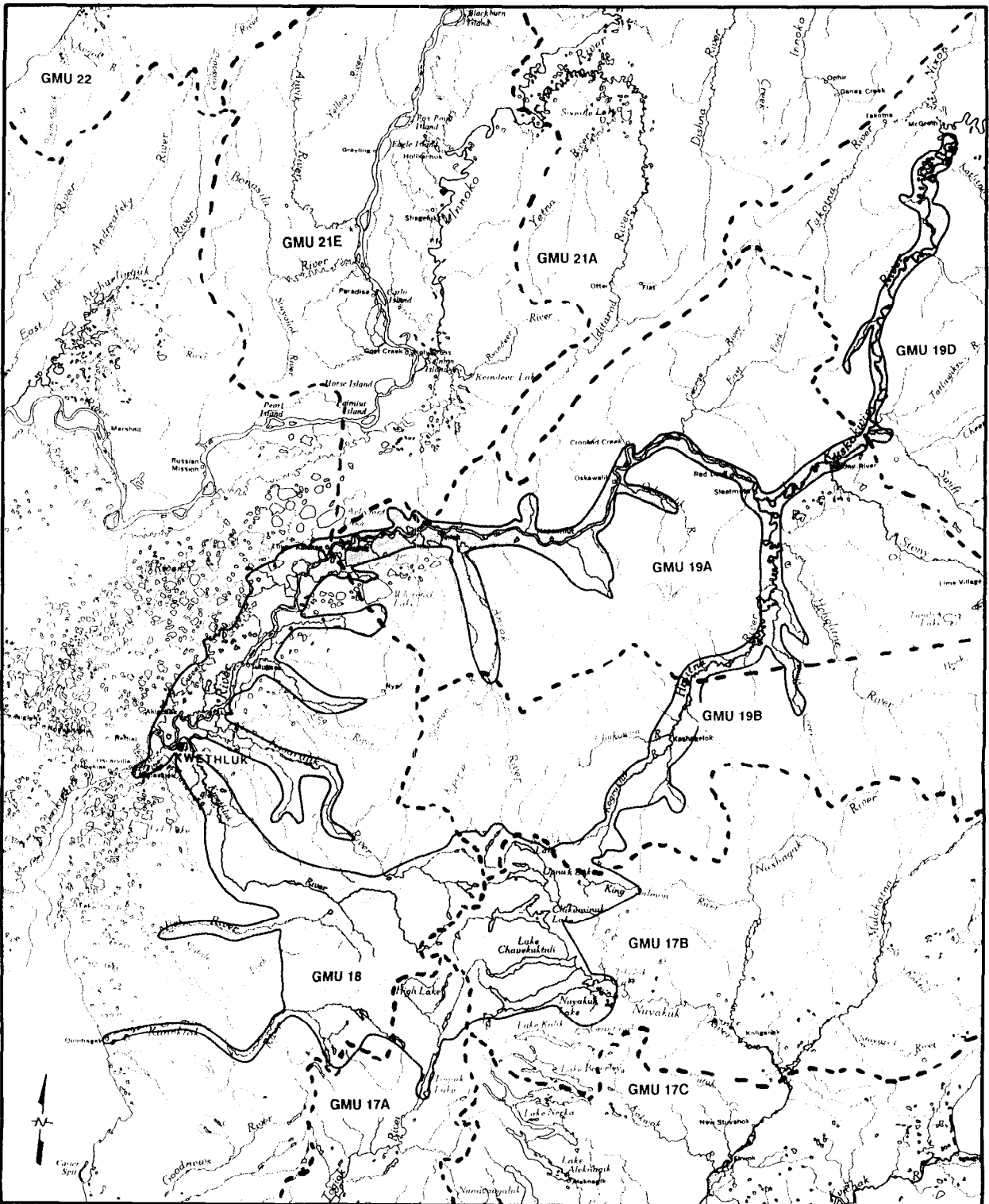
Black bear were usually harvested mid-August through September. During September especially, hunters kept a lookout for black bear while moose hunting. Although black bears were harvested primarily during the September moose hunting season, people hunt them at other times when

encountered because the meat of black bear is very good. Black bears were usually shot with a rifle, however, some hunters used snares to successfully harvest black bears during the fall. The areas used for black bear hunting (Fig. 28) closely approximate those areas used for moose (Fig. 26) and extended up the Kuskokwim River as far as McGrath. Some hunters specifically mentioned the Holokuk River drainage as an important black bear hunting area used by Kwethluk hunters since at least the 1940s. Black bear hunting areas included GMUs 18, 19A, 19B and 19D.

An experienced Kwethluk bear hunter estimated that approximately ten black bear were harvested annually by community residents. Based on a sample of Kwethluk households surveyed during this study, it was estimated that the total community harvest from September 1985 through August 1986, was three black bear. Thirty-seven percent of Kwethluk households reported receiving black bear meat.

When talking to Kwethluk hunters about brown bear, hunters often suggested that particular hunters should be interviewed because of their expertise and experience as bear hunters. Much of the information described here is based on interviews and discussions with men specifically knowledgeable of bear hunting activities.

Brown bear were harvested by hunters who went out specifically looking for them and also by hunters who encountered them while hunting for other game such as moose, caribou, and furbearers. Brown and black bears were harvested when people wanted meat and fat. Rarely were bears killed in association with salmon fishing camp activities. Occasionally bears were killed when they bothered fishing camps along the Kwethluk and Akulikutak rivers, breaking into smokehouses and taking salmon from drying racks. Brown bear were usually harvested during late March, April, May, and late August through the middle of October. Hunters preferred to harvest brown bear within a couple of weeks after the bear emerged from dens in spring. Brown bear were also harvested during late August through September after the bear have been feeding on berries. Hunters timed their brown bear hunting activities in accordance with weather conditions. During "early" springs, hunters commonly begin hunting bears in mid-March. If spring appeared to be "late," hunters commonly waited until April before hunting. Families traveled to traditional spring and fall camps near Heart Lake, located



69

Fig. 28. SUBSISTENCE BLACK BEAR AND BROWN BEAR HUNTING AREAS USED BY KWETHLUK RESIDENTS, 1920-1987

Legend



Bear

----- Game Management Units

SCALE

0 20 40 Miles

Sources: Coffing, Michael W., Alaska Department of Fish and Game, Technical Paper No. 157, Juneau, Alaska

This map depicts areas used between 1920 and 1987 by residents of Kwethluk. Data were compiled from interviews with ten key respondent households during February and March, 1987. Additional information was added during a community review in May, 1987. This map represents only those areas used by people while domiciled in Kwethluk. Undocumented use of other areas may occur; consult with the appropriate community representatives for definitive information.



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near the headwaters of the Kwethluk River, and North Fork Lake, located near the headwaters of the Kisaralik River, to harvest brown bear. There was some overlap of the geographic areas used for hunting black bear and brown bear, however, most of the brown bear hunting occurred along the Kwethluk and Kisaralik River drainages, the upland areas east of Kwethluk, and areas adjacent to the mountain lakes also east of Kwethluk. Areas used for brown bear hunting included GMUs 17A, 17B, 18, 19B, and 19A. Brown bear were killed with rifles of various calibers ranging from .222 to .30'06. Brown bears were not reportedly trapped or snared.

Brown bears were hunted by scanning the countryside with binoculars and by looking for bear tracks. Brown bear were sometimes hunted while they were still in their dens, but were usually taken after they had emerged. Some hunters knew the location of brown bear dens and bear trails which were used year after year. Knowledge of these areas was learned by experience and passed down from elder hunters who were teaching the younger men how, when, and where to hunt brown bear. Over time, hunters learned to know where to expect to see bears. Experienced hunters were able to determine the sex, size, and approximate age of a brown bear by examining its tracks. Hunters usually avoided harvesting sows with cubs. Once a hunter began to hunt a particular bear he was stalking or tracking, he might pass up opportunities to harvest other bear sighted during the hunt, especially if the other bear was a sow or appeared smaller than the bear being tracked. Hunters preferred large male brown bear particularly when in need of skins for building skin boats (*angyaqatet*). Occasionally, when hunting on foot from camps near Heart Lake and North Fork Lakes, hunters sometimes spent two or three days away from their main camp when tracking and hunting brown bear.

After a bear was killed, it was gutted, skinned, and the head was cut off. As Kwethluk hunters have done for generations, the bear skull was not brought back to the community, but was buried in the hunting area, facing the east. If the animal was harvested within a few miles of camp, the meat was packed back to camp after the initial field butchering. At camp, the meat was further processed for drying by men and women or it was hung up on a meat rack until it could be taken to Kwethluk. Meat made into jerky was often dried over a couple of weeks time. If the bear was harvested some distance from the main camp and the hunters were on foot, as occasionally happens when brown bear hunting,

the meat was cut into small pieces, hung on a drying rack, and allowed to dry for several days while hunters returned to their base camp with the hide. They returned for the meat several days later after the meat had dried and was lighter to carry.

Distribution of the bear and its parts depended on how many hunters were involved in the hunt, their age, and relationship. Generally speaking, the hunter who killed the bear usually kept the hide, but the meat was shared within the family group at the camp. When the hunting group was comprised of two hunters from two different households, the hunter making the kill usually kept the hide and the assisting hunter received the meat from the neck. The two hunters then usually divided the animal longitudinally, so that each received a frontquarter, a hindquarter, and a rib section. In instances when hunters from several households helped in harvesting, butchering, and packing the bear, the individual making the kill usually kept the hide, elders received the "choicest" parts, such as the hindquarters and internal organs, and the younger men received the front quarters. When hunters were of the same generation, the remaining meat was generally divided evenly. Selected parts of the bear were sometimes reserved for certain individuals in the hunting camp or in Kwethluk. For example, the internal organs, such as the heart, kidneys, and intestines were often distributed to elders. When the hunters returned to Kwethluk, the meat was distributed among several, often related, households.

When hunting by boat, bear meat was handled and cared for the same as moose meat. The animal was cut up into several easily sectioned pieces such as the four legs, the ribs, and the neck and was hung on a horizontal pole, protected from the sun and rain until taken home. Fresh meat was transported to the community when time and travel conditions allowed it. There it was distributed among households or frozen for later use. In 1986, 25 percent of the households received brown bear meat and 34 percent of the households received black bear meat. When hunting in the mountains during spring, families who returned to Kwethluk by floating down the Kwethluk River in skin boats often dried the meat first, making it lighter to transport. Both black and brown bear meat was considered very tasty and was prepared by drying, boiling, baking, and roasting. The bones were boiled so that all of the meat could easily be removed from them. The marrow was only occasionally used because the bones are very thick and not easily broken. The liver was considered to be too rich and was not eaten. Traditionally,

brown bear hides were used for boat coverings, door covers, and leggings and were bartered and traded to people as far away as the Yukon River. The skins were used for mukluk soles when seal skin could not be obtained. Currently, bear hides were used for mattresses and trimmings on boots. People continued to use brown bear hides when making skin boats for floating from mountain camps down the Kwethluk River to Kwethluk following breakup.

Prior to the 1960s brown bear probably contributed a larger proportion of big game harvested by Kwethluk residents. Residents reported that more Kwethluk households hunted brown bear then. There are several likely reasons why the number of households hunting brown bear has diminished over time. Thirty or more years ago families were spending longer periods of time out hunting and fishing from seasonal camps. During more recent times, few hunters stay in the field for more than two or three weeks at a time before returning home. As a result, people have fewer encounters with brown bear and fewer opportunities to harvest them. Moose and caribou are also more abundant and accessible to Kwethluk residents than in the past. Most families had at least one boat and an outboard motor which allowed them to access moose hunting areas. In contrast, prime brown bear hunting areas were not easily accessible by boat from Kwethluk. To get to areas for hunting brown bear hunters must either charter small aircraft to camps located near the mountains, hunt during the late winter and early spring when access to the mountain areas is possible using snowmachine, or rely on hunting for brown bear along the lower tributaries accessible by boat in fall. For those hunters that made the concerted effort necessary, brown bear hunting continued to be an important element of their family's subsistence activities and an avenue for sharing and distributing brown bear meat to other Kwethluk households.

Brown bear hunting was inherently dangerous compared to many other hunting activities, and was a skill that was taught to the younger men by the older experienced hunters. Opportunities for teaching these skills to younger hunters were not as frequent as in the past because legal seasons have been significantly shortened and young men are attending school during much of the year. In 1986, the spring season was over before school was out and did not reopen until September, after school was well

underway again. As with other hunting activities, some young hunters missed school in order to accompany experienced men hunting bear.

Based on their observations and experiences over the past 70 years, residents reported that brown bear numbers in the mountains east and south of Kwethluk were relatively high in 1986 and were continuing to increase. Some elders and experienced hunters attributed this increase in brown bear populations to the decreased harvest effort over the past 30 years. Hunters also reported that brown bears have also become more aggressive as their number have increased.

