NATURAL RESOURCE UTILIZATION OF FOUR UPPER KUSKOKWIM COMMUNITIES

by

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ABSTRACT

This report describes the harvest and use of natural resources in the Upper Kuskokwim region of southwestern interior Alaska. Research was conducted in the communities of Nikolai, Telida, McGrath, and Takotna intermittently between late 1981 and early 1985. These communities had a combined 1984 population of 733 persons. Although the contemporary population is ethnically mixed, Upper Kuskokwim Athabaskans have inhabited the region continuously at least since contact and remain the largest Alaska Native group in the area today.

Research methodologies employed in this study included review of relevant literature, participant-observation, informal interviews, individual household mapping sessions, and frequent seasonal site visits. The author gained added insights through his residence in one of the study communities throughout the study period.

A similar natural resource base is available to all four Upper Kuskokwim communities, although differences are noted in the extent and patterns of use of certain resources, and in the harvest and preservation technologies employed. This resource base consists primarily of moose, caribou, black and grizzly bear, Dall sheep, and small game; waterfowl and game birds; king, chum, and coho salmon; freshwater fish species, including several whitefish species, sheefish, Arctic grayling, and northern pike; and nine furbearer species. A variety of plant species also are harvested, including berries, timber, and edible greens.

In addition to describing contemporary resource harvest and use patterns, this report examines historical uses of moose, caribou, bear,

furbearers, and salmon. Included as appendices are Athabaskan and common English geographic place names for the Upper Kuskokwim region, Upper Kuskokwim Athabaskan names for selected wild resources found in the area, a discussion of the historic use of fish fences for harvesting king salmon, and a description of fishwheel use and construction.

Inhabitants of the study area identified several important resource-related issues during the course of fieldwork. These included concern for declining salmon stocks, low moose and caribou populations, and increasing wolf numbers. Many residents are particularly concerned about increasing levels of competition from non-local residents for some important resources. Additionally, area residents have experienced and continue to face land use and development issues which might affect their current natural resource use patterns. Paramount among these are changing land ownership patterns, settlement entry, mineral leasing, and mineral entry programs.

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CHAPTER 1

INTRODUCTION

This study examines the range of subsistence use patterns in and around the Upper Kuskokwim communities of Nikolai, Telida, Takotna, and McGrath in the southwestern Interior of Alaska. Research findings focus on the period from Statehood (1959) to the present, although certain historical information is presented where appropriate.

The Division of Subsistence, Alaska Department of Fish and Game initiated research in the Upper Kuskokwim region during spring 1980 with a field visit by one member of the research staff for the purpose of collecting information pertinent to regulatory issues. Subsequent field visits were made to the area to document moose hunting activities during the fall 1980 season. Initial research of a general nature was limited to identifying resources harvested and geographic use areas of Nikolai and Telida residents. This information was presented in two reports (Stickney 1981a, 1981b). In July 1981, the Division began to conduct research of a more specific nature on the subsistence activities of all four permanent Upper Kuskokwim communities--Nikolai, Telida, McGrath, and Takotna. This research also monitored moose hunting activities in the Upper Kuskokwim Controlled Use Area established by the Alaska Board of Game (1981) in the vicinity of Nikolai and Telida (Stokes and Andrews 1982; Stokes 1983; Andrews and Stokes 1984). Salmon fishing issues led to research focused on subsistence salmon activities which were summarized in a report to the Alaska Board of Fisheries (Stokes 1982). Throughout this time, research continued in each of the communities to document the use of a variety of fish and wildlife species by Upper Kuskokwim residents.

PURPOSE

The purpose of this report is to present information on the nature and extent of wildlife and other natural resource use by McGrath, Takotna, Nikolai, and Telida residents during the 1980s. In addition, the report provides certain historic information about the past use of wildlife resources, the adoption of new activities and practices, and the decline of others.

This report is intended for three groups of readers. First and most important are the area residents whose way of life this report hopes to accurately reflect. Second, this report makes previously undocumented information readily available for individuals and agencies involved in the development of policy and regulations dealing with the natural resources, lands, and waters used by area residents. This report and accompanying natural resource use maps will also be of use to various state and federal agencies currently engaged in various planning and inventory processes for the area. These activities include the Bureau of Land Management's Upper Kuskokwim Planning Block; Alaska Department of Natural Resources' (DNR) Minchumina Basin Oil and Gas Lease Sale 42 and Kuskokwim Area Plan, and various DNR-sponsored settlement entry programs (see Chapter 12). Third, this study provides baseline information on wild resource use patterns for the scientific community and should serve as a useful reference for any subsequent research efforts undertaken within the Upper Kuskokwim region.

STUDY AREA

Geographically, the Upper Kuskokwim study area is bounded by the Alaska Range and the Stony River to the south, the Iditarod River to the west, a line running north/south between Telida and Lake Minchumina to the east, and the upper Nowitna River system to the north, encompassing approximately 15,000 square miles (Fig. 1). Major Kuskokwim tributaries include the Takotna, Big, and Tonzona rivers; and the North, South, East, Middle, Pitka, Swift, Windy, and Nixon forks (Fig. 2). The upper Innoko River system also falls within the study area as portions of Game Management Units 19 and 21 (Fig. 1).

Four year-round permanent settlements are located in the Upper Kuskokwim region -- McGrath, Takotna, Nikolai, and Telida (Fig. 1). The area population is estimated at between 733 and 750 people (see Chapter 3). The Tatalina Air Force Station features a year-round population, however this military communications site was excluded from the study.

OBJECTIVES

This study presents both contemporary baseline and historical data on the use of fish and wildlife by residents of the Upper Kuskokwim communities. Specific objectives of this study are:

(1) to briefly describe the historical occupation of the area and population trends of the study communities;

(2) to identify the fish, game, and plant resources used by inhabitants of the study area;