Kwethluk hunters estimated that the community's annual brown bear harvest was about 4 to 6 bear in spring and 1 to 3 bear during fall. Based on harvest surveys during this study, an estimated nine brown bear were harvested from September 1, 1985 through August 31, 1986.

Regulations

During the 1985-86 regulatory year, the black bear season in areas hunted by Kwethluk residents was open all year. The individual hunter bag limit was three black bear per year. In contrast, seasons in areas used for brown bear hunting, GMUs 17A, 17B, 18, 19A and 19B, were restricted to a fall and spring season (Table 26). These seasons applied to all Alaska resident subsistence and sport hunters. The non-resident spring bear season in GMUs 17A and 18 started May 10, otherwise the seasons were the same as for residents. As described above, Kwethluk hunters traditionally harvest brown bear during times when the season was not open, such as during March and August. During the 1985-86 regulatory year, the brown bear season in GMU 17, 18, and 19 did not allow harvests during those months.

Before harvesting brown bear, subsistence and resident hunters hunting in GMUs 17, 18, and 19 were required by regulation to purchase a brown bear tag from the State of Alaska for \$25. Successful hunters were required to take the skull and the skin to the Department of Fish and Game to be sealed. Hunters were then ineligible to harvest brown bear from the area again for four years (Alaska Board of Game 1985, 1986).

**TABLE 26. SUMMARY OF 1985-1986 BROWN BEAR HUNTING SEASONS IN
GAME MANAGEMENT UNITS HUNTED BY KWETHLUK RESIDENTS**

Game Management Unit	Subsistence	Resident	Non-resident
18	Sept.10-Oct.10 April 10-May 25	Sept. 10-Oct. 10 April 10-May 25	Sept. 10-Oct. 10 April 10-May 25
17A	Sept. 20-Oct. 20 April 10-May 25	Sept. 20-Oct. 20 April 10-May 25	Sept. 20-Oct. 20 April 10-May 25
17B	Sept. 10-Oct. 10 May 10-May 25	Sept. 10-Oct. 10 May 10-May 25	Sept. 10-Oct. 10 May 10-May 25
19A	Sept. 10-Oct. 10 May 10-May 25	Sept. 10-Oct. 10 May 10-May 25	Sept. 10-Oct. 10 May 10-May 25
19B	Sept. 10-Oct. 10 May 10-May 25	Sept. 10-Oct. 10 May 10-May 25	Sept. 10-Oct. 10 May 10-May 25

SOURCE: Alaska Board of Game 1985.

NOTE: Bag limits for each Game Management Unit listed above was 1 bear every 4 years.

Brown bear bag limit restrictions, the \$25 tag fee, requirements that the skull and the hide be retained and sealed, and seasons which did not include traditional hunting times discouraged some hunters from brown bear hunting activities. Other hunters continued to hunt brown bear following traditional practices, but without reporting their harvests. These hunters tried to harvest brown bear every year in the same fashion as other big game. Hunters sometimes harvested more than one bear per year. Traditional belief prohibited hunters from announcing that they planned to go kill a bear and also required that the bear skull be buried facing east near the kill. Even though hunters did not participate in the state's system of reporting their harvest, when asked during the course of this study, bear hunters willingly reported their harvests of brown bear. Because state and federal reporting methods required hunters to violate their traditional practices regarding brown bear, few hunters were willing to step forward and report their hunting success or provide useful information to the Department of Fish and Game for fear of being cited for not having a harvest tag, not having the bear skull and hide sealed, harvesting bear out of season, or harvesting brown bear more frequently than once every four years.

Subsistence bear hunters in Kwethluk did not make a habit of "boasting" or telling grandiose stories of their bear hunting experiences, or any hunting experiences for that matter. Like other animals taken for food or other subsistence uses, to harvest a bear is considered as being given a gift which is to be fully utilized and shared widely. Subsistence bear hunters found it difficult to understand the rationale of the state's regulations which allowed hunters to leave the entire body of the bear in the field, requiring the salvage of only the skull and the hide when their customs required that the bear be used for food and that the hunter follow the tradition of burying the skull in the area where the bear was killed, away from things of man, where it would not be kicked around, gnawed on by dogs, and otherwise vilified.

Although relatively few, if any, brown bears harvested by Kwethluk hunters were tagged and sealed by Department of Fish and Game biologists, Kwethluk hunters have voluntarily provided detailed harvest data to the Department of Fish and Game. Harvest data have included the number of bears harvested annually, approximate size and age, sex, and condition of the animals. They have also shared

information on the distribution and abundance of brown bear based on their experience and observations over time and have voluntarily accompanied and assisted Department of Fish and Game biologists conducting bear population surveys by aircraft. Kwethluk residents believe that brown bear, like all wildlife, are there to be used when needed.

FURBEARER HUNTING AND TRAPPING

Furbearers have always played an important role in the lives of Kwethluk residents. Before, during, and after the dramatic fall of the fur prices early this century, furs were important for trade, barter, and cash. Furs of beaver, otter, mink, fox, lynx, and wolverine were usual items of trade for commodities such as seal skins, which were used for boat coverings and mukluk soles, seal meat, seal oil, as well as staple commodities such as coffee, salt, sugar, tea, and flour, among other things.

Some furbearer species are quite numerous in the lower Kuskokwim River area. For the last few years the Department of Fish and Game has sealed more furbearers in GMU 18 than in any other GMU. The most abundant species in 1985-86 included beaver, mink, otter, muskrat, and fox. Wolf, wolverine, marten, and lynx are found in the boreal zones north and east of Kwethluk and were harvested on an opportunistic basis. Beaver were very numerous in the area and residents reported some of the tributary streams were being blocked by beaver dams making access to upstream areas difficult for people and for fish. Beaver were not always so abundant. During the early part of this century (1905-1920) until at least the late 1950s, people from Kwethluk traveled east, over the Kuskokwim Mountains, to hunt and trap beaver. Trappers traveled extensively, during winter and spring, throughout the areas around Chukiminuk and Nuyakuk lakes, as well as in the upper Holitna, Aniak, King Salmon, and Togiak River drainages in search of beaver. Prior to 1960, GMU 18 was closed to beaver trapping. Residents reported that as beaver gradually became more common in the lower Kuskokwim River region, such as along the headwaters of the Kisaralik, Tuluksak, Kwethluk, Eek, and Kanektok rivers, people began to harvest them in those drainages.

Wolf and wolverine were reportedly more abundant in the area during the 1920s and 1930s, during the era of reindeer herding, than in 1985-86. During times when reindeer were calving, herders had to constantly be watchful for wolves and wolverine who were preying on newborn reindeer calves. According to residents, after reindeer were no longer abundant and herding in the area had ceased, numbers of wolves and wolverine declined. Thus these furbearers were encountered less frequently and were harvested less often.

Harvest and Use

The area used when harvesting furbearers extends from the Tikchik Lakes area, westward to the Kuskokwim River, and encompasses the valleys and tundra areas adjacent to the Kwethluk and Kisaralik rivers (Fig. 29). Many of the same travel routes used by Kwethluk residents when hunting and trapping furbearers years ago were still being used in 1986.

Methods used to harvest furbearers varied depending on the time of the year and the species harvested. Furbearers were harvested with snares, Conibear traps, leg-hold traps, basket traps (*taluyat*), and by shooting. *Taluyat* are wire-meshed or wooden lathe funnel traps made locally. Generally, most furbearers were trapped or snared, with the exception of muskrats which were primarily hunted using .22 caliber rifles (Table 27). Number 1 single-spring leg-hold traps were commonly used for harvesting squirrel. Number 1 1/2 to Number 3 size leg-hold traps were usually used for catching fox. Mink and otter were caught using Conibear traps, Number 1 1/2 size leg-hold traps, and *taluyat*. Reportedly, older trappers depended more on using *taluyat* for catching mink while younger trappers tended to use Conibear traps for these animals. Beaver were harvested using snares, Conibear traps, leg-hold traps, and were also shot.

During the study period, furbearer harvest effort was aimed at beaver, mink, otter, red and cross fox, and muskrat. Beaver, muskrat, and fox were the primary furbearers harvested (Table 8). Trappers did not specifically direct their effort towards wolf, wolverine, lynx, or marten, however,

Fig. 29.
SUBSTANCE FURBEARER
HUNTING AND TRAPPING AREAS
USED BY KWETHLUK RESIDENTS,
1920-1987

Legend
 **FURBEARERS**

Source: Coffing, Michael W.,
 Alaska Department of Fish and
 Game, Subsistence Division,
 Technical Paper No. 157, Juneau,
 Alaska

This map depicts areas used
 between 1920 and 1987 by
 residents of Kwethluk. Data were
 compiled from interviews with ten
 key respondent households during
 February and March, 1987.
 Additional information was added
 during a community review in
 May, 1987. This map represents
 only those areas used by people
 while domiciled in Kwethluk.
 Undocumented use of other areas
 may occur; consult with the
 appropriate community representa-
 tives for definitive information.

SCALE 1:1,000,000
 0 10 20 30 MILES



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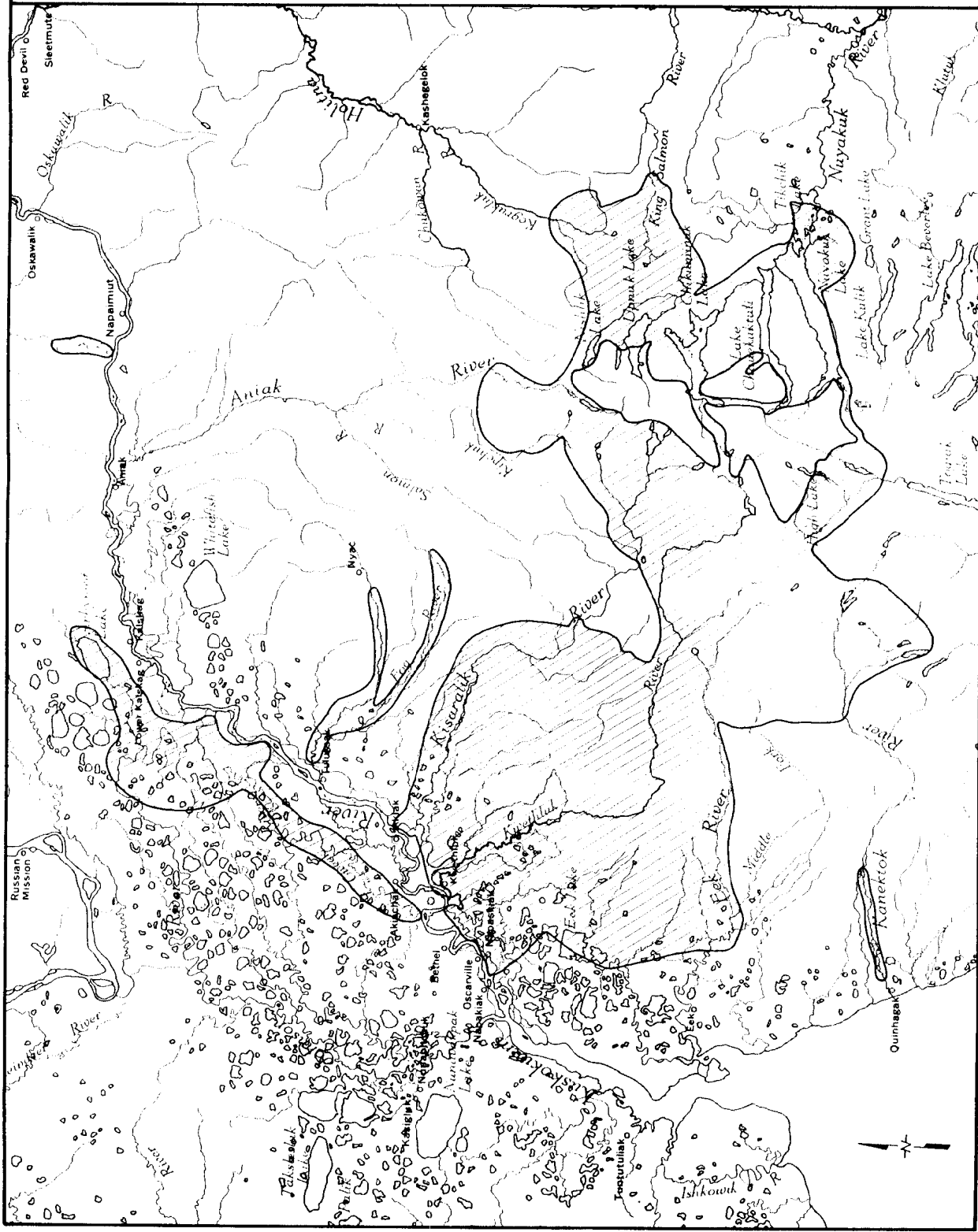


TABLE 27. METHODS OF HARVEST AND USE OF FURBEARERS BY KWETHLUK RESIDENTS, SEPTEMBER 1985 - AUGUST 1986

Resource	Percent hunted	Percent trapped ^a	Percent sold ^b	Percent eaten	Percent dog food
Beaver	19	81	25	54	27
Mink	6	94	0	38	56
Otter	13	87	23	33	23
Muskrat	74	26	0	37	63
Red Fox	3	97	16	0	0

^a Includes harvest using snares.

^b Does not include any furs that may have been sold by households that were given furs or furbearers as gifts.

trappers were aware that they might encounter these animals and were on the lookout for them while tending their trap lines or when involved in other subsistence activities.

Beaver, mink, and otter were the furbearers most commonly sold, however, 75 percent or more of the fur harvested was not sold but was used domestically for clothing, crafts, and food. Occasionally, an individual, such as an elder, would ask a trapper to catch a certain type of furbearer for them. When fur prices are low, trappers reported that they frequently trade or give some of the lower valued animals to relatives or elders for use either as food or for crafts. Sometimes people receiving furbearers will then sell them to a fur buyer (H. Jones pers. comm., 1988). The meat of all types of furbearers, except for fox, wolf, and wolverine, was used for food and was also used as dog food.

Most furbearer harvesting activities were aided by the use of a snowmachine and sled. Some residents used all-terrain vehicles to hunt furbearers in areas relatively close to Kwethluk. During the study period, at least one trapper used his dog team for checking and maintaining his trapline. Small boats were used extensively during periods of open water, especially for harvesting muskrat and beaver. Several trappers made day trips from Kwethluk to check their traps and snares. Others maintained a trapping camp close to their trapping area go out for several weeks at a time, returning to Kwethluk periodically. One family maintained a sod-covered shelter along the Kwethluk River which was used primarily as a trapping line cabin. The shelter was resodded periodically and was kept in usable condition.

Furbearer harvests fluctuate with seasonal or local weather conditions. During winters when many of the tributaries freeze-up late or when there is little or no snow cover, it is difficult for hunters and trappers to access much of the hunting and trapping areas. Low fur prices also affect the number of furbearers harvested. During the 1985-86 season, on the average, beaver were being sold for \$23, mink for \$33, red fox for \$30, otter for \$30, and muskrats for \$0.60 (H. Jones pers. comm., 1988). Some individuals skin, stretch, and dry their furs before selling them. Others sell the entire furbearer, usually accepting a lower price and letting the fur buyer do the skinning.

Regulations

Residents 16 years old or older, who hunted or trapped furbearers for subsistence use, barter, or sale were required to purchase a hunting or trapping license. In 1985-86, bag limits and seasons for furbearers in the areas used by Kwethluk residents were fairly liberal (Table 28). Many furbearers could be harvested with either firearms, traps, or snares. Conventional steel traps were required to have a jaw spread of 9 inches or less and Conibear traps were required to have a jaw spread of less than 11 inches. Snares had to be less than 72 inches long. Traditional Yup'ik *taluyat*, described earlier, were also legal gear.

Individuals who harvested furbearers were required to fill out a harvest report and to have beaver, otter, wolf, wolverine, lynx, and marten sealed by a representative of the Department of Fish and Game, including village sealing agents, within a specified time following harvest. Depending on the species and the methods used to harvest, this sealing period was either 60 days after harvesting or 30 days after the close of the season. For example, during 1985-86, wolf or wolverine harvested using a trap or snare had to be sealed within 30 days of the close of the season, whereas individuals harvesting the same species using a gun were allowed 60 days from the date of harvesting the animal to have the skin sealed. Fur sealing requirements applied to all untanned skins of beaver, otter, wolf, wolverine and lynx, regardless whether the skins were sold to a fur buyer or kept by the household for use in clothing and traditional crafts. As mentioned earlier, many furs were processed at home, used in Native crafts, and were never sealed.

Methods used for harvesting beaver were restricted to traps or snares, except that firearms could be used in GMU 18 from April 1 through June 10. The hunting and trapping seasons for beaver did not correspond to customary seasons and practices. For instance, beaver were harvested not only for their fur, but also for meat. During late August and September, when many households were hunting moose, beaver were commonly harvested for camp food. During 1985-86 and since, regulations prohibited harvesting beaver for food during this time of year.

TABLE 28. SUMMARY OF FURBEARER TRAPPING SEASONS AND BAG LIMITS IN GAME MANAGEMENT UNITS USED BY KWETHLUK RESIDENTS, 1985-1986

Resource	Game Management Units			
	18	19	17B	17A
Beaver	Nov.1 - June 10 No limit	Nov.1 - April 15 40 per season	Jan.15 - Mar.15 20 per season	Jan.1 - Jan.31 20 per season
Fox	Nov.10 - Mar.31 No limit	Nov.1 - Mar.31 No limit	Nov.10 - Feb.15 No limit	Nov.10 - Feb.15 No limit
Otter	Nov.10 - Mar.31 No limit	Nov.1 - April 15 No limit	Nov.10 - Mar.31 No limit	Nov.10 - Mar.31 No limit
Muskrat	Nov.10 - June 10 No limit	Nov.1 - June 10 No limit	Nov.10 - June 10 No limit	Nov.10 - June10 No limit
Mink	Nov.10 - Jan.31 No limit	Nov.1 - Mar.31 No limit	Nov.10 - Jan.31 No limit	Nov.10 - Jan.31 No limit
Wolf	Nov.10 - Mar.31 No limit	Nov.1 - Mar.31 No limit	Nov.10 - Mar.31 No limit	Nov.10 - Mar.31 No limit
Marten	Nov.10 - Mar.31 No limit	Nov.1 - Feb.28 No limit	Nov.10 - Feb.28 No limit	Nov.10 - Feb.28 No limit
Lynx	Nov.10 - Mar.31 No limit	Nov.1 - Mar.31 No limit	Nov.10 - Mar.31 No limit	Nov.10 - Mar.31 No limit

SOURCE: Alaska Board of Game 1985.

SMALL GAME HUNTING AND TRAPPING

Small game includes ptarmigan, hare ("rabbits"), parka squirrel, marmot, porcupine, and grouse. Small game was harvested throughout much of the area used when harvesting other wildlife (Fig. 30). Harvest activities occurred throughout the year, however, the primary harvest time occurred from mid-August through May.

Harvest and Use

Seventy-four percent of the households reported hunting for small game and approximately one percent of the total edible weight of wildlife harvested was small game. Small game provided food at hunting camp and in the home. In 1985-86, more than one-half of the households sampled harvested ptarmigan and porcupine and nearly one-third hunted for hare (Table 8). Except for parka squirrels and marmot, small game were generally available relatively close to the community. Some of the first game harvested among young hunters learning how to hunt is small game, such as hare and ptarmigan. Many of the skills needed to harvest larger game, such as moose, caribou, and bear, are developed and learned while hunting small game. During the 1985-86 season, ptarmigan and porcupine provided the majority of the small game harvested.

Snowshoe hare were found near areas of dense willow cover which grows adjacent to most of the drainages. These animals were harvested by snaring and shooting. Hare populations in the area are characteristic of hare populations throughout Alaska. In some years populations are high and the hare are very abundant, while other years, they are scarce. The number of hare harvested annually is influenced by this cyclic variation in population abundance. Tundra hare, usually found in the open tundra areas, were also harvested by shooting. February through March was a preferred time for hunting them.

Porcupine are found wandering throughout the upland area used by Kwethluk residents for subsistence activities. From dense stands of spruce to the lichen-covered mountainside, solitary

porcupine are found any time, any place. They were harvested on an opportunistic basis all year long, when people were out gathering firewood, while moose hunting, while checking traplines, and while hunting caribou and furbearers. Porcupine are slow moving and relatively easy to kill. They were usually killed by hitting them over the head with a stick or shot with a small caliber rifle. Porcupine were harvested primarily for food and were prepared much the same way that hare were prepared. Residents also made use of the quills for making crafts such as earrings.

Ptarmigan represented over one-half of the pounds of small game harvested. These birds were most frequently hunted in winter and spring. Beginning in early March, flocks of ptarmigan, some containing several hundred birds, move from the uplands and mountain areas into the lowlands along the Kwethluk and Akulikutak rivers and other areas having patches of willow, which provide cover and food. These flocks of birds were easily hunted with a .22 rifle or a shotgun, becoming more wary and skittish after being disturbed several times. Some individuals used snares to catch ptarmigan.

Ptarmigan were preserved by freezing or drying after being plucked or skinned. It was not unusual to see 15 to 30 skinned ptarmigan, hanging from wooden meat racks above a house or cache, drying in the sun during April and May. Once dried, the birds commonly were eaten without any other preparation. As with many dried foods, seal oil was a frequent condiment to dried ptarmigan. Ptarmigan were also cooked by boiling and were often the basis for soups.

Grouse were hunted between late August and early May, however, grouse were occasionally harvested near salmon fishing camps during the summer. They were also harvested along the Kwethluk, Akulikutak, and Kisaralik rivers and in areas where moose hunting occurs. Parka squirrel were harvested in the mountains during March, April, August, and September. Squirrels were harvested with small traps such as Number 0 or Number 1 single-spring leg-hold traps set at holes at the dens. People had favorite squirrel trapping areas used year after year. After the squirrels were caught, they were skinned and hung on meat drying racks to dry before being taken back to Kwethluk where they were shared with other families, cooked and eaten, or frozen for later use. The skins were stretched, dried, and used for making parkas. Squirrel skins were also bartered and sold. Although residents did not report harvesting marmots during the study period, marmots were harvested

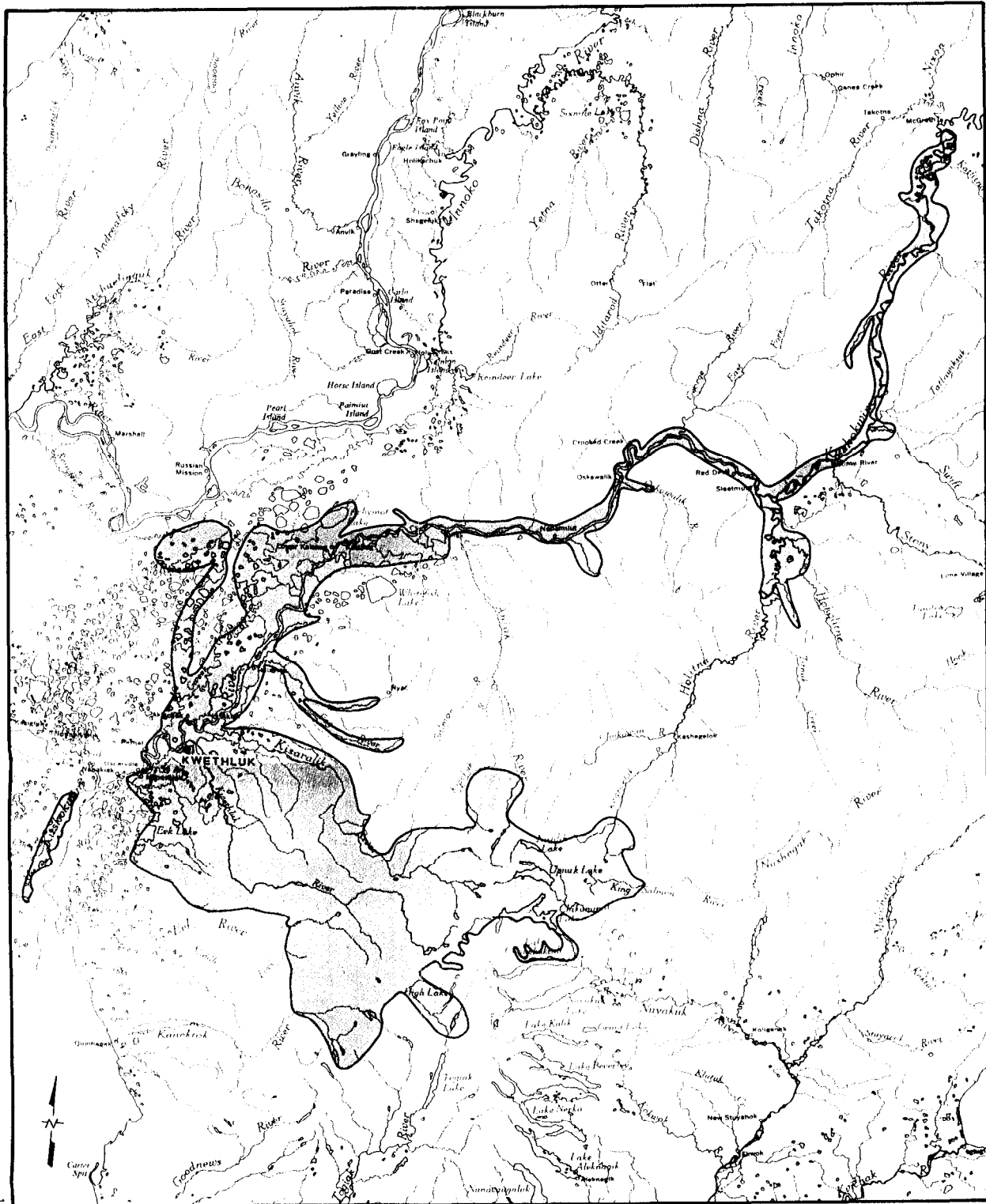


Fig. 30. SUBSISTENCE SMALL GAME HUNTING AND TRAPPING AREAS USED BY KWETHLUK RESIDENTS, 1920-1987

Legend

 Small Game

SCALE

0 20 40 Miles

Sources: Coffing, Michael W., Alaska Department of Fish and Game, Technical Paper No. 157, Juneau, Alaska

This map depicts areas used between 1920 and 1987 by residents of Kwethluk. Data were compiled from interviews with ten key respondent households during February and March, 1987. Additional information was added during a community review in May, 1987. This map represents only those areas used by people while domiciled in Kwethluk. Undocumented use of other areas may occur; consult with the appropriate community representatives for definitive information.