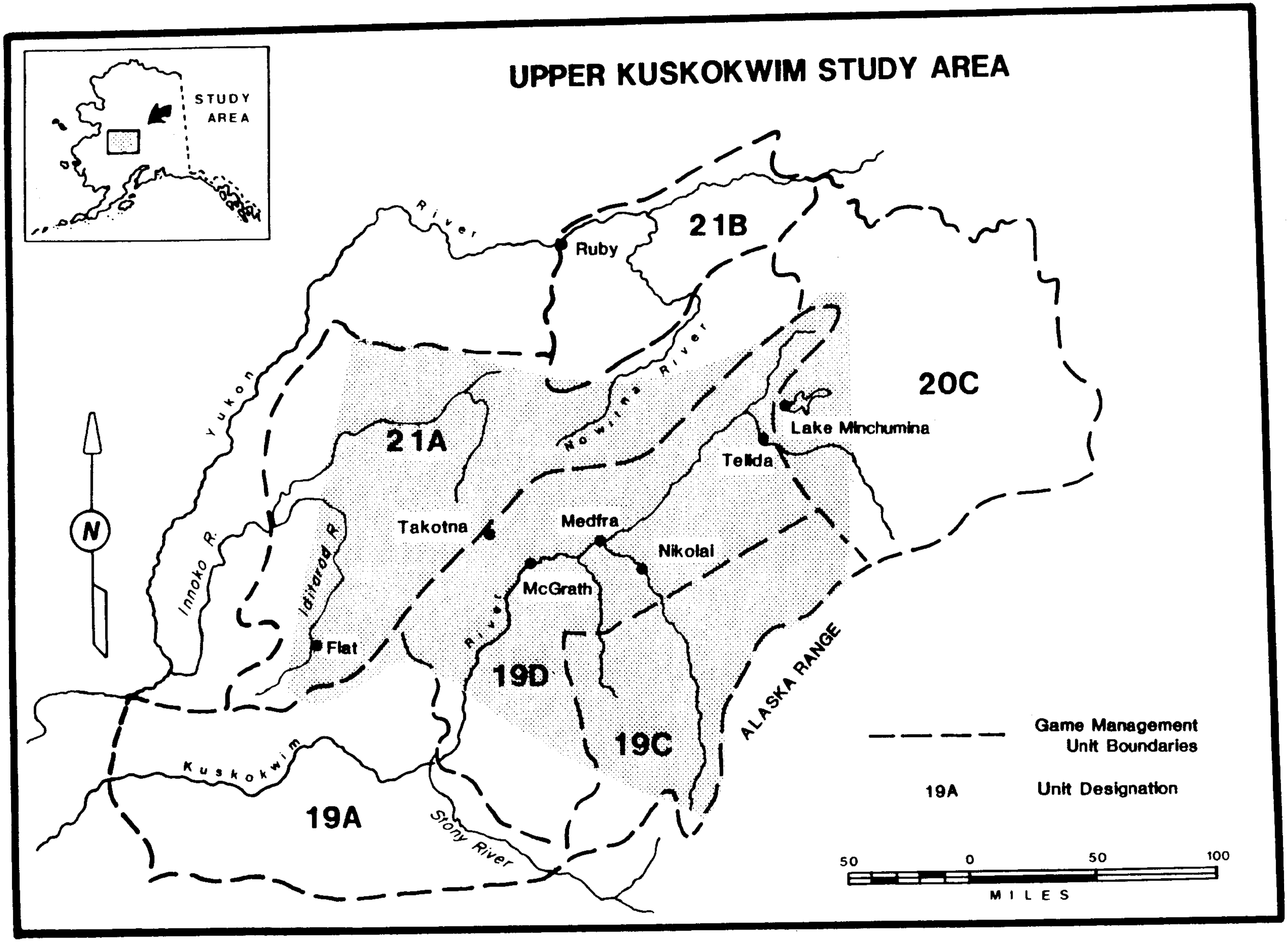

Fig. 1. Upper Kuskokwim study area.

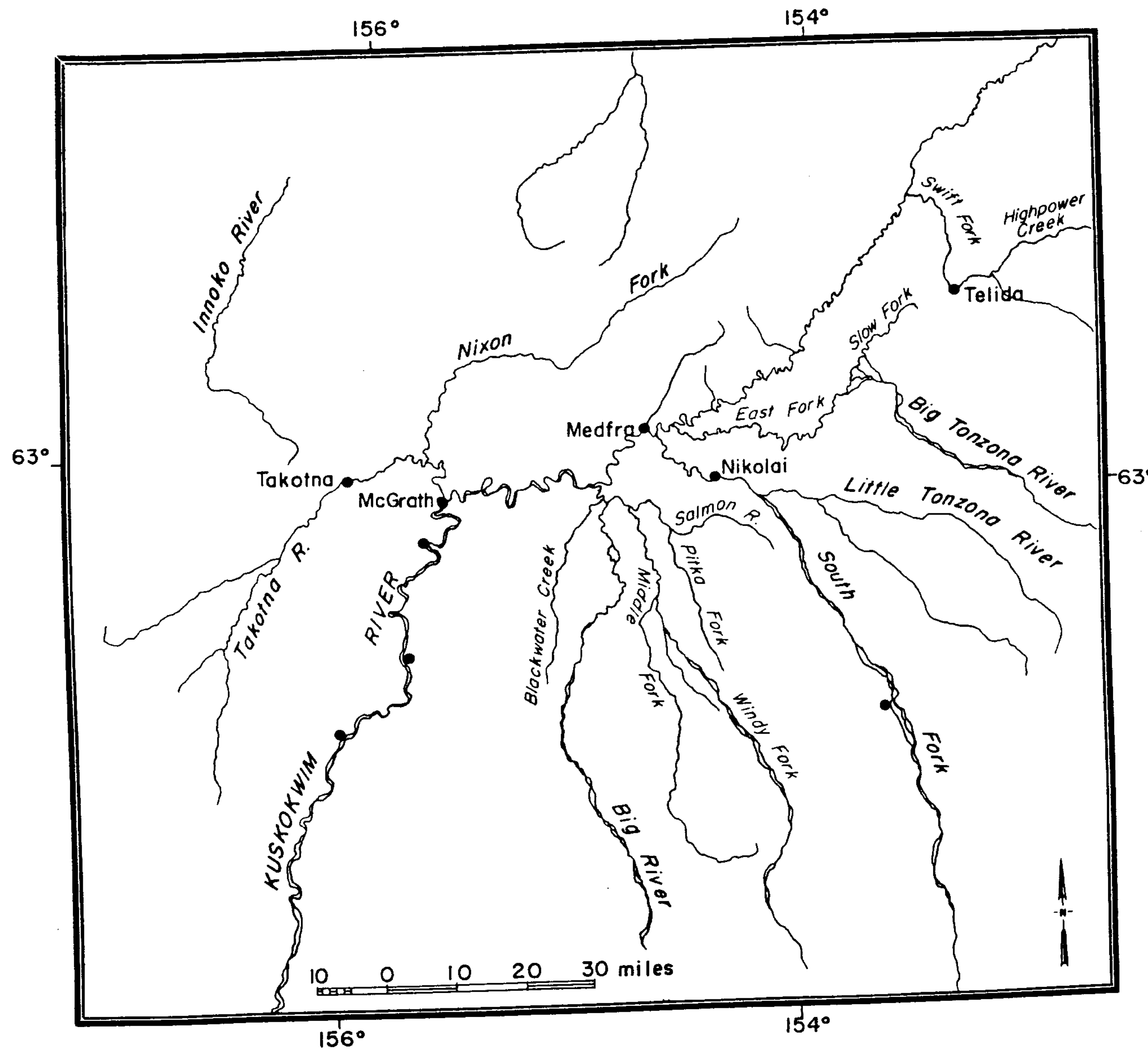

Fig. 2. Major tributaries of the Upper Kuskokwim region.

(3) to describe the seasonal round of hunting, fishing, trapping, and gathering activities by residents of each community;

(4) to describe the contemporary communities and the seasonal settlement patterns;

(5) to describe harvest methods, processing and preservation techniques, use of species, and preferred seasons of harvest;

(6) to summarize harvest levels of selected species for the study period;

(7) to describe the geographic areas used for hunting, fishing, trapping, and gathering by Upper Kuskokwim communities over the past 20 years; and

(8) to identify and discuss land, water, and wildlife management related to subsistence uses.

METHODOLOGY

A draft research design which outlined the goals, methodology, and focus of the research was developed in the early stages of this study and presented for review to local governing bodies, interested individuals, and agencies throughout the area (Stokes 1982).

Field data collection occurred in a variety of settings including community meetings, individual homes, at seasonal activity sites and places of employment, and during chance encounters with area residents. Most information was gleaned through first person discussion. The formality of discussion ranged from structured interviews employing a sequential set of predetermined questions for ascertaining geographic use areas information, to spontaneous conversations during subsistence-related activities such as fish cutting. Numerous meetings were attended in the area at which residents discussed resource-related issues, either among themselves or with resource management specialists from various governmental entities.

The author resided in Nikolai throughout the study period and traveled regularly to the other study communities. The length of visits to McGrath, Takotna, and Telida ranged from a single day to more than a week in duration. Some trips were undertaken using surface transportation to provide the researcher with a better perspective and understanding of the areas utilized by inhabitants of the study area communities. Additional field trips were made to seasonally-important sites when people were involved in various subsistence activities. Participant observation was the primary method of data collection in these settings. At other times, field trips were made for the sole purpose of collecting information necessary for preparing responses to specific development proposals under consideration within the study area. Four reports were prepared for the Alaska Board of Game and Board of Fisheries in response to requests for background information for specific regulatory proposals and management issues related to moose hunting and salmon fishing (Stokes and Andrews 1982; Stokes 1982; Stokes 1983; Andrews and Stokes 1984). Literature was reviewed relevant to the research and study area. Ethnographic monographs, historical literature, and biological reports and publications relevant to the research goals and study area also were reviewed.

Geographic areas used for subsistence activities by residents of each community were mapped using acetate overlays on U.S. Geological Survey maps (scale 1:250,000). The survey format and households sampled varied between communities. In Nikolai and Telida, at least one member of every permanent household was interviewed on the subject of areas used for resource harvesting. Takotna residents contributed information as a group in public meetings where attendees reportedly represented more than 50 percent of Takotna households. Areas used by McGrath residents were mapped during interviews with 33 selected households (approximately 18 percent). The selection criteria and process for the latter sampling involved listing locally-known trappers, fishermen, and/or hunters. These lists were developed through discussions with knowledgeable community leaders and resource users. Most McGrath respondents participated in all three activities. Consequently, while the McGrath sample represented less than 20 percent of the total community households, those contacted likely represent more than one-half of those identified as being involved in multiple subsistence activities. Formal surveys utilizing limited response options were avoided throughout the project duration and with one exception, informants freely assisted the principal investigator on an unpaid basis.