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occasionally when people were in the mountains hunting big game and when trapping parka squirrels. Marmots were used similarly to parka squirrels.

Regulations

Small game harvest seasons and bag limits during the 1985-1986 regulatory year provided for liberal seasons and possession limits for porcupine, hare, and squirrel (Table 29). With the exception of season dates for ptarmigan and grouse, which closed April 30, small game seasons and bag limits appear to match fairly well with customary practice. The small game seasons and bag limits in effect during 1985-86 were the same seasons and bag limits which have been in effect for several years. One exception was that prior to July 1985, squirrels could not be harvested unless the hunter held a valid trapping license.

MARINE MAMMAL HUNTING

Even though Kwethluk is located nearly 100 miles from the Bering Sea coast, some residents traveled to the coast at Kuskokwim Bay to harvest marine mammals during the study period. Historically, Kwethluk residents traded furs and other goods for marine mammal products. Residents reported that people from communities along the coast from Nunivak to Quinhagak customarily traveled up the Kuskokwim River to Kwethluk to trade seal, walrus, seal oil, and seal hides for items such as squirrel skins, bird skins, wolverine, wolf, and brown bear skins. Walrus, seal, and seal oil were used for food while seal skins were used for making mukluk soles, to cover kayaks, and for making rope and lashings. Seal skins also carried to the mountains and used to build skin-covered boats for floating hunters and their goods back to Kwethluk.

Marine mammals, including bearded, spotted, harbor, and ringed seals, walrus, and belukha whale were routinely found in Kuskokwim Bay and within the Kuskokwim River near its mouth. According to local residents, belukha whale and seals used to be more abundant in the lower Kuskokwim River

TABLE 29. SUMMARY OF 1985-1986 SMALL GAME HUNTING SEASONS AND BAG LIMITS IN GAME MANAGEMENT UNITS USED BY KWETHLUK RESIDENTS

Species	Season	Bag limit
Porcupine	No closed season	No limit
Hare	No closed season	No limit
Parka squirrel	No closed season	No limit
Marmot	No closed season	No limit
Grouse	Aug. 10 - April 30	15 per day, 30 in possession
Ptarmigan	Aug. 10 - April 30	20 per day, 40 in possession

SOURCE: Alaska Board of Game 1985.

area than they were during this study. It was not uncommon to see belukha whale and seals in the lower Kuskokwim River, in the vicinity of Bethel, each summer. In the mid-to late 1950s, a belukha was caught when it tangled in the salmon net of a fisherman near Kwethluk. A belukha was seen near Sleetmute, located 236 miles upriver from Kwethluk, in 1964. During the summer 1988, more belukha than usual were seen in Kuskokwim Bay near Quinhagak, and near the mouth of the Kuskokwim River. Sightings of belukha near Aniak were reported in 1989 and 1990, so it is not entirely unlikely that at sometime in the future belukha may again be caught by Kwethluk fishermen or hunters. People attributed the reduction of marine mammals in the river to the increase in motorboat traffic and commercial salmon fishing activities as well as natural variation in animal populations.

Seals were occasionally seen in the Kuskokwim River during summer as far upstream as the Gweek River located nine miles downstream from Kwethluk. Seals that find their way upriver are usually solitary animals and are probably spotted, harbor, or young bearded seals. Distribution and abundance of these marine mammals is largely a function of environmental factors such as sea ice conditions, tides, and temperatures, as well as the availability of prey species such as salmon and other fish.

Harvest and Use

The area used by Kwethluk residents for hunting marine mammals extended from the mouth of the Johnson River, downriver to Kuskokwim Bay, along the Bering Sea coast from Jacksmith Bay, south of Quinhagak, to Kinak Bay, near Kipnuk (Fig. 31). The principal hunting areas were located along the coast and downstream from Tuntutuliak.

Seals were the primary marine mammal hunted. Hunters traveled to communities such as Eek, Kwigillingok, and Kipnuk, where they had relatives with whom they hunted. Spring seal hunting trips were a part of the usual seasonal round for some Kwethluk hunters who participated year after year. Others participated on a less regular basis. Depending on the ice conditions and the timing of spring

breakup, hunters wanting to go to spring mountain camps at times had to forego an opportunity to hunt marine mammals, since these two activities sometimes occurred during the same time.

Marine mammal hunting in Kuskokwim Bay occurred from late March to early May, depending on environmental factors such as ice conditions, temperatures, and winds. Late April was often the optimum time for seal hunting. During that time there is usually shorefast ice, extending from the coastline, and drift ice, which provides favored habitat for seals. Hunters based their activities from coastal communities and transported outboard powered skiffs to the ice edge using snowmachines and sleds, where the hunt occurred. Kwethluk hunters usually hunted with residents of Kuskokwim Bay communities, including Kwigillingok, Eek, and Kipnuk. Hunting methods were probably similar to those described for Kwigillingok hunters (Stickney 1984). Harvest within the Kuskokwim River was often done on an opportunistic basis during periods of open water.

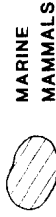
Less than 10 percent of the Kwethluk households interviewed reported that they had attempted to harvest marine mammals sometime between September 1, 1985 through August 31, 1986 (Table 8). Although relatively few households participated in these harvest activities, those that did were usually successful in harvesting seals. Households reported that walrus were hunted incidentally to seal hunting activities.

Marine mammal products received wide distribution. During the study, 68 percent of households reported receiving seal meat and 63 percent reported receiving seal oil. Seal oil was used by most households. The desirability of marine mammal products was obviously much greater than mere participation rates and harvest levels indicate. Seal oil and seal meat were often obtained from hunters within the community, when available, or from friends and family members in other communities (Table 11). Seal oil was also periodically available in the Kwethluk Native store. Marine mammal products also were routinely purchased from individuals of "downriver" or coastal areas.

Fig. 31.

SUBSISTENCE MARINE MAMMAL HUNTING AREAS USED BY KWETHLUK RESIDENTS, 1920-1987

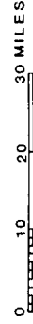
Legend



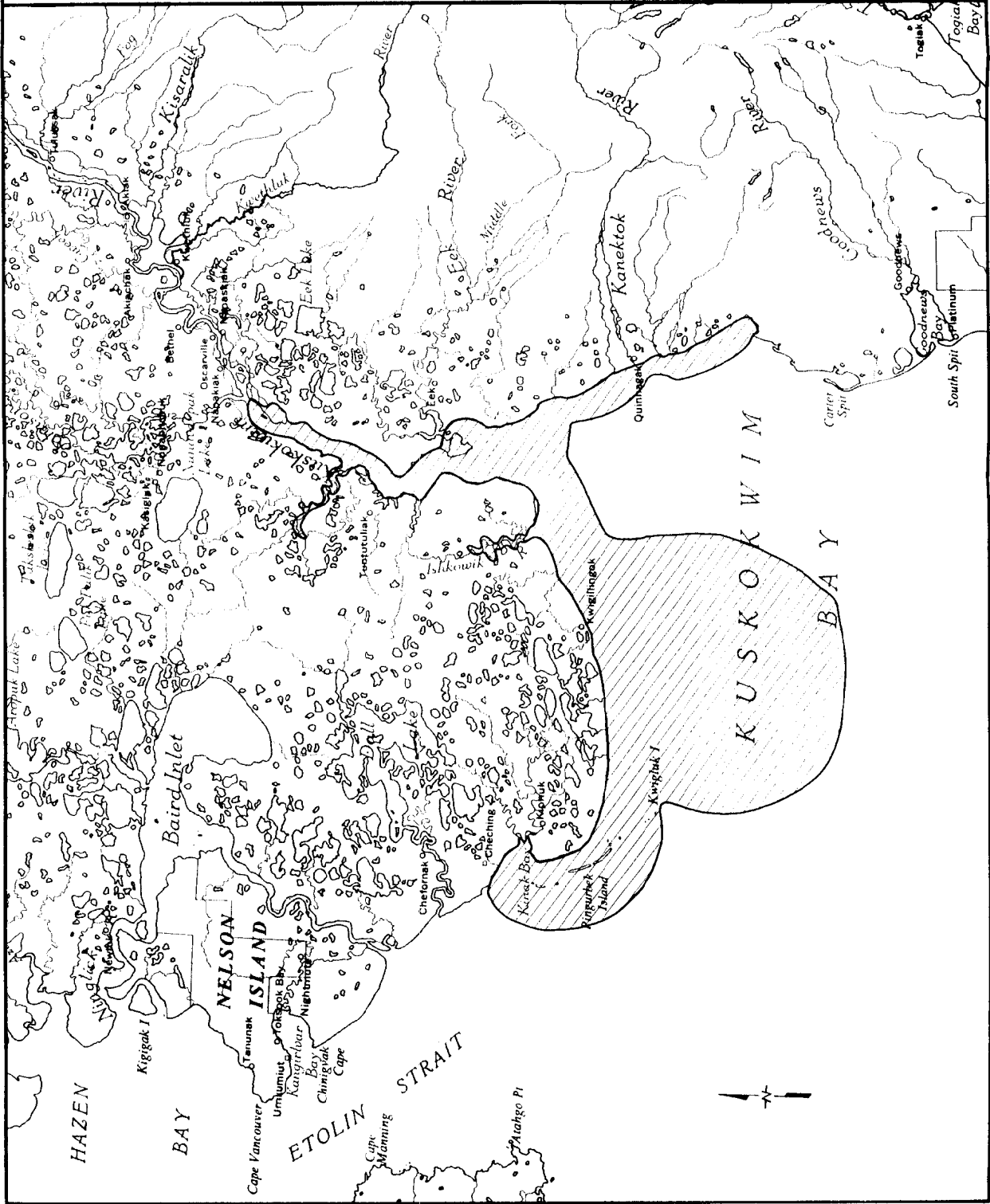
Source: Coffing, Michael W., Alaska Department of Fish and Game, Subsistence Division, Technical Paper No. 157, Juneau, Alaska

This map depicts areas used between 1920 and 1987 by residents of Kwethluk. Data were compiled from interviews with ten key respondent households during February and March, 1987. Additional information was added during a community review in May, 1987. This map represents only those areas used by people while domiciled in Kwethluk. Undocumented use of other areas may occur; consult with the appropriate community representatives for definitive information.

SCALE 1:1,000,000



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Regulations

Under provisions of the Marine Mammal Protection Act, seal and belukha whale are managed by the U.S. Department of Commerce and walrus are managed by the U.S. Department of Interior. In 1985-86 and since, only Alaska Natives were allowed to harvest marine mammals. The harvest of marine mammals was not restricted by seasons or bag limits.

WATERFOWL HUNTING

The Kuskokwim River Delta area is an important nesting and rearing area for numerous species of waterfowl. Species of ducks harvested by Kwethluk hunters include pintail, greater scaup, American wigeon, mallard, black scoter, white-winged scoter, green-winged teal, goldeneye, shoveler and eider. Geese species harvested include white-fronted and several subspecies of Canada geese. Tundra swans and sandhill cranes were also harvested. Traditionally, waterfowl were hunted when they first arrived in spring. Once the birds began to lay eggs and nest, people stopped hunting until the young were hatched and the adults were molting. Eggs of some species were collected. Firearms were used in the past, much as they were during this study. Historically, nets placed in lakes were also used to capture molting birds which could be driven or herded. During the study period, waterfowl were harvested primarily using firearms.

Harvest and Use

Although much of the waterfowl harvest occurred relatively close to Kwethluk, areas used for hunting waterfowl covered a large area (Fig. 32). The arrival of the birds in spring often coincides with spring breakup, a time when travel over the land and water is sometimes difficult. By the time many of the birds have returned, much of the surrounding landscape is bare of snow and low-lying areas are covered with water. Water-covered, partially frozen lakes and tributaries make travel with

snowmachine cumbersome and sometimes dangerous. Hunters traveled to and from hunting areas on foot and with the aid of snowmachine, all-terrain vehicles, and small boats. Early in the season, a few hunters used snowmachines or all-terrain vehicles to pull small aluminum boats up the still frozen tributaries to hunt waterfowl in areas located near the Kwethluk and Akulikutak rivers (Fig. 32). As the snow and ice melt and water levels rise, these small boats were used to move hunters through the maze of marsh and small lakes. Waterfowl were harvested as birds flew past the hunters and as birds were scared from potholes and small lakes by stalking hunters. In spring, some individuals traveled to coastal communities such as Kipnuk, Kwigillingok, and Eek where they sometimes combined waterfowl hunting activities and marine mammal hunting (Figs. 31 and 32). This is when eider ducks were usually harvested.

Waterfowl were also harvested during late summer and fall. Hunters harvested waterfowl in conjunction with other late summer and early fall subsistence activities such as berry picking, moose hunting, and wood gathering. By mid-late September many of the birds had left on their southward migration and were not available to hunters for the remaining 10 weeks of the hunting season which closed December 16 (Alaska Board of Game 1985). Kwethluk hunters reported that a few ducks overwinter near foothills and mountains where there is open water throughout the winter due to swift currents and warm water springs. Hunters reported these ducks were sometimes the first ones seen in the spring. Kwethluk hunters have harvested ducks from these areas during December.

Nearly three-quarters of the households surveyed attempted to harvest ducks during the study period and 47 percent of the households interviewed reported they attempted to harvest geese and swans (Table 8). Although waterfowl provided only one percent of the estimated total pounds of edible resources harvested annually by community residents, waterfowl were one of the earliest sources of fresh meat following winter. Ducks, geese, and swans were common table fare during spring when they were available. Relatively few cranes were harvested. Waterfowl were prepared in a variety of ways such as boiling, baking, and in soups. Waterfowl were distributed widely within the community and also were received from other communities in the lower Kuskokwim River area.

Regulations

Waterfowl hunting in Alaska is regulated by the Alaska Board of Game, but is guided by federal restrictions. The Migratory Bird Treaty Act of 1916 prohibits the U.S. Department of Interior or the State of Alaska from adopting regulations that allow the harvest of migratory birds anytime between March 10 and September 1. In addition, the U.S. Department of Interior limited the total number of days which the hunting season for migratory birds can be open, to 107 days per season. During the study period, waterfowl hunting was open from September 1 through December 16. Hunting regulations were the same for subsistence and non-subsistence hunters. Bag limits for ducks were 10 per day, 30 in possession. The bag limits for white-fronted geese and Pacific black brant were each two per day and four each in possession. The season for hunting Canada geese was closed. As shown above, the regulations did not conform with customary and traditional seasons and practices in the Kwethluk area.

BERRY, PLANT, AND WOOD GATHERING

A variety of berries and plants were harvested for subsistence by Kwethluk residents. Berries and edible plants supplemented meals comprised mostly of fish and game. Plant foods also provided a variety of essential vitamins and nutrients to the diet. Some plants were used as medicines. Wood was gathered for use as fuel, structural material, and for smoking fish.

Harvest and Use

Without question, the majority of effort directed towards harvesting plant products involved the harvest of wild berries during July, August, and September. Salmonberries, blueberries, crowberries (locally called "mossberries" or "blackberries"), and lowbush cranberries were harvested as soon as they ripened. Salmonberries and blueberries were harvested first. These berries were picked beginning in mid-July continuing through mid-August. Salmonberries mature later near the coast than they do near

Kwethluk and families often traveled downriver or flew to one of the communities along the coast where they have friends or relatives, specifically to harvest salmonberries. Crowberries were harvested from mid-August through early September. Lowbush cranberries were harvested in September, although some people preferred to wait until after the first heavy frost before picking these berries.

Some households gathered berries in areas relatively close to Kwethluk while others traveled by boat to areas 50 to 75 miles downriver specifically for berry picking (Fig. 33). People going out to pick berries went both by themselves or with a larger family group. People sometimes went for the day and returned to Kwethluk, or they sometimes stayed out for several days at a time until they obtained the berries they desired. Berry picking trips lasting several days often included other subsistence activities, such as fishing and waterfowl hunting. Small gill nets were set for harvesting whitefish and pike near camps. Waterfowl, muskrat, and beaver were typically harvested for food while camping when berry picking. Berries also were gathered on an opportunistic basis when pursuing other subsistence resources such as moose, caribou, bear, and parka squirrels. Berries that last through the winter are sometimes harvested during spring near camps in the mountains.

Primary berry picking areas were located along the Kwethluk, Akulikutak, and Kisaralik rivers, in the tundra lake area located on the east side of the Kuskokwim River between Kwethluk and Eek, in the Johnson River drainage west of Kwethluk, in the Kialik River drainage north of Tuntutuliak, and in the Tagayarak River drainage south of Tuntutuliak (Fig. 33). Berry picking areas were accessed by boat and on foot. Berries are a major ingredient in *akutaq*, a favorite food commonly served with many meals. Families that were unable to harvest enough berries sometimes bought berries from other people. The amount of berries harvested by each household varied greatly and ranged to as much as 60 gallons of salmonberries, 20 gallons of blueberries, 20 gallons of crowberries, 40 gallons of lowbush cranberries. Overall, households each harvested an average of 20 gallons of berries.

Berries were preserved by freezing. Before people had electric freezers, berries were placed in barrels and buried underground soon after they were picked. After winter temperatures were cold enough for berries to remain frozen above the ground, the barrel was dug up and kept above ground until the berries were used. During the study, most households used electric freezers for preserving

and storing berries. The most popular use of berries was when making *akutaq*, a whipped mixture of berries, sugar, and shortening or fat. Households also made jam, jellies, and breads from berries.

A variety of other plants were also harvested for food and medicine. Most were gathered relatively close to the community or in the vicinity of a fishing, trapping, or hunting camps (Fig. 34). Among these were wild rhubarb, wild celery, sourdock, "stinkweed," Labrador tea, and spruce needles. Wild rhubarb was ready for harvest sometime in June and was used much like domestically grown rhubarb. Wild celery was harvested in early summer before the plant stalk became tough and fibrous. The outside sheath of the stem or stalk of this plant is peeled and the inner stalk eaten raw. Sourdock leaves were harvested in late June and July and the leaves were prepared by boiling, like spinach. "Stinkweed" leaves were gathered during fall after the first frost and were steeped to make a bitter tea or juice used to treat colds and sore throats by drinking the juice. The plant was also used in preparing a poultice which was placed on infections and aching joints and was also used as a switch when taking a steam bath (*maqi*) to help alleviate sore muscles. Labrador tea, gathered throughout the year, was boiled to make tea and was consumed much like commercial teas. It was also added to commercial brands of tea. Green spruce needles were also used for tea. Harvest areas for green plants and plants used for tea were similar to those used when picking berries. Many of the plants were readily available in and around the community. People also gathered a fungus which commonly grows on birch trees. Referred locally as "punk" or "*kumakaq*," this fungus was burned to an ash (*araq*) and mixed with leaf tobacco for chewing. People gathered "punk" to make *araq* for their personal use and for sale. In comparison to other resources, relatively few households reported sharing plant and vegetative resources with other households. For additional information on plants used in the Kuskokwim area the reader is referred to Charnley (1984) and Oswalt (1957).

Wood, both green and seasoned, was used for heating homes and steam bath houses, for cooking, smoking fish, and for construction. Several households used wood for heating and cooking and depended on wood as their sole source of heat. Spruce was preferred, however, cottonwood, and birch were also used. Firewood used for heating houses was harvested from areas along the Kuskokwim and Kwethluk rivers (Fig. 35). Driftwood, gathered from along the Kuskokwim River, was also used

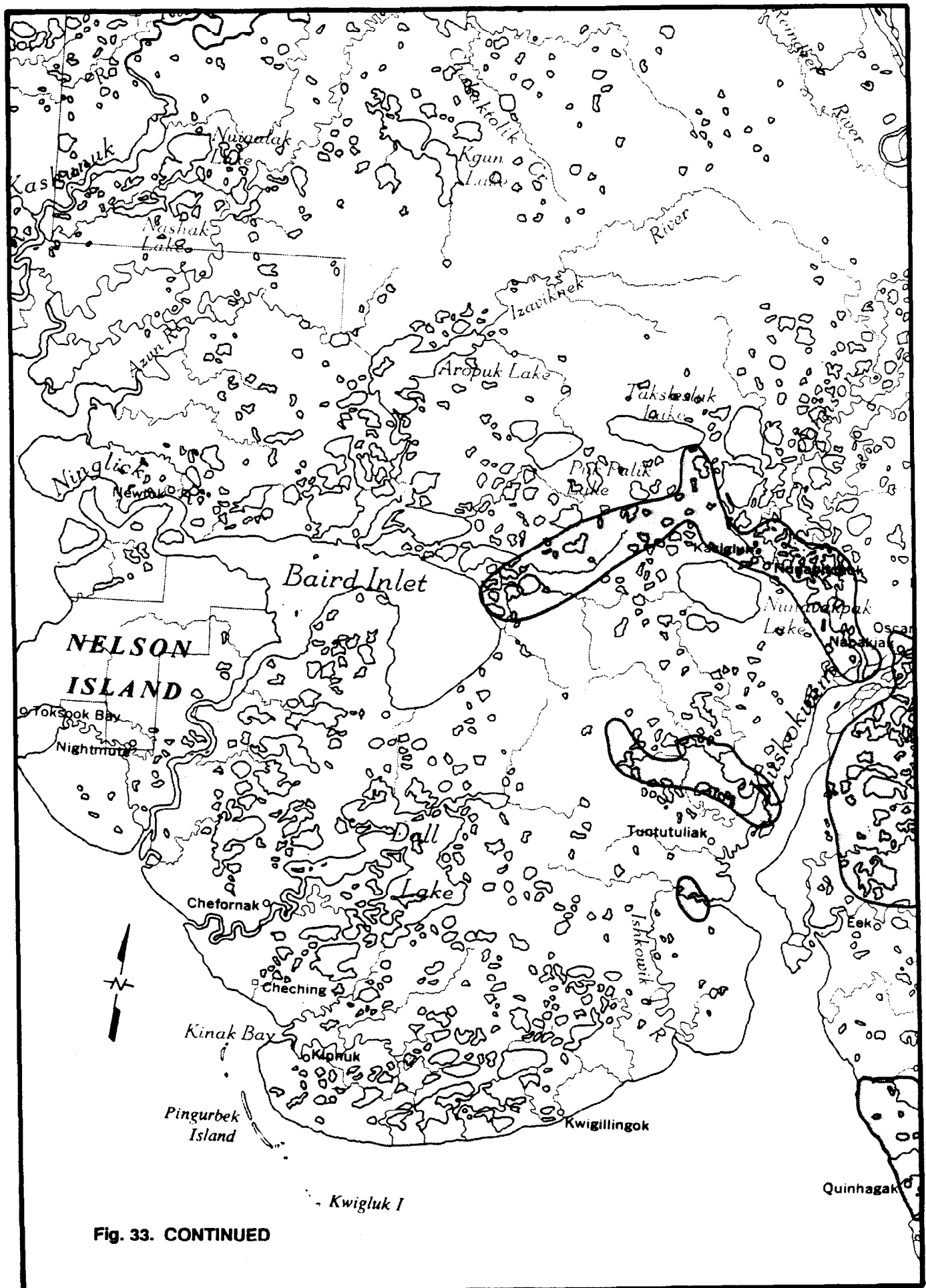


Fig. 33. CONTINUED

for fuel. Firewood was gathered year-round, however, September and early October were especially busy months for gathering firewood from adjacent waterways for the coming winter. Unsuccessful hunters who have traveled up the Kuskokwim River in search of moose sometimes gathered logs on their return trip to Kwethluk. Driftwood was also gathered from the Kuskokwim River soon after spring breakup when large logs from upriver were sometimes available (Fig. 35). Driftwood logs were sometimes purchased from people in Kwethluk and other communities who have them for sale. Boats were used to haul wood during periods of open water. During winter and spring wood harvest areas were accessed using snowmachines and sleds. Wood for heating and cooking was used when camping. Approximately 62 percent of the households surveyed reported that they harvested firewood during the study period and 30 percent reported that they shared firewood with other households. Quantities of firewood harvested by households ranged from wood gathered while camping to as much as four cords used for heat. Several types of non-coniferous woods such as willow, cottonwood, birch, alder, and aspen were gathered for smoking fish.