Numerous photographs were taken to further document resource utilization activities of area inhabitants. Photographs were made of sites, harvest activities and processing activities, and equipment. Several of these are included in subsequent chapters. Unless otherwise noted, all photographs were taken by the author.

Upper Kuskokwim Athabaskan and English place names were compiled from previously unpublished sources and local residents. Orthographical review and translation of Upper Kuskokwim Athabaskan place names was undertaken by locally-recognized experts and a paid linguistic consultant.

This document, as well as earlier reports to the Alaska Boards of Game and Fisheries, was reviewed by interested area residents and members of local organizations supplemental to Division review. As in earlier reports, reference to participants by name is avoided throughout this report.

LIMITATIONS

Temporal, personnel, and fiscal restrictions served to limit the depth of this final product. Geographical characteristics of the study area made travel to some sites difficult at certain times of the year. Scheduling conflicts with other research-related responsibilities also served to limit final product depth. The ethnic diversity of the study area somewhat hindered fieldwork. The political sensitivity of the "subsistence issue" in Alaska today and the resulting reluctance of some individuals to freely discuss their resource utilization practices likely affected the completeness of the final product. In many instances, frank discussion of some subjects was avoided to minimize potential retribution against participants by enforcement and regulatory agencies.

Because the author is a permanent resident of Nikolai, the largest Athabaskan Indian settlement within the Upper Kuskokwim region, more data were collected from that community. While this report tends to focus more on the activities of Nikolai, in many instances the practices and patterns are indicative of those of other Upper Kuskokwim communities. With the exception of the native place names component, virtually all fieldwork and data collection were conducted by the author.

An unforeseen limitation in the amount of time for fieldwork were numerous requests for specific and timely information relative to resource management and development issues. Often these requests necessitated spending several months engaged in research and development of products tailored to provide specific information on certain harvesting activities in delineated areas.

ORGANIZATION OF THE REPORT

This report has been organized in a way that should facilitate quick reference to the use of different wildlife species or subsistence activities of individual communities in the Upper Kuskokwim. Chapters 2 and 3 briefly describe the regional setting in terms of the contemporary communities, their historical development, and the natural environment. Chapter 4 describes the seasonal round of subsistence activities and the availability and distribution of fish and wildlife species. Chapters 5 through 11 examine the various hunting, fishing, and gathering activities of community residents.

Each of these chapters begins with an overview describing the nature and extent of the resource in the area and the historical uses by indigenous populations. A description of the contemporary subsistence activities follows and is presented for each community. In several chapters, community use is further subdivided into geographic elements to simplify presentation. Chapter 12 discusses many of the resource and development issues which may affect subsistence uses in the Upper Kuskokwim. Appendices include a list of selected Upper Kuskokwim Athabaskan and English place names and accompanying maps; a listing of common, Athabaskan, and scientific names of many of the wildlife species important to area inhabitants; a description of the construction and use of king salmon fish fences; and a description of the use and construction of fishwheels in the Upper Kuskokwim.

Figures and tables appear throughout the text on the page immediately following initial reference. Where beneficial, reference to previous figures are made. Maps showing geographic use areas for harvesting various species by community appear where applicable. Throughout the text and where appropriate, Upper Kuskokwim Athabaskan (underlined) species names, place names, tools, equipment, and products immediately follow their English counterparts. Most Upper Kuskokwim Athabaskan spellings were derived from Dinak'i Upper Kuskokwim Athabaskan Dictionary (Collins and Collins 1966). Blueprint copies of geographic use area maps (scale 1:250,00) are available upon request from the Division of Subsistence regional office in Fairbanks. Blueprint maps showing Native-named places (scale 1:250,000) (Appendix 1) also are available upon request.

CHAPTER 2

REGIONAL CHARACTERISTICS, CONTACT, AND HISTORIC SETTLEMENT OF THE UPPER KUSKOKWIM

REGIONAL CHARACTERISTICS

The Upper Kuskokwim, as a region, features distinct physical, historic, political, cultural, and linguistic characteristics that combine to recognizably offset it from surrounding areas of Alaska. Many natural elements contribute to creating the environment that supports the ecosystem characteristic of the Upper Kuskokwim. Factors of climate, physiography, hydrology, and vegetation are briefly discussed below. Other elements affected by human activity also have a role in the contemporary environment and several are discussed later in this chapter.

Climate

Detailed weather records have been maintained continuously for McGrath since 1942. According to weather summary sheets through 1979, extreme temperatures have ranged from 90° Fahrenheit on June 15, 1969 to -67°F. on December 27, 1961. The average temperature for McGrath in January is -9.2°F. while the average temperature for July is 58.4°F. The average annual mean temperature is 25.2° Fahrenheit. February and April are the driest months, each averaging .76 inches of precipitation, while August is the wettest with a mean of 2.92 inches of precipitation. The greatest single day precipitation level was 1.56 inches on

December 23, 1970. Average annual snowfall for McGrath is 84.9 inches (AEIDC 1980).

Additionally, a National Weather Service monitor station was placed at Nikolai between 1970 and 1976 and yielded partial climatic data for that period. Records for this timeframe indicate extremes ranging from 86°F. (June 25, 1971) to -62°F. (January 21, 1973) (AEIDC 1980). The average daily temperature for Nikolai in June during that period was 55.9°F. Based on data from the six-year period, April has been the driest month with an average precipitation of .29 inches and August the wettest with 5.1 inches. The most precipitation recorded for a single day was 1.83 inches on December 23, 1970. Average annual snowfall during the six-year reporting period was 62.5 inches (AEIDC 1980). While weather records for Takotna and Telida are unavailable, the weather probably does not significantly differ from that recorded for McGrath (15 air miles distant from Takotna) and Nikolai (40 air miles distant from Telida).

Physiography

Geologically, the study area is, for the most part, situated in the southwestern portion of the "Minchumina Basin" (Alaska Department of Minerals and Energy Management 1983). Geologic characteristics of this area have been described as follows:

> The southwesterly portion of this basin is bordered by the steep glaciated slopes of the Alaska Range and the northwesterly portion by the low rolling hills of the Kuskokwim Mountains. This broad basin is the direct result of a recent geologic period in which an extensive ice field and large glaciers scoured the landscape and blanketed the

low-lying region with glacial outwash and till. The region is now characterized as a vast lowland of meandering rivers, scattered oxbow and pothole lakes, and marshy tundra. Moderate topographical relief is provided by ancient sand dunes which are visible as forested, gently curved benches and flat plains of sandy soil. Additional relief is provided in various low mountains along the Takotna River and north of Telida (Darbyshire and Associates 1984).

The area features discontinuous permafrost in layers of varying thickness.

Hydrology

River systems in the study area drain into the Bering Sea by way of the Kuskokwim River, except for the upper Innoko River tributaries that feed into the Yukon River. Glacial rivers originating in the Alaska Range are generally silt-laden during the summer months, while those tributaries arising in the lowlands often feature low turbidity. Enroute, both classifications of rivers drain numerous interconnected and isolated lakes and swamps characteristic of the area. Following break-up in the spring, water levels in the non-glacial systems are most affected by precipitation, while temperature seems to be the dominant factor affecting Alaska Range fed river stages.

Except for the swift upper rivers and certain lesser spring-fed tributaries, most area rivers are ice-covered by mid-November. Most upper river tributaries are ice-free by late May, although ice may remain in place in the main Kuskokwim River below Big River until early June.

While water velocities in the lowland areas are generally moderate (less than 6 mph), erosion and corresponding shifts in channel are evident throughout the area and, over the years, have necessitated changes in community sites for Nikolai, Telida, and McGrath. Flooding from prolonged precipitation and, during the spring, ice-jams are problems in some areas in some years.

Vegetation

From the air, dense pockets of white spruce are clearly visible along the present and recent river corridor including oxbow lakes. The river corridors also feature both mixed and solid stands of balsam poplar, locally called cottonwood. Within the corridor, various species of birch occur either as the predominant species or in mix with white spruce and poplar, although stands of birch are generally found on higher ground. Away from the river corridor, black spruce is the most commonly encountered tree species except on the southern exposure and crown of low rolling hills, where birch and quaking aspen often are found.

Lesser vegetative undercover includes alder, willow, grasses, mosses, berry plants and other shrubs. Above tree line, lichens, mosses, grass, and shrub alder and willow are common. Marshy areas often feature mosses, grasses, and shrubs.

HISTORIC CONTACT AND SETTLEMENT

Approximately 150 years have lapsed since the first known European foray into the upper Kuskokwim drainage. This first direct contact with the aboriginal population was likely made by employees of the Russian-American Company. For simplicity, several divisions of the post-contact timeline have been made to facilitate an historical overview of the Upper Kuskokwim in this chapter. These include the "Russian Period" (1832-1866), the "American Period" (1867-1905), the "Mining Period" (1906-1940), and the "Pre-Statehood Period" (1941-1959). The period of time between 1960 and the present, including descriptions of the contemporary communities, is discussed in Chapter 3.

Ethnic Origin/Classification

Linguistically, Upper Kuskokwim Athabaskans are part of the large Dene-speaking group of Indians that extends from areas in the southwestern United States northward into northwestern Canada and includes prehistoric occupants of the Pacific Northwest (Krauss 1982).

Because little systematic archeological research has occurred in the study area (Andrews 1977), definitive information about the ethnic identity of precontact occupants of the Upper Kuskokwim is unavailable. Nonetheless, oral information provided by older Nikolai residents combined with recent linguistic research indicates that the present Athabaskan inhabitants of the area probably are descendants of a distinct ethnic group which likely occupied the area for an undeterminable period prior to contact with Russians and Europeans. Because this area was one of the last in Alaska physically penetrated by Russians and Europeans and, until recent times, was characterized by a conspicuous absence of linguistic and ethnological studies, ethnic identification of the indigenous population was often extended from aboriginal groups in adjoining areas.

In 1842, Russian naval Lieutenant Lavrentii Aleksevich Zagoskin was dispatched by the Russian-American Company to examine reported trade and supply problems as well as to better determine the potential of the fur industry in Western Alaska, including the middle and upper Kuskokwim Valley (Michael 1967). In the narrative of his travels in the area, Zagoskin called upper Kuskokwim inhabitants the "Goltsan" (Michael 1967). In 1867, Father Illarion, a Russian Orthodox priest visiting the Kolmakov area referred to both Upper Kuskokwim and Holikachuk area inhabitants as "Kolchane" (Oswalt 1960). In the absence of direct extended contact with Upper Kuskokwim Athabaskans, "Kolchan" and "Goltsan" were, in all likelihood, terms possibly anglicized from the generic Tanaina word "Giltsane." This word, meaning "the others" or "the rest," was apparently applied to all inland Athabaskans by their coastal-dwelling relatives (R. Collins pers. comm., 1984).

Another term sometimes used to describe the Upper Kuskokwim group was "Ingalik," a Yup'ik Eskimo name apparently applied to all inland Athabaskans along a line extending from the upper Anvik River drainage southward to the Alaska Range. A distinct Athabaskan group in the lower Innoko and middle Yukon River continues to carry this title (Krauss 1982). Pending completion of an analysis of the Upper Kuskokwim language, the title of "Ingalik" or "McGrath Ingalik" continued to be applied to the area's Athabaskan population until the early 1960s, largely because of superficial linguistic similarities between Upper Kuskokwim and Yukon River languages. This "sameness" was apparently reinforced, in part, by earlier genealogical investigations indicating extensive ancestral connections between the two areas. In the early 1960s, linguists sponsored by the Wycliffe Bible Translators commenced systematic work with the language characteristic of the Upper Kuskokwim as spoken by residents of Nikolai and Telida. After a period of time, it became apparent to them that the dialect spoken by area inhabitants was distinctive from those characteristic of both the Anvik region and other Interior Athabaskan groups. The linguists found conservative or archaic characteristics of the language indicating it was at least as old as those spoken by surrounding groups (R. Collins pers. comm., 1984). They concluded that this enabled them to identify the speakers as a separate Interior Athabaskan group. Shortly thereafter, the term "Upper Kuskokwim Athabaskan" was applied to this language in reference to the geographic occurrence of its modern speakers (Collins, 1966).

After publishing work initially in support of the Ingalik sub-group theory, anthropologist Edward Hosley (1961, 1966) also eventually concluded that the Upper Kuskokwim were indeed linguistically separate from the Ingalik and reapplied the term "Kolchan" to area inhabitants in 1968. However, subsequent research indicates Hosley may have erred in subdividing the "Kolchan" into two linguistic groups since the "Telida Koyukon" group he identified in fact speak true Upper Kuskokwim Athabaskan with slight dialectical differences. Reasons for this error may be found in a possible misinterpretation of oral accounts describing the founding of Telida (see Chapter 3) and because of an erroneous delineation of the eastern extreme of Upper Kuskokwim Athabaskan use areas. Among most ethnographers, the "Kolchan" denominator is no longer contemporarily employed; use of the geographically descriptive linguistic term "Upper Kuskokwim Athabaskan" has become commonplace. For continuity, this latter designation is used throughout this report. Regardless of these applied titles, area descendants of the aboriginal population continue to call themselves "Dena'ina" ("the people").

While considered a distinct linguistic group, the Athabaskan inhabitants of the area are of mixed ancestry. Genealogical investigations indicate multiple connections between the Upper Kuskokwim population and the Ingalik and Holikachuk of the Innoko River, and the Koyukon and Tanana to the north and east. Furthermore, at least one large family genealogy indicates ties with the Dena'ina (Tanaina) Athabaskans to the southwest. Additionally, several families feature ancestral ties with Yup'ik Eskimo speakers of the middle Kuskokwim. Consequently, while a distinct and comparatively ancient Upper Kuskokwim language is featured, the ancestry of many area inhabitants points to a regular in-migration of members of other Athabaskan and, to a lesser extent, Yup'ik groups from the Interior, usually through marriage ties. Because genealogical data are difficult to precisely enumerate beyond five generations back from the present, the historical longevity or extent of these contacts is difficult to gauge. Oral accounts of periodic hostility between Upper Kuskokwim inhabitants and many of the surrounding groups point to the limited extent of these relationships at some points in time. Consequently, examination of the aforementioned data indicates migration followed a pattern of "eras."

Information about the geographic distribution of the population within this area and the extent of land use areas of the Upper Kuskokwim inhabitants in early historic times is somewhat confusing and, at times, contradictory. Extending from the Vinasale area upstream to a point near Lake Minchumina and south into the Alaska Range, estimates of historic Upper Kuskokwim Athabaskan land use area vary between sources, ranging from 14,400 square miles (Andrews 1977:153) to 22,000 square miles (Hosley 1981:618). Historically, closely affiliated groups on the fringe of this area (such as the "Sikmuit" referred to by Gordon in 1907) may have permitted seasonal extension of these use areas to encompass even larger areas.

At the time of contact with the first Europeans in the 1800s, the Upper Kuskokwim aboriginal population was fairly small, consisting of widely-scattered groups or bands of semi-nomadic people whose existence was structured around the caribou hunt and key upriver fisheries. Year-round permanent settlements were non-existent. Seasonal encampments periodically shifted consequent to changes or shifts in the range or availability of targeted resources. The total Upper Kuskokwim population probably did not exceed 250 to 300 persons in aboriginal times, with warfare, the emphasis on large game over fish, and recurrent periods of starvation probably serving to keep population densities low (Hosley 1981).

In a 1966 manuscript, Hosley reconstructed the existence of up to eight closely-related yet geographically distinct historical bands. One, according to Hosley, inhabited areas between the North Fork and South Fork of the Kuskokwim River including the headwater systems of the East Fork (Fig. 2). A second group was the Nikolai band which occupied and used the South Fork including those tributaries originating in the Alaska Range. The third distinct band identified by Hosley in 1966 was the Takotna River group which utilized both the Nixon and Takotna river systems. The Tatlawiksuk band inhabited the Tatlawiksuk and Swift River drainage in the area of Stony River while another group occupied the

Vinasale area below the present-day site of McGrath, apparently inclusive of the Black River (Hosley 1968). Three other bands identified by Hosley occupied the Lake Minchumina and Kantishna River areas. Of these, one occupied the Toklat River drainage from the headwaters downstream to and including the lower Kantishna River. Another inhabited area around the Kantishna River upstream of the confluence of the Toklat including the headwaters of lesser upper Kantishna tributaries. The third group occupied the Lake Minchumina area between the Kantishna River and the Swift Fork tributary of the North Fork encompassing portions of the Alaska Range between these two rivers.