Wood was also used for construction. Tall slender spruce were harvested and used for elevating Citizen Band radio and VHF radio antennas in Kwethluk and at fishing camps. Wooden poles were also used when building wooden salmon drying racks at fishing camps and for clothesline poles used when hanging clothesline for drying clothes. Although not identified during this study, the author subsequently learned that trees were also harvested from along Heart Lake for building frames of skin covered boats.

Regulations

Federal regulations prohibited harvesting of live wood over three inches diameter on federal public lands. Harvesting trees less than three inches in diameter or any dead wood (standing or fallen) was not prohibited on federal public lands. Much of the wood gathering activities occurred on private lands such as Native allotments or land owned by Kwethluk, Incorporated or other nearby Native corporations. Kwethluk, Incorporated did not require permits or charge fees for gathering firewood.

Fig. 35.
**SUBSISTENCE WOOD GATHERING
 AREAS USED BY KWETHLUK
 RESIDENTS, 1920-1987**

Legend

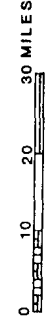


WOOD

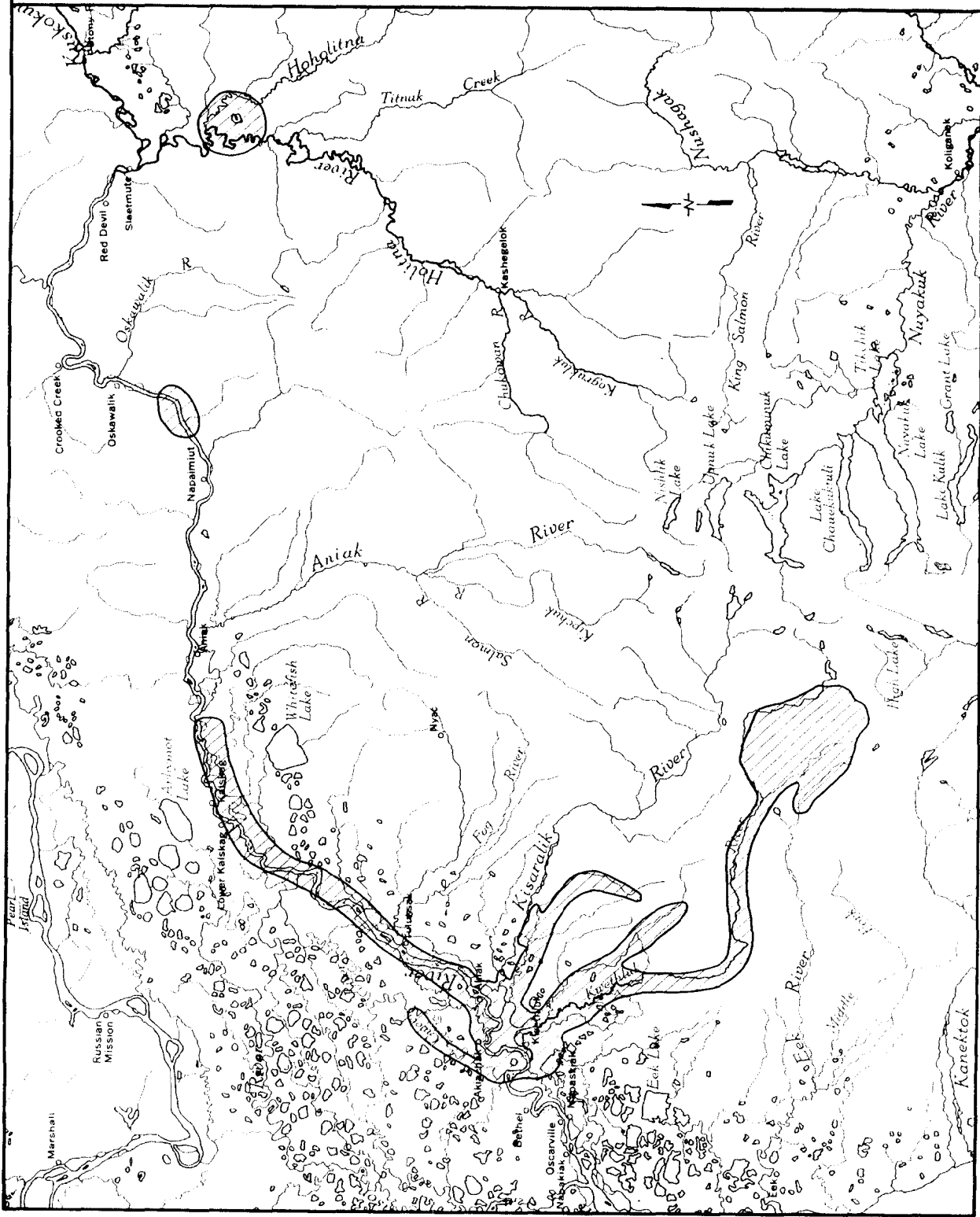
Source: Coffing, Michael W., Alaska
 Department of Fish and Game,
 Subsistence Division, Technical
 Paper No. 157, Juneau, Alaska

This map depicts areas used
 between 1920 and 1987 by
 residents of Kwethluk. Data were
 compiled from interviews with ten
 key respondent households during
 February and March, 1987.
 Additional information was added
 during a community review in
 May, 1987. This map represents
 only those areas used by people
 while domiciled in Kwethluk.
 Undocumented use of other areas
 may occur; consult with the
 appropriate community representa-
 tives for definitive information.

SCALE 1:1,000,000



STATE OF ALASKA
DEPT. OF FISH AND GAME
 Subsistence Division



Although some areas used by residents of Kwethluk are corporation lands belonging to other communities, such as Akiachak or Akiak, the traditional use of those harvest areas was recognized. It appears that an unwritten, but mutual understanding that these traditional uses could continue between these communities.

CHAPTER 7

SUMMARY AND DISCUSSION

This report was designed to provide a quantitative and qualitative description of the harvests and uses of wildlife harvested by hunting, fishing, and gathering for subsistence by residents of Kwethluk. The research documented the number of salmon harvested for subsistence use and methods used for harvesting, processing, and using salmon. Also documented were contemporary patterns of land use associated with subsistence activities, including the areas used for harvesting a variety of fish, game, and for gathering berries, plants, and wood as well as the seasonality of use of each resource. The study described the historical and contemporary nature of the community, provided information on the mixed subsistence-cash economy of Kwethluk during 1985-86, and provides a summary of the major findings of the research.

Kwethluk, located along the Kuskokwim River 20 miles upriver from Bethel and approximately 11 airmiles from Bethel in an east-northeast direction was a relatively large Yup'ik community, which had 540 residents living in 112 households in 1986. Many of the residents living in the community during the study period once lived in now abandoned settlements along the Kwethluk River not far from the mountains east of Kwethluk. Many other families had seasonal camps in the mountains or along one of the rivers flowing from the mountains to the Kuskokwim River or into Kuskokwim Bay. Residents maintained close ties to these areas, which was reflected in the seasonal pattern of land use in 1986. People from the mountain areas, people who resided in the community year-round, and people who married into the community were the source of the community inhabitants during 1986. Forty-five percent of the population was younger than 20 years old.

The cash sector of the local economy was relatively weak and insecure. The median household income during 1986 was only \$16,624. Household incomes ranged from \$1,200 to \$53,000. The cost of living in the community was 1.91 times greater than the cost of living in Anchorage and more than twice the U.S. average, a fact which further erodes the cash earnings of residents. Wage income was the major source of income to the community, providing 45 percent of the overall income. Funding

from state and federal agencies played the major role in local wage-earning opportunities. Seventy-seven percent of the available jobs were government funded. Much of the wage employment was not full time. Fifty percent of the wage-earning jobs lasted for nine months or less and 44 percent of the available jobs were part time. Twenty-five percent of the households were not involved in any wage employment. Most of the households that obtained wage employment income had only one job. The average wage income per household was \$9,747.

Commercial salmon fishing and historically, trapping for sale, were other sources of cash for residents. Fifty-eight households earned income from commercial salmon fishing, averaging \$6,814. Overall, commercial salmon fishing contributed 16 percent of the total community income. During 1986 there were 68 limited entry salmon permits owned by community residents, the largest number for any other Kuskokwim Area community other than Bethel and Quinhagak. Commercial fishing was supplementary to income from other sources. Only eight percent of the households reported commercial fishing income as their sole source of income. Transfer payments and sources of income other than wage employment, especially the state Permanent Fund dividend, and commercial salmon fishing contributed 39 percent of the total community income.

The subsistence sector of the local economy was relatively substantial in Kwethluk. All households participated in harvesting wildlife for subsistence use. Nearly one-third (29 percent) of the households were active harvesting wildlife from seven of the eight resource categories. Berries and plants, freshwater fish, small game, waterfowl, and salmon were the primary resources that residents tried to harvest. Sixty-three percent of the households tried to harvest moose. Household harvests of wildlife ranged from 19 to 23,758 pounds and averaged 3,860 each (pounds edible weight). Fifty percent of the households harvested more than 2,000 pounds of edible wild food. The per capita harvests was 800 pounds, among the higher harvests among Alaska communities (Wolfe and Walker 1987).

The largest portion of the subsistence harvest was comprised of fish. Salmon contributed 53 percent of the edible weight of wildlife harvested for subsistence use. Seventy percent of the households were directly involved in harvesting or processing salmon for subsistence use. Chinook salmon was the primary salmon harvested for food and represented nearly one-half of the weight of all

salmon harvested. Salmon fishing camps continued to play a major role in the subsistence salmon production. During 1986 there were 52 salmon fishing camps "owned" and in use by Kwethluk residents. Some of the fishing camps had been used consistently for more than 50 years by those who owned them during 1986.

Freshwater fish accounted for 32 percent of the edible weight of wildlife harvested for subsistence use. Several species of whitefish, northern pike, burbot, Alaska blackfish, and sheefish were the major species harvested. Dolly Varden, Arctic grayling, lake trout, rainbow trout, and smelt were also harvested. In addition to fish, big game comprised an important part of the yearly subsistence food supply. Moose accounted for nearly 90 percent of the edible weight of big game harvested. Brown bear provided nearly 2,000 pounds of edible meat to the community. Black bear and caribou were also harvested. As in other mixed, subsistence-cash economies, wild foods were distributed along non-commercial networks between harvesters and consumers. Sharing of subsistence resources between households was common in Kwethluk. Resources were shared widely with households in Kwethluk and in other communities.

Kwethluk utilized a traditional harvest area for obtaining subsistence products. The areas used for hunting, fishing, and gathering was extensive and ranged from Kuskokwim Bay north to McGrath, and from Baird Inlet east to the King Salmon River north of Dillingham (Fig. 16). Some areas have been used by generations of Kwethluk hunters and fishers. Many of these areas are important for their subsistence and cultural significance and residents continue to use these areas on a seasonal basis. As wildlife populations have fluctuated or expanded their range over time, residents have adapted by harvesting from the variety of resources available to them and by adjusting their search areas accordingly. Use areas were comprised of private, state, and federal lands including the Yukon Delta National Wildlife Refuge, the Togiak National Wildlife Refuge, and Wood-Tikchik State Park.

Regulatory seasons, bag limits, harvest reporting, and sealing requirements in effect during 1986 were cause for concern by subsistence users, especially for caribou, brown bear, and migratory birds. Although residents were supportive of allowing the Kilbuck caribou herd to increase, the complete closure of all of GMU 18 south of the Yukon River, in 1985, to the taking of caribou created problems

for the community. The closure meant that caribou from the prolific Mulchatna caribou herd could not be harvested when they were in GMU 18. Also, the closure prohibited any caribou from being taken, even though a harvestable surplus existed. These concerns led to legal action by the community, which resulted in a federal court ordered hunt in 1990, the initiation of a caribou management plan for Kilbuck herd caribou, and the establishment of a caribou hunt in GMU 18 south of the Kuskokwim River.