As more information became available, Hosley (1981) noted the existence of only six groups or bands, omitting the Toklat and Kantishna River bands that were more closely identified with Tanana or Koyukon speakers to the east and north. However, Hosley continued to include the Tatlawiksuk group below Vinasale Mountain, an area currently in use by Stony River residents (Kari 1985). This redelineation of the northeastern extent of Upper Kuskokwim-occupied lands is supported by other recent research. Members of a band once occupying the lower Toklat River area and now living in Nenana identify linguistically with former inhabitants of the Bearpaw/Lake Minchumina area as well as "downriver" (the village of Tanana) peoples (Shinkwin and Case 1984). While there are now distant genealogical ties with people from the Tanana-Minto area, it is even questionable whether Upper Kuskokwim Athabaskans inhabited areas much further east than the Highpower/ Lonestar Creek drainage midway between Telida and Lake Minchumina (R. Collins pers. comm., 1984).

Review of genealogical data, conversations with older Nikolai and Telida inhabitants, and discussions with other knowledgeable individuals all indicate there likely was, at least since contact, a great deal of dynamism between not only these subgroups, but among other contiguous populations as well. A good illustration of this would be Wickersham's apparent encounter with old Chief "Shescie" of Telida near the confluence of Chitsia creek with the Kantishna River below the mouth of the Bearpaw River in 1903. "Shescie" and his companions "who have for many years hunted round the heads of the streams approaching Denali" gave the party directions to the "great glacier which... comes down from its [Denali] summit." (Wickersham 1938:255-256). Consequently, territorial divisions and individual or group resource use areas, at that time, were likely in flux and not, by any means, fixed or rigid entities. The apparent reasons for this are not clear and require further research into the circumstances.

The Russian Period (1832-1866)

According to Zagoskin, the first recorded European penetration of the upper Kuskokwim upstream of Vinasale occurred in 1839 when a party headed by Petr Kolmakov traveled by kayak up the Takotna River, and subsequently portaged across into the upper Innoko drainage in search of beaver pelts (Michael 1967). Descending the Innoko River enroute to the company post, Kolmakov learned from Indians that this post had been closed after Kuskokwim Yup'iks massacred its inhabitants (Michael 1967). Retracing their course, the Kolmakov party crossed back into the upper

Takotna by a different portage. Zagoskin himself traveled as far upstream as the mouth of the Takotna River in 1844 (Michael 1967).

"Kolmakovskiy Townlet" was the first permanent trading post in the upper and middle river, established by the Russian, Fedor L. Kolmakov, (father of Ptr), near the mouth of the Holitna River in 1832 as an extension of the then Nushagak River-based Russian-American Company activities (Charnley 1984). To more effectively facilitate participation in an expanding fur trade with both Yup'ik and Athabaskan inhabitants of the Kuskokwim Valley, a larger post was established a little further down the Kuskokwim in 1841 opposite the mouth of the Kolmakov River. Known as Kolmakovskiy Redoubt, this site was fundamental in establishing Company presence and Russian influence in the middle and upper Kuskokwim drainage and, after a short period of time, became a profitable post (Oswalt 1980). As the direction of Russian supply shifted from Alexandrovski Redoubt on the Nushagak River to Mikhailovski (St. Michael) along Norton Sound in the early 1840s, the use of and importance of the original Townlet diminished. A second, intermediate, trading station was opened further up the river near Vinasale Mountain in the 1850s (Oswalt 1980), approximately 25 air miles south of the present site of McGrath. Situated near a lake outlet that was seasonally utilized for whitefish harvest activities by the aboriginal population of the area, this post was only seasonally occupied by Company employees, but later assumed increasing importance as a trading site with upper river inhabitants.

Despite occasional trading forays, the Russian-American Company's approach to the fur trade apparently was one of relative passivity. While the furs taken by upper Kuskokwim inhabitants were highly prized and much sought after, the Company appeared to make comparatively little effort to travel into the upper river beyond the Takotna River to obtain them, instead relying on word-of-mouth and intermediaries to draw aboriginal trappers with their catch to one of the Company-operated posts. This approach, first employed at Kolmakov, apparently was successful as the Russian-operated trading post at Vinasale attracted upriver inhabitants and their valuable furs in seemingly appreciable numbers from as far away as the South Fork of the Kuskokwim River. The indigenous population received its first exposure and subsequent conversion to Orthodox Christianity at these trading posts, often at the hands of Company agents empowered by the Church to act on its behalf. Older Nikolai inhabitants recall hearing of mass baptisms occurring in the river at Kolmakov and later at Vinasale during this period.

At the time of his visit to the middle Kuskokwim, Zagoskin noted that Nikolayev Redoubt (Fort St. Nicholas) on the Kenai Peninsula also was participating in the lucrative upper Kuskokwim fur market independent of the Kolmakov and Alexandrovski posts (Michael 1967), possibly taking advantage of prehistoric trade routes linking the Susitna Valley with the Upper Kuskokwim (Hosley 1966, Fall pers. comm., 1983). Dispatching Tanaina Indian intermediaries over trade routes leading directly into the upper Kuskokwim from upper Cook Inlet, these expeditions led to pronounced decreases in the volume of fur traded at Kolmakov. Reports of hostilities between the two indigenous groups that may have disrupted the fur trade, decreased profitability of the Kolmakov post, and concerns over Tanaina care of the skins while in transit back to Nikolayev led to discontinuation of this trading practice. Zagoskin recommended that each post limit its fur collection activities to areas within prominent surrounding natural boundaries (Michael 1967).

According to prospectors, an additional Russian outpost may have been constructed on the upper Takotna River near one of the portages to the Innoko drainage (Brown 1980). Given the traders' high regard for the Takotna and Innoko rivers as beaver-yielding streams and their practice of constructing posts at strategic points along important aboriginal trade routes, the existence of this post is entirely possible although lifelong inhabitants of the area have not heard of this site (Brown 1980).

The American Period (1867-1905)

Trade at both Vinasale and Komakovskiy redoubts resumed under the auspices of the Alaska Commercial Company around 1870 (Oswalt 1980), after possibly being temporarily abandoned in 1866 when the Russian-American Company withdrew from Alaska following United States purchase. At the resumption of fur trade under the American flag, many former "creole" employees of the Russian-American company who remained in the area were rehired. Vinasale likely was the first "contemporary" upper river community occupied, at least seasonally, by both Upper Kuskokwim Athabaskans and the aforementioned employees who periodically traveled there from Kolmakovskiy Redoubt. This occupancy by Upper Kuskokwim Indians apparently continued from the 1860s through the early 1940s.

The time of the first American entry to areas upstream of Vinasale is obscure although between 1898 and 1902, government-sponsored expeditions made two well-documented journeys through portions of the upper Kuskokwim valley. Geologist J.E. Spurr and topographer W.S. Post traveled from the upper Cook Inlet across the Alaska Range, descended the South Fork of the Kuskokwim River and continued downstream to Kuskokwim Bay in 1898 for the U.S. Geological Survey. Apparently seeking comparative mileages and characteristics of alternate transportation routes to the Klondike gold fields, they mapped large areas of the upper and middle Kuskokwim Valley (Spurr 1900). The following year, Lt. J.S. Herron passed through the upper Kuskokwim valley east of the South Fork, traveling northeastward to Fort Gibbon under the auspices of the U.S. Army. This expedition set out to find "the most direct and practicable [railroad] route from tide water to the crossings of the Tanana River" (Herron 1909). Despite a series of misfortunes and injuries, the party eventually arrived in Fort Gibbon the following spring with the assistance of Telida Indians.

Two other well documented journeys into the area occurred between 1903 and 1908. In 1903, U.S. District Judge J. Wickersham set out from Fairbanks enroute to the north face of Mt. McKinley via the Kantishna River system (Wickersham 1938), returning by the same route. George B. Gordon, an ethnographer sponsored by the University of Pennsylvania, crossed the Minchumina portage and descended the Kuskokwim River by way of the North Fork in 1907 (Gordon 1917). These expeditions provided important information about the area and its inhabitants, although they were preceded by others.

According to some Nikolai residents, two small steamboats reached the upper South Fork above the present-day site of Nikolai late in the fall of 1892, where at least one remained for the winter (see Chapter 3). These boats engaged in trade with both the aboriginal population and a small number of non-Native trappers who were reported to have been in the area by that time.

Additionally, a few prospectors likely visited the area in the late 1890s and, continuing into the 1930s, tributaries of the upper Kuskokwim were regularly examined by gold seekers. Many of these prospectors, successful or not, remained in the area for a time in pursuit of furs.

The coalescence of the Athabaskan population into recognizable permanent settlements probably began between the 1880s and 1905. This "drawing together" was likely enhanced by the proximity of trading sites. Initially, most of these settlements were of a seasonal nature. Certainly the establishment of a Russian Orthodox Church at "Old" Nikolai in the middle 1890s attracted upper river inhabitants to this site.

The Mining Period (1906-1940)

One factor not to be overlooked in the development of contemporary settlement patterns was the discovery of significant quantities of gold in various tributaries of the upper Kuskokwim and Innoko river systems. While a few of the earlier prospectors moved freely throughout the country prior to any of the major finds, little supply infrastructure beyond the trading posts left in place at the time of the Russian withdrawal was necessary.

The first "stampede" occurred during the summer of 1900 when rumors reached Nome of discovery of the mythical "Yellow River," a placer-bearing stream reported long ago by the Russians. Some of these participants ascended as far upstream as the Stony River that year. After suffering great hardships during the winter of 1900-01, many returned to Nome. However, an unknown number remained in the area, continued to prospect for gold, and made several promising discoveries in both the lower and upper Kuskokwim Valley (Brown 1980).

The first truly significant discovery of gold in the area occurred on Ganes Creek in the upper Innoko system in 1906, leading to an influx of placer miners in 1907 (Brown 1980). Subsequent discoveries in both the Takotna and Innoko river systems over the next few years led to further increases in population as a number of mining communities such as Ophir (1908), Flat (1910), and Iditarod (1910), were quickly established (S. Collins pers. comm., 1985).

With the arrival of hundreds of miners, numerous trading companies quickly established posts at many of the larger mining camps and other strategic points throughout the area. According to knowledgeable area residents, the first of these upper river posts after Vinasale was established around 1905 near the strategic confluence of the Takotna River with the Kuskokwim across from present-day McGrath. Several riverboat companies were quickly formed to serve sites in the upper Kuskokwim and Innoko rivers, and a network of winter overland trails soon linked most of the major mining settlements with larger communities including Nenana, Nome, Bethel, and Seward.

Along both the summer and winter trail systems, travelers were served by a network of roadhouses. Often located a single day's journey apart, these roadhouses, at the least, offered shelter and food for the traveler and his dogs. Nikolai residents noted some trading posts served both travelers and full-time residents from around the area.

While a few featured Athabaskan proprietors, most roadhouses were operated by men who often spent the summer engaged in mining activities.

During the Mining Period (1906-1940), "market hunting" and "market fishing" supplemented the income of area inhabitants. Local hunters were able to sell fresh moose, bear, and caribou meat to roadhouse operators. According to one Nikolai resident, the demand "was great." As many of the proprietors departed each spring for the gold fields, teams of dogs from around the area were left in the care of Native handlers at those roadhouse sites near traditional salmon and, possibly, whitefish harvest sites. Not only were these families responsible for the immediate care of the dogs, they also caught and processed enough fish to maintain these teams over the winter.

Other economic opportunities offered by the roadhouses, trading posts, and area mines included temporary laborer and domestic jobs. Additionally, jobs were available in sawmill and logging operations, on the river boats that served the upper river, and in the territorial postal service. According to one older Nikolai resident, local dog drivers who transported the mail were widely regarded as being exceptionally dependable, particularly during periods of inclement weather.

All of these opportunities altered the seasonal round of the Upper Kuskokwim population, as people willingly spent increasingly longer periods of time in or around the small settlements characteristic of this period. Nonetheless, hunters continued to journey to many of the traditionally important areas in the Alaska Range each year.

Reestablishment of a second upriver Russian Orthodox Church at "Old" Telida in 1918 served to draw Upper Kuskokwim Athabaskans inhabiting the northeastern portions of the area to this community at least on a periodic basis.

Beginning in the middle 1920s, aircraft were increasingly utilized to transport passengers and mail to, from, and around the Upper Kuskokwim. With the construction of airfields at Medfra, McGrath, and Takotna in the late 1920s and early 1930s, use of the winter trail network diminished. Consequently, by the early 1930s, many roadhouses had closed because of reduced business. Those that remained in operation apparently were located at strategic points along area rivers or near summer roads still utilized to move large freight to area mines. Most roadhouses that remained open featured trading posts, fur ranches, or other endeavors that financially supported the proprietors.

Aircraft added another dimension to the trapping patterns of Nikolai residents, who sometimes reportedly flew to distant traplines for extended periods of time. Ultimately this technology permitted trappers to spend additional time in the winter settlements.

The Pre-Statehood Period (1941-1959)

Mining production was already in decline by the time of World War II. The mining activities were interrupted in the early 1940s when heavy equipment (such as crawler tractors) were requisitioned by the government to support the war effort. This equipment was used for construction of airfields to facilitate the ferrying of military aircraft to Europe and the Soviet Union and to transport fuel overland during the winter in "Cat trains" to many of these landing sites.

With further reductions in winter travel correspondent to decreases in the mining industry and increasing reliability of air service, most remaining roadhouses closed in the early 1940s. Some of these sites, such as Big River, East Fork, and Salmon River continued to feature year-round residents, most of whom engaged in trapping, fishing, and other subsistence-oriented activities. Others, particularly Medfra, continued to operate facilities such as fur farms, trading posts, runways, post offices, and sawmills, serving the few remaining miners and trappers as well as inhabitants of nearby communities.

The next coalescing factor, for communities was the creation of schools. Many people believed the school which began in 1948 permanently established Nikolai. Initially operated by a church, the Territory took control in 1951. Establishment of a school at Nikolai eventually led to additional transportation services that, in turn, facilitated local establishment of postal facilities and a store. At the same time, the economic importance of Medfra as a service center to Nikolai inhabitants gradually decreased. Likewise, many of the single household "satellite settlements" were abandoned during the winter as parents moved to Nikolai to be with their children while they attended school.

SUMMARY

The Upper Kuskokwim as a region is distinct because of cultural, linguistic, and physical features. The area probably was inhabited prehistorically by ancestors of the Athabaskan-speaking peoples encountered by Europeans at historic contact nearly 150 years ago. The first Europeans came in pursuit of commercial furs. Later, the discovery of gold drew thousands of others. This led to the founding of numerous communities, trading posts, and transportation companies to supply the mines. A network of summer and winter trails was developed to link these new settlements with each other and outside markets. As the flow of gold slowed, many people moved on.

Upper Kuskokwim Athabaskans became willing participants in changing economic conditions, exchanging furs for cash or goods, "market" hunting and fishing for new arrivals, and taking seasonal positions for wages. The aboriginal population coalesced into permanent settlements at Nikolai, Telida, Takotna, and McGrath around the Orthodox Church, schools, and trading posts. Improved harvest and transportation technology facilitated continuation of many facets of the traditional seasonal round from these winter settlements. While World War II brought about an end to much of the mining activity, the subregional population continued to grow until well past statehood, for the most part around a service-based economy as is discussed in the following chapter on the contemporary communities.

CHAPTER 3

CONTEMPORARY UPPER KUSKOKWIM COMMUNITIES

Most of the Upper Kuskokwim population now resides within the boundaries of four settlements -- McGrath, Takotna, Nikolai, and Telida (Figs. 1, 2). The few individuals or families which reside in isolated locations elsewhere in the study area generally spend at least several months each year in one of the area communities, often taking advantage of seasonal wage employment opportunities. In 1984, the contemporary study area population was approximately 733 persons (Table 2). Community sizes range from less than 30 persons in Telida to slightly more than 500 in McGrath (Table 1). Numbers of households per community range from 7 in Telida to 181 in McGrath (Table 2). According to the 1980 census, median incomes ranged between $5,000 and $21,944 (Table 2) in 1979. Areawide, the population is approximately 50 percent Alaska Native, the majority of these of Upper Kuskokwim Athabaskan descent.