Tag fee and sealing requirements for brown bear also posed particular problems for subsistence hunters. Hunters found it culturally offensive to comply with regulations requiring the bear skull to be taken out of the field and requiring both the skull and the hide to be sealed. Subsistence hunters also found it offensive that regulations allowed sport hunters to leave all of the meat in the field and required that only the hide and skull be salvaged. The bag limits of one bear every four years made it impossible for some hunters to legally harvest the number of bears they needed and also comply with state regulations. As a result of these circumstances, bear hunters generally did not report their hunting effort or harvest success to the Department of Fish and Game using the sealing and tag fee methods.

Harvest reporting systems using paper (such as tags, seals, tickets, and mailed reports) posed particular problems for residents of Kwethluk, in that the reporting systems were so alien to traditional practices. Regulations which required all beaver to be sealed, including those used for domestic purposes, were generally not followed. While trappers had their beaver sealed when they sold them, most beaver used domestically were not sealed and, therefore, not represented in Department of Fish and Game harvest records. Harvest reporting methods in place for moose and caribou were not working in 1986. Data collected during this study indicated that an estimated 32 moose harvested during the 1985-86 regulatory year, however, Department of Fish and Game harvest ticket returns indicated that only one moose was harvested. For the following regulatory year (1986-87), harvest ticket records indicate that three Kwethluk residents successfully harvested moose. Observations made while conducting research in Kwethluk for this study, between August 1986 and April 1987, indicated that approximately 33 moose were harvested by Kwethluk residents. Because one hunter often

provided wild fish and game to several households, the bag limit of one moose per hunter was not adequate in all situations. Hunters tried to harvest more than one moose if meat was needed.

Certain salmon regulations also posed potential problems to Kwethluk, such as proposals to close tributary streams to subsistence salmon fishing during commercial periods. Opportunities to harvest salmon for subsistence from the Kwethluk and Akulikutak rivers during open commercial salmon fishing periods in the main Kuskokwim River were important to Kwethluk residents. Some residents that harvested salmon from the Kwethluk River did not have adequate gear to fish in the larger Kuskokwim River. Others were physically unable use drift gill nets for catching salmon, however, they maintained set gill nets at a traditional use sites near their fishing camps along the Kwethluk River. The opportunity to leave a set gill net in the Kwethluk River during commercial fishing periods in the Kuskokwim River, and not having to repeatedly remove and reset the net, was a factor that made subsistence fishing feasible for some households.

In summary, in 1985-86 fish, game, and other natural resources continued to be important and essential elements of survival for Kwethluk residents. Residents balanced wage earning, commercial fishing, and subsistence hunting, fishing, and gathering opportunities in a manner that provided security and satisfaction in their lives. They continued to adapt to changing environmental and political climates by adopting modern tools which they have tempered with traditional knowledge and skills passed from one generation to another.

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APPENDIX 1. KWETHLUK JOINT RESOLUTION 84-05

CITY OF KWETHLUK, KWETHLUK IRA COUNCIL
AND KWETHLUK INCORPORATED
Kwethluk, AK 99621

Joint Resolution 84-05

WHEREAS, City of Kwethluk represents the public interest of the residents of Kwethluk; and

WHEREAS, Kwethluk IRA Council is the governing body of the village of Kwethluk, traditionally organized and recognized by the United States through the Secretary of Interior; and

WHEREAS, Kwethluk Incorporated is a village corporation formed under the Alaska Native Claims Settlement Act of December 16, 1971; and

WHEREAS, U.S. Fish & Wildlife Service has conducted a public hearing on May 15, 1984 regarding Kuskokwim Safari's request for a sportfishing guide permit, for operation during July and September, near or adjacent to Kwethluk Incorporated selected lands; and

WHEREAS, in the past, bear hunting guide permits were issued for operations in Kwethluk and Kiseralik Rivers before local and surrounding village residents were given the opportunity to present their views as required under the Alaska National Interest Lands Conservation Act of December 2, 1980; and

WHEREAS, during the public hearing local residents with subsistence campsites and Native allotments voiced that increased motorboat activity will affect the safety of area residents and users of the Kwethluk River; and

WHEREAS, increased motorboat activity may also adversely affect the present and future population of the fish, by disturbing the spawning areas as well as spawning of various fish species; and

WHEREAS, there was a question of navigability of Kwethluk River during the land selection by Kwethluk Incorporated; and

WHEREAS, past occurrences has shown that some sportfisherman have caused wanton waste of various fish species, by leaving them on the river sides and banks; and

WHEREAS, past occurrences has shown that some of those people who travel up the Kwethluk River have littered the Kwethluk Incorporated lands, Native allotment land and may include some State lands; and

WHEREAS, past occurrences has shown vandalism done, i.e., shooting at set net buoys, shooting at houses, windows and slashing set nets; and

WHEREAS, trespassing has occurred on Kwethluk Incorporated lands and Native allotment lands along the banks of the Kwethluk River,

NOW, THEREFORE, BE IT RESOLVED by the City of Kwethluk, Kwethluk IRA Council and Kwethluk Incorporated, upon motion duly made and seconded, hereby adopts this Joint Resolution; and

BE IT FURTHER RESOLVED, that research on fish, wildlife and their subsistence uses be done and comprehensive conservation plan developed, before any permits are issued, as set forth under the provisions of Alaska National Interest Lands Conservation Act of December 2, 1980; and be it

FURTHER RESOLVED, that U.S. Fish & Wildlife Service does not issue any sportfishing guide permits for reasons set forth above; and be it

FURTHER RESOLVED, that U.S. Fish & Wildlife Service does not issue sport hunting guide permits to interested parties without prior consultation of the affected area village residents; and now be it

FINALLY RESOLVED, that the Secretary of Kwethluk Incorporated be and hereby is authorized to certify a copy of this Joint Resolution, and is further directed to immediately send a copy of this Resolution to U.S. Fish & Wildlife Service.

Date this 30th day of May, 1984.

Approved:

Oliver Oliver
Mayor, CITY OF KWETHLUK

Phillip Gray
Secretary, KWETHLUK INCORPORATED

David Gubok
Vice-President, KWETHLUK IRA COUNCIL

Moses Nicolai
President, KWETHLUK INCORPORATED

APPENDIX 2. KWETHLUK SALMON HARVEST AND FISHING CAMP SURVEY

KWETHLUK SURSISTENCE SALMON SURVEY, Summer 1986
 Division of Subsistence, ADF&G

Person Interviewed _____ Date _____ Interviewer _____

Household ID # _____ FISH CAMP Location _____

FISH CAMP HISTORY

How did you decide on this place for your camp? _____

What other families use this place for fish camp? _____

Are they all from Kwethluk? _____

How long have you been using this fish camp? _____

Since you were married, have you had fish camp at other places? _____

WHERE	WHEN	WHAT OTHER FAMILIES WERE THERE?	WHY DID YOU STOP USING IT?

Household ID # _____

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FISHING ACTIVITIES

When did you begin fishing this summer for subsistence? _____

Did you fish for kings before the commercial season opened? no yes what type of gear?
drift or set? _____
What size net do you use for kings drift net _____ length _____ mesh _____ depth _____ fishing area _____
for subsistence fishing? set net _____ length _____ mesh _____ depth _____ set net site _____

Did you fish for red or dog salmon before the commercial season opened? no yes drift or set?
What size net do you use for dog salmon drift net _____ length _____ mesh _____ depth _____ fishing area _____
for subsistence fishing? set net _____ length _____ mesh _____ depth _____ set net site _____

Did you fish for silvers before the commercial season opened? no yes drift or set?
What size net do you use for silvers drift net _____ length _____ mesh _____ depth _____ fishing area _____
for subsistence fishing? set net _____ length _____ mesh _____ depth _____ set net site _____

What size is your boat _____ wooden _____ (did you build it yourself? Y N) aluminum _____ other _____

What size is your outboard _____ Do you have other boats _____

How many years does your boat last? _____ your outboard? _____ your nets? _____

Do you use your own equipment and nets

Household ID # _____

This year, who checked the nets or drifted? _____

This year, who helps cut the fish? _____

Did anyone else help this year with drifting or cutting and smoking the fish? _____

Who is here at camp with you this year? _____

SUBSISTENCE CATCHES	Harvest # Total	# eaten	# dried	# strips	salted heads	split heads	# stink heads	salted whole fish	# frozen	# for dog food
kings (taryaqvak)			ulligtaq		sulunaq	qamiqerr-luk	tepa			
dog salmon (iqalluk)			ulligta-piak							
red salmon (sayak)			ulligtaq					kemek		
silver salmon (qakiyyaq)							tepa	kemek		
"humpies" (amaqaayak)										
whitefish (akakiik)										
sheefish (ciliq)										

NUMBER OF DOGS you have including pups _____

Household ID # _____

What time of the day do you usually try to fish _____

Did weather or water level affect your salmon fishing for subsistence this year?

Does anyone in your household have a commercial fishing permit? no yes who _____
when did they get the permit? _____
 Bristol Bay Yukon River Other

IF YES, are they fishing this summer? no yes

Which kind of fish are they fishing for? king dog silver

Where do they fish commercially? kings _____ dogs _____ silvers _____

Do you use the same equipment for commercial and subsistence fishing? no yes

IF NO, in the past did you have a commercial permit? no yes

Why did you decide to stop commercial fishing? _____

Where did you fish? _____

Is anyone in your household a helper or crewmember? no yes for whom? _____

**APPENDIX 3. KWETHLUK NON-SALMON HARVEST, WAGE EMPLOYMENT, INCOME,
AND EQUIPMENT SURVEY**

KWETHLUK SURVEY 1986 Freshwater Fish Harvest and Use

SPECIES	Total Quantity Harvested	Method of Harvest	Months Harvested	Type of Transportation Used	Communities Given To	Communities Received From	Quantity Used For	
							Dog Food	Food
Whitefish (10)								
Lush (11)								
Sheefish (12)								
Pike (13)								
Dolly Varden (14)								
Grayling (15)								
Rainbow Trout (16)								
Lake Trout (17)								
Smelt (18)								
Blackfish (19)								
Other (Specify)								

Harvest Method Codes:
 01 - net, open water 04 - fishtraps
 02 - net, under ice 05 - rod and reel
 03 - dipnet 06 - hooking through ice

Who participated in freshwater fishing? _____

SPECIES	Hunted		# Days Spent Hunting	Months Hrvsted	Type of Trnsprtatr Used	Communities Given To	Communities Received From	Quantity Used For Dog Food
	Y	N						
Moose (30)								
Caribou (31)								
Brown Bear (32)								
Black Bear (33)								
Parka Sqrrel (40)								
Rabbits (41)								
Marmots (42)								
Porcupine (43)								
Ptarmigan (44)								
Grouse (45)								
Other (Specify)								

Who participated in large game hunting? _____ small game hunting? _____

Marine Mammal Hunting

KWETHLUK SURVEY 1986

SPECIES	Hunted		Total Quantity Harvested	# Days Spent Hunting	Months Hrvstd	Type Of Trnsprtatn Used		Communities Given To	Communities Received From	Quantity Used For Dog Food
	Y	N								
Spotted Seal (50)										
Bearded Seal (51)										
Ringed Seal (52)										
Walrus (53)										
Other (Specify)										

Seal oil
(54)

List the location(s) where you hunted seals:

List the the location(s) where you hunted walrus:

Who participated in marine mammal hunting? _____

WATERFOWL AND EGGS	Hunted		Total Quantity Harvested	Months Harvested	Type of Trnsprtatn Used	Communities Given To	Communities Received From	Quantity Used For Dog Food
	Y	N						
Geese (60)								
Ducks (61)								
Crane (62)								
Swan (63)								
Eggs (64)								
Other (Specify)								

OTHER GATHERED SPECIES	List Species Harvested	Total Quantity Harvested	Months Harvested	Type of Trnsprtatn Used	Communities Given To	Communities Received From

Who participated in waterfowl and egg harvest? _____ other gathering? _____

Hunting and Trapping of Fur Animals

KWETHLUK SURVEY 1986

SPECIES	Total Quantity Harvested	Months Harvested	Type of Trsnpr-ttn Usd	Qty Eaten	Qty For Dog Food	Qty Fur Sold	Qty Meat Sold	Communities Given To	Communities Received From
Beaver (80)	-----								
Mink (81)	-----								
Otter (82)	-----								
Muskrat (83)	-----								
Red Fox (84)	-----								
Wolf (85)	-----								
Wolverine (86)	-----								
Lynx (87)	-----								
Marten (88)	-----								
Other (Specify)	-----								

Who participated in TRAPPING fur animals? _____ in HUNTING fur animals? _____

Did you go to spring camp during spring of 1986? Yes ___ No ___
 Where is your spring camp? _____ What type of activities do you do at spring camp? _____
 ___ coast
 ___ mountains
 ___ river drainage

Other Income Sources (Check all that apply)