The purpose of this section of the report is to summarize services and socioeconomic characteristics of the contemporary Upper Kuskokwim communities, recognizing that appreciable changes have occurred between the time of initial writing and publication.

MCGRATH

Located approximately 225 air miles northwest of Anchorage, McGrath has the largest population of the four study area communities. In 1984, there were 537 persons in 181 housing units (B. Juettner pers. comm.,

TABLE 1. COMPARATIVE 1984 POPULATION, SEX, AND RACE CHARACTERISTICS OF UPPER KUSKOKWIM COMMUNITIES.

Community	Total Population	Male	Female	Alaska Native	Non-Native
McGrath	537[1]	--	--	40%	60%
Nikolai	107[2,3]	53%	47%	94%	6%
Takotna	62[4,5]	55%	45%	29%	71%
Telida	26[3]	62%	38%	92%	8%

1 source: municipal officials pers. comm., 1984
2 excludes school staff
3 source: this study 1984
4 source: Tanana Chiefs Conference 1983:174
5 source: Tanana Chiefs Conference 1984

TABLE 2. 1984 POPULATION, HOUSEHOLDS, AVERAGE HOUSEHOLD SIZE, AND 1979 MEDIAN INCOME IN MCGRATH, TAKOTNA, NIKOLAI, AND TELIDA.

Community	1984[1] Population	Number of Households	Average HH size	Median Income, 1979[3]
McGrath	537	181	2.97	$ 21,944
Takotna	62	22	2.82	15,000
Nikolai	107[2]	29	3.69	5,000
Telida	27	7	3.86	no data
Total	733	239	3.33	

1 source: municipal officials pers. comm., (except for Nikolai) 1984
2 source: this study 1984
3 source: 1980 U.S. Census

comm., 1984). McGrath has shown a growth of 51 percent since 1980 when the U.S. Bureau of the Census findings placed the population at 355 persons. At that time, the population featured more males than females in all but four age classes (1-14; 25-34; 55-64; and 65 and older) (Table 3). The ratio of males to females is greatest in the 35-44 year old age class (Table 3).

The most recent estimates by the City of McGrath indicate approximately 40 percent of McGrath residents are Alaska Native, the majority of these of being non-Upper Kuskokwim ancestry (B. Juettner pers. comm., 1984). McGrath's population has grown consistently since the community was founded. In 1920, 90 people were reported as living there, with the population doubling by 1950 and again doubling in size by 1980 (Table 4).

According to elderly Nikolai inhabitants, the original location of contemporary McGrath was a prehistoric meeting place and trading site used by aboriginal bands indigenous to the area. A trading post was established on the north bank of the Kuskokwim River, near the confluence of the Takotna River (Tochak) shortly after 1900 by Abraham Appel. As river traffic increased up the Kuskokwim River in route to the Innoko mining district "Appeltown" grew along both banks of the Takotna River. Around 1910 the growing settlement was renamed after U.S. Deputy Marshall Peter McGrath. McGrath was reestablished on its present site along the south bank of the Kuskokwim River shortly before World War II because of recurrent flooding and river channel changes. The last residents of "Old Town" moved across the river to the present-day community site in the late 1950s.

TABLE 3. AGE AND SEX CHARACTERISTICS OF THE MCGRATH POPULATION, 1980 (N=355).

Age Class	Males (N=187) Percent of Population*	Females (N=168) Percent of Population*
65 and older	1.4	3.1
55-64	2.3	2.3
45-54	3.9	3.1
35-44	9.6	5.6
25-45	9.6	10.7
15-24	8.5	7.9
10-14	4.5	4.5
5-9	7.9	5.6
0-4	5.0	4.5
TOTAL	52.7	47.3

* rounded to nearest tenth.
Source: Tanana Chiefs Conference, Inc., 1983

TABLE 4. POPULATION TRENDS FOR MCGRATH, 1920-1984.

Year[1]	Population
1920	90
1930	112
1940	138
1950	175
1960	241
1970	279
1980	355
1984[2]	537

[1] Darbyshire and Associates 1984 (except for 1984)
[2] McGrath municipal officials pers. comm., 1984

The oldest official building in contemporary McGrath is the former Northern Commercial Store constructed in 1938.

As the transportation and supply hub of the study area, McGrath offers many unique services within the Upper Kuskokwim. The federal government is a major employer in McGrath. The Federal Aviation Administration's (FAA) flight service station (FSS) provides round-the-clock service for arriving and departing aircraft as well as enroute services to other aircraft. In addition, the McGrath FSS operates facilities via remote electronics at Lake Minchumina, Farewell, and Galena. The National Weather Service (NWS) also maintains a facility at McGrath that provides aviation and general weather services. During the summer, the Bureau of Land Management (BLM) operates a fully staffed fire detection and suppression station in McGrath. Staffing levels vary depending on the level of fire activity but may include a contingent of smoke jumpers, initial attack crews, and one or more village crews. Additionally, fixed and rotary-wing aircraft including one or more retardant planes are often stationed in McGrath for the duration of the fire season. With the exception of one caretaker position, the BLM station is unmanned during the winter. Fire suppression responsibilities are scheduled to be transferred to the State of Alaska's Department of Natural Resources in 1985 (M. Phillips pers. comm., 1984). The U.S Fish and Wildlife Service maintains the Innoko Wildlife Refuge headquarters in McGrath and the U.S. Postal Service operates a facility in McGrath.

The State of Alaska is another major employer of McGrath residents. The Department of Transportation and Public Facilities (DOT/PF) has maintenance responsibilities for the 5,400-foot paved runway. DOT/PF staff based in McGrath also have some maintenance and/or inspection responsibilities for the Takotna-Ophir road system and surrounding community runways. The University of Alaska has operated a Rural Education Center for several years and recently the Cooperative Extension Service funded a field agent position for the area. The Department of Health and Social Services provides a part-time social service case worker and an itinerant nursing position for the subregion, while the Alaska Department of Fish and Game (ADF&G) has stationed a game biologist in McGrath for a number of years. A Department of Public Safety Fish and Wildlife Protection officer is stationed in McGrath. With the withdrawal of a State Trooper position in the early 1980s, the F&WP officer also performs some general law enforcement duties when necessary. McGrath is served periodically by an itinerant magistrate.

The City of McGrath employs a number of community residents both seasonally and year-round. Incorporated as a second-class municipality in 1975, the City maintains a washeteria/central water supply point. This facility also houses the health clinic, city offices, meeting space, and the area mental health service organization. City services include operation of a daycare facility, cold weather bus system, clinic, and road maintenance equipment. The City also provides fire and ambulance service under the auspices of the clinic. Planning for a community-wide water system is currently underway. Revenues for the City of McGrath in FY83 (audited) were $503,000.

The 5,000 watt public radio station, KSKO-am, operates 18 hours per day and reaches a large portion of the southwestern Interior with a programming format including music, news, sporting events, and other items of interest to area residents. McGrath residents receive both the

Learn/Alaska and Alaska Satellite Project channels on television. Four additional channels of cable television are commercially available. The Kusko Courier is a weekly newspaper serving McGrath and surrounding communities with news of local and regional interest.

The largest employer in McGrath and, indeed, in each of the study area communities is the Iditarod Area School District. In addition to the administrative staff of 27 associated with the operation of the central office, the McGrath school is the largest in the district, employing more than 18 people (I. Harrington pers. comm., 1984). Enrollment in McGrath School for the 1983-84 school year was over 130 students for grades kindergarten through 12. Other major employers in the public sector include the Tanana Chiefs Conference, McGrath/Anvik Community and Family Services, and the McGrath Native Village Council.

There are a number of private or profit-oriented businesses based in McGrath. These include three package liquor outlets, two bars, one roadhouse, two eating establishments, several variety/sporting goods establishments, a large retail grocery store, a travel agency, a trash collection service, and many other specialized small businesses serving the entire study area.