- ___ Commercial Fishing ___ National Guard ___ Energy Assistance
- ___ Social Security Income ___ AFDC ___ Cottage Crafts
- ___ Longevity Bonus ___ Permanent Fund ___ Pension
- ___ Corporation Dividends ___ BIA Assistance ___ Other (Specify) ___

HH Member	Job Title	Hrs Per Week	Months Worked (September 1985 - August 1986)							Hourly Salary									
			S	O	N	D	J	F	M		A	M	J	J	A				

Please estimate your household's cash income in 1985 (include commercial fishing, trapping, wages, social security, old age, etc.) _____

Equipment (Indicate the number owned by your household)

- ___ Snowmachines ___ Cache ___ Outboard Motors ___ Nets for: ___ catching salmon (open water)
- ___ ATC ___ Steam ___ sleds ___ catching whitefish (open water)
- ___ Car or Truck ___ Dog Teams ___ Traps ___ fishing under ice
- ___ Freezers ___ Boats

APPENDIX 4. BACKGROUND INFORMATION ON KUSKOKWIM SUBSISTENCE SALMON HARVEST SURVEYS

Information about subsistence salmon harvest by Kwethluk fishermen was first collected in 1934 (Pennoyer *et al.* 1965:49). Data were also collected during 1935, 1936, and 1938, but were not collected again until 1959 when surveys of some Kuskokwim River salmon fishing camps were done. In 1960, for the first time, the Alaska Department of Fish and Game surveyed salmon fishing camps from McGrath downstream to Napakiak, counting salmon hanging in 229 smokehouses at camps and communities along the river (Alaska Department of Fish and Game 1961:19). Surveys of this type continued. In 1961, the surveys included the section of the Kuskokwim River from the mouth, upstream to McGrath. In 1962, "subsistence catch forms" were distributed to households in Kuskokwim River communities prior to the fishing season and the area along the Kuskokwim River upstream from the Swift River was dropped from the survey (Alaska Department of Fish and Game 1964:60). It is unclear if "subsistence catch forms" were used from 1963 through 1965. In 1966 "subsistence catch calendars" were used to help determine subsistence salmon harvest levels of Kuskokwim River communities (Alaska Department of Fish and Game 1967:19). Catch calendars were filled out by families who caught salmon for subsistence and calendars were picked up during the annual surveys of smokehouses, drying racks, caches, and some personal interviews conducted in July and August of each year.

Beginning in 1969, the subsistence salmon catch calendars were printed with return postage paid and subsistence fishermen were asked to return their salmon catch calendars by mail to the department (Alaska Department of Fish and Game 1970:25). Subsistence salmon harvest surveys of salmon fishing camps and communities, conducted in late July and August, continued through 1982. In 1983, subsistence salmon harvest data were not collected from Kwethluk and several other communities. Nevertheless, subsistence catch calendars were mailed to all known fishing families. Subsistence surveys continued again during 1984 and 1985, however, during some years only a sample of communities were surveyed. From 1960 through 1985, subsistence salmon harvest surveys in Kwethluk were conducted by the Division of Commercial Fisheries of the Alaska Department of Fish and Game.

Starting in 1986 with this study, the Division of Subsistence conducted subsistence salmon harvest surveys in Kwethluk. Subsistence salmon harvest calendars were also used in 1986.

One of the problems with data collected prior to 1985 was that chum, sockeye, and sometimes coho salmon were not usually differentiated on the subsistence harvest calendar and surveys. Although salmon harvest calendars provided opportunities for each species to be recorded, frequently the species were lumped together and reported as chum salmon. Because of this problem, these species have routinely been recorded by the department as "small salmon" (Alaska Department of Fish and Game 1987b). Unlike earlier studies, the 1986 subsistence salmon harvest data for Kwethluk shows the amount harvested of each of the five species taken for subsistence.

As described above, harvest reports of some type have been used since 1962 to record subsistence salmon harvests. These calendars were printed in English, a language that many area residents neither spoke, read, nor wrote. The majority of the salmon harvest calendars mailed to subsistence fishermen were not returned to the department. It is evident, however, that some families completed salmon harvest calendars, but did not mail them back to the department. For instance, several harvest calendars were often collected when conducting the community salmon harvest surveys during late summer. In 1983, a year when subsistence salmon harvest surveys were not done, only three salmon harvest calendars were returned by Kwethluk subsistence fishermen. In 1986, 42 percent of the salmon production units in Kwethluk completed harvest calendars. All but two of these were collected by the researcher during the periodic salmon fishing camp visits throughout the summer and household visits in October.

Beginning in 1987, the Division of Subsistence began entering data from the subsistence salmon calendars into a computerized database file using RBASE. To date, harvest calendars for the years 1982 through 1990 have been entered in the database. Analysis of the data from calendars returned by Kwethluk households show that for the years 1982 through 1985, harvest calendars accounted for approximately 36 percent of the total estimated subsistence harvest of chinook and 35 percent of the total estimated subsistence harvest of small salmon (Table 30). Harvest calendars are helpful when determining which days subsistence salmon fishing occurs and the relative timing of subsistence

TABLE 30. CALENDAR HARVEST DATA AS AN INDICATOR OF TOTAL ESTIMATED SUBSISTENCE SALMON HARVEST FOR KWETHLUK, 1982-86

Year	Estimated total number of fishing units	Number ^a of fishing units returning calendars	Number of salmon reported on calendars				Percent of total ^b harvest represented by calendars							
			Chinook	Sockeye	Chum	Coho Pink salmon"	Chinook	Sockeye	Chum	Coho Pink salmon"				
1982	57	26	2,204	77	7,199	765	250	8,291	37	c	c	16	c	38
1983	d	3	114	2	624	77	0	703	d	d	d	d	d	d
1984	59	17	2,172	273	4,183	976	79	5,511	32	c	c	c	c	38
1985	48	19	1,863	529	2,822	1,203	15	4,569	38	9	41	39	58	29
1986	52	22	3,117	1,000	4,543	962	238	6,743	53	18	47	27	38	35

NOTE: The category "Small salmon" includes all sockeye, chum, coho, and pink salmon.

a Subsistence salmon harvest calendars are mailed to heads of households that are thought to subsistence fish for salmon. Harvest calendars often represent the harvest of a "fishing family" or a salmon production unit. 1986 calendar data represent harvest by salmon production units.

b Estimated total harvests for 1982 through 1986 are provided in Table 19.

c Data not collected by species during community harvest surveys.

d Community not surveyed.

salmon harvests. Harvest calendars received from households that use them, however, do not adequately account for the majority of salmon harvested by Kuskokwim Area residents for subsistence use. House to house surveys conducted by staff in Kuskokwim Area communities after subsistence salmon fishing is completed in the fall are the most effective method of gathering reliable harvest data.

**APPENDIX 5. EDIBLE WEIGHTS OF WILDLIFE RESOURCES USED
BY KWETHLUK RESIDENTS**

Resource	Edible weight (pounds)	Resource	Edible weight (pounds)
Chinook salmon	17.0	Grouse	1.0
Sockeye salmon	7.2	Ptarmigan	1.0
Chum salmon	6.8	Parka squirrel	0.75
Coho salmon	6.4	Hare	2.5
Pink salmon	3.4	Porcupine	4.0
Whitefish	3.0	Beaver	15.0
Dolly Varden	1.5	Otter	3.0
Grayling	1.5	Muskrat	0.75
Smelt	.07	Mink	2.0
Blackfish	.25	Spotted seal	56.0
Rainbow trout	2.0	Bearded seal	140.0
Lake trout	2.0	Ringed seal	63.0
Pike	4.5	Geese	5.0
Burbot	4.5	Ducks	1.5
Sheefish	6.5	Cranes	10.0
Moose	715.0	Swans	10.0
Black bear	150.0	Blueberries	6.0/gallon
Brown bear	200.0	Salmonberries	7.0/gallon
Caribou	120.0	Crowberries	5.0/gallon
		Cranberries	4.5/gallon

APPENDIX 6. COMMON, YUP'IK, AND SCIENTIFIC NAMES OF RESOURCES USED BY
KWETHLUK RESIDENTS

Common name	Yup'ik name	Scientific name
Chinook salmon	<i>Taryaqvak</i>	<i>Oncorhynchus tshawytscha</i>
Sockeye salmon	<i>Sayak</i>	<i>Oncorhynchus nerka</i>
Chum salmon	<i>Iqalluk</i>	<i>Oncorhynchus keta</i>
Coho salmon	<i>Qakiiyak</i>	<i>Oncorhynchus kisutch</i>
Pink salmon	<i>Amaqaaqyak</i>	<i>Oncorhynchus gorbuscha</i>
Broad whitefish	<i>Akakiik</i>	<i>Coregonus nasus</i>
unidentified whitefish	<i>Cavirutnaq</i>	<i>Coregonus sp.</i>
Humpback whitefish	<i>Cingikeggliaq</i>	<i>Coregonus pidschian</i>
Least cisco	<i>Elluuyak</i>	<i>Coregonus sardinella</i>
Dolly Varden	<i>Iqallugpiq</i>	<i>Salvelinus malma</i>
Arctic grayling	<i>Culugpauk</i>	<i>Thymallus arcticus</i>
Rainbow smelt	<i>Qusuuk</i>	<i>Osmerus mordax</i>
Blackfish	<i>Imangaq, can'giiq</i>	<i>Dallia pectoralis</i>
Rainbow trout	<i>Talaariq</i>	<i>Salmo gairdneri</i>
Lake trout	<i>Cikigniq</i>	<i>Salvelinus namayacush</i>
Northern pike	<i>Luqruiuyak</i>	<i>Esox lucius</i>
Burbot	<i>Manignaq</i>	<i>Lota lota</i>
Sheefish	<i>Ciiq</i>	<i>Stenodus leucichthys</i>
Longnose sucker	<i>Cuntargak, nepcak</i>	<i>Catostomus catostomus</i>
Moose	<i>Tuntuvak</i>	<i>Alces alces</i>
Black bear	<i>Tan'gerliq</i>	<i>Ursus americanus</i>
Brown bear	<i>Taqukaq</i>	<i>Ursus arctos</i>
Caribou	<i>Tuntu</i>	<i>Rangifer tarandus</i>
Grouse	<i>Egtuk</i>	<i>Dendragapus canadensis</i>
Ptarmigan	<i>Qangqiiq</i>	<i>Lagopus lagopus</i>
Parka squirrel	<i>Qanganaq</i>	<i>Spermophilus undulatus</i>
Marmot	<i>Cikigpak</i>	<i>Marmota caligata</i>
Snowshoe hare	<i>Maqaruuaq</i>	<i>Lepus americanus</i>
Tundra hare	<i>Qayuqeggliq</i>	<i>Lepus othus</i>
Porcupine	<i>Issaluq</i>	<i>Erethizon dorsatum</i>
Beaver	<i>Paluqtaq</i>	<i>Castor canadensis</i>
Land Otter	<i>Cuignilnguq</i>	<i>Lutra canadensis</i>
Muskrat	<i>Kanaqlak, tevyuli, iligvak</i>	<i>Ondatra zibethicus</i>
Mink	<i>Imarmiutaq</i>	<i>Mustela vison</i>
Red fox	<i>Kaviaq</i>	<i>Vulpes fulva</i>
Wolverine	<i>Terikaniaq</i>	<i>Gulo gulo</i>
Lynx	<i>Terrtuleq</i>	<i>Felis canadensis</i>
Marten	<i>Qavcicuaq</i>	<i>Martes americana</i>
Spotted seal	<i>Issuriq</i>	<i>Phoca largha</i>
Bearded seal	<i>Maklak</i>	<i>Erignathus barbatus</i>
Ringed seal	<i>Nayiq</i>	<i>Phoca hispida</i>
Pacific walrus	<i>Asveq</i>	<i>Odobenus rosamarus divergens</i>
Geese	<i>Lagit</i>	
Ducks	<i>Yagulet</i>	
Cranes	<i>Qut'raaq</i>	<i>Grus canadensis</i>
Swans	<i>Qugyuk</i>	<i>Cygnus columbianus</i>

APPENDIX 6. -- CONTINUED

Common name	Yup'ik name	Scientific name
Blueberries	<i>Curaq</i>	<i>Vaccinium uliginosum</i>
Salmonberries	<i>Atsalluqpiaq</i>	<i>Rubus chamaemotus</i>
Crowberries	<i>Tan'gerpak</i>	<i>Empetrum nigrum</i>
Cranberries	<i>Kavirliq</i>	<i>Vaccinium vitis</i>
Sourdock	<i>Quagciq</i>	<i>Rumex arcticus</i>
Labrador tea	<i>Ayuq</i>	<i>Ledum palustre</i>
Wormwood ("Stinkweed")	<i>Qanganaruaq, caiggluk</i>	<i>Artemisia sp.</i>