MTNT is the village corporation created by the 1976 merger of the McGrath, Takotna, Nikolai, and Telida village corporations formed under the Alaska Native Claims Settlement Act (ANCSA). MTNT is headquartered in McGrath where it operates a number of enterprises employing 12 residents. Current corporate enrollment is 320. The McGrath Greenhouse is a commercial endeavor utilizing waste heat from McGrath Light and Power. Both are owned and operated by MTNT. The village corporation also operates the fuel distributorship for McGrath and surrounding communities, and MTNT owns a number of residential rental units in McGrath. Pre-subsidized residential power rates average 32 cents per kilowatt hour (J. Vanderpool pers. comm., 1984).

As noted earlier, McGrath features a 5,400-foot maintained runway and a 1,000-foot landing strip for ski-equipped aircraft. Float landings are made on the Kuskokwim River adjacent to the community. At the time of this writing (February 1984), four airlines provide scheduled passenger service between McGrath and Anchorage at least 20 times each week in equipment ranging from Boeing 737 jets to piston engine powered Queen Aires. One way ticket prices range from $65 to $74. Other carriers provide regular air freight service to McGrath. Air freight rates range between 15 and 30 cents per pound. Three fixed-wing aircraft operators serve the region from McGrath on both a scheduled and charter basis. Additional connections to Galena, Shageluk, Holy Cross, Grayling, Aniak, and Anvik are also scheduled. Federal Aviation Agency records indicate 20,655 reported flight operations recorded by the McGrath FSS between February 1983 and January 1984, ranking 12th among the 26 Flight Service Stations in Alaska in reported traffic (J. McGlaughlin pers. comm., 1984).

McGrath is served by two barge companies which make numerous trips from Bethel each summer. While much of the cargo consists of petroleum products, a considerable amount of deck cargo is also shipped via barge. Deck cargos range from vehicles to building supplies. According to several knowledgeable McGrath residents, introduction of regular air freight service to McGrath has reduced the volume of non-petroleum goods shipped on the barges.

There are several churches of various denominations served by either resident or itinerant priests and ministers in McGrath. These include St. Michael's (Catholic), McGrath Chapel (Assembly of God), McGrath Community Church (Inter-denominational), and the Bahai Fellowship (Bahai).

McGrath features several organizations unique to the study area. The Kuskokwim Valley Rescue Squad provides emergency medical services on a 24-hour-a-day call basis to all the area communities. McGrath also has a Civil Air Patrol branch operated by a number of local members. Civic organizations include the Upper Kuskokwim Mushers Association, a Veterans of Foreign Wars Post, an historical society, and a regional arts council.

While wild foods are an important element in the diet of area inhabitants, commercially-manufactured foodstuffs comprise a substantial portion as well. The availability and costs of these commercially-obtained foods vary between communities. Table 5 depicts the comparative cost of goods between McGrath, Nikolai, Takotna, and Anchorage. Probably the single greatest factor in these wide price variations between Anchorage and the study area is attributable to freight costs. Because case goods are generally shipped at the same per pound cost via the postal system, there is some uniformity of price ranges between area retailers. According to individuals associated with retail grocery sales in the area, most differences in price between area communities with stores is attributable to different wholesale suppliers and differing management practices ("mark-up" percentage). Perishable and non-mailable goods are more costly and difficult to ship, particularly beyond McGrath. Consequently, these items are either priced

TABLE 5. COMPARATIVE PRICES OF SELECTED NON-LOCALLY DERIVED FOODS ADAPTED FROM THE "COOPERATIVE EXTENSION SERVICE MARKET BASKET LIST" IN THE COMMUNITIES OF MCGRATH, NIKOLAI, TAKOTNA, AND ANCHORAGE, 1984.

ITEM	SIZE	MCGRATH (1)	NIKOLAI (2)	TAKOTNA (2)	ANCHORAGE** (1)
White potatoes, fresh	10 lb.	7.45	10.00	4.90	3.10
French fries, frozen	24 oz.	2.15	na	na	1.41
Dehydrated potatoes	28 oz.	3.69	4.25	na	2.59
Cabbage	per lb.	1.05	1.25	na	.79
Carrots, fresh	2 lbs.	.99	1.10	na	1.40
Celery	per lb.	2.19	na	na	.89
Cucumbers	per lb.	.85 ea	na	na	.77
Lettuce	per lb.	1.35	1.25	na	.69
Onions	per lb.	.95	1.00	.50	.75
Tomatoes, fresh	per lb.	1.79	na	na	.85
Corn, canned (w.k.)	17 oz.	1.15	1.30	1.10	.57
Green beans, canned	16 oz.	1.09	1.20	1.10	.54
Leafy greens, canned	15 oz.	1.29	1.15	1.10	.55
Peas, canned	17 oz.	1.29	1.25	1.05	.57
Tomatoes, canned	14.4 oz.	1.09	1.25	na	.55
Beets, canned	16 oz.	1.09	1.30	.95	.64
Tomato juice	46 oz.	2.25	na	na	2.36
Potato chips	8 oz.	2.59	2.70	na	1.25
Catsup	24 oz.	3.09	na	na	1.14
Pickles, dill, whole	22 oz.	2.79	2.70	na	1.00
Apples, fresh	per lb.	1.49	1.05	.50 ea	.48
Bananas, fresh	per lb.	1.25	1.15	na	.54
Cantalope, fresh	per lb.	1.49	2.55	na	.69
Grapefruit, fresh	per lb.	1.09 ea	1.25 ea	na	.54
Oranges, fresh	per lb.	1.35	1.05	.50 ea	.72
Strawberries, frozen	20 oz.	2.99	3.05	na	1.84
Applesauce, canned	15 oz.	1.45	1.10	na	.56
Fruit cocktail, canned	17 oz.	1.59	1.75	na	.72

Table 5. continued

ITEM	SIZE	MCGRATH (1)	NIKOLAI (2)	TAKOTNA (2)	ANCHORAGE** (1)
Peaches, canned	16 oz.	1.55	na	1.35	.63
Pears, canned	16 oz.	1.55	1.60	na	.68
Apple juice, canned	46 oz.	2.55	na	na	1.55
Grape juice, canned	46 oz.	3.65	na	na	2.42
frozen	12 oz.	1.25	1.95	na	.89
Grapefruit juice, canned	46 oz.	3.75	na	na	1.50
Orange juice, fresh	16 oz.	na	na	na	.83
frozen	12 oz.	1.95	1.95	2.50	1.50
Cereal, Cornflakes	18 oz.	2.45	na	na	1.37
Oatmeal, old fashioned	42 oz.	3.65	4.05	3.60	2.02
Flour, all purp. enr.	10 lb.	5.95	5.85	5.45	2.80
whole wheat	5 lb.	3.59	3.45	na	1.80
Cornmeal	20 oz.	1.45	na	na	.69
*Macaroni, elbow	4 lb.		5.55	na	
Rice	28 oz.	2.35	1.85	na	.66
Spaghetti, dry	48 oz.	4.85	na	na	2.34
Biscuit mix	48 oz.	3.05	na	na	2.07
*Pancake flour	7 lb.		7.50	na	
Cake mix, yellow	18.25 oz.	2.19	2.15	na	.97
frozen, R.T.E.	17 oz.	3.69	na	na	2.57
Pie, frozen, unbaked	26 oz.	3.89	na	na	2.37
Bread, white, enr.	24 oz.	1.89	2.10	1.90	.95
whole grain	24 oz.	1.99	2.25	1.95	1.20
hamburger buns	12 oz.	1.99	na	na	.88
Crackers, saltine	2 lb.	3.45	3.25	3.35	1.76
* Pilot bread	2 lb.		3.95	na	
Cookies, vanilla waf.	12 oz.	2.59	na	na	1.43
Soup, chicken noodle (canned)	10.75 oz.	.85	.85	.75	.44
Macaroni & cheese mix	7.25 oz.	.95	1.05	.75	.39

Table 5. continued

ITEM	SIZE	MCGRATH (1)	NIKOLAI (2)	TAKOTNA (2)	ANCHORAGE** (1)
Milk, whole	gallon	5.99	na	na	3.04
2% low-fat	gallon	5.99	na	na	2.96
non-fat dry	52 oz.	10.99	11.40	na	6.01
Ice cream	1/2 gallon	3.89	3.50	na	2.24
Cheese, cottage	16 oz.	1.89	na	na	.96
American-sliced	24 oz.	6.65	na	na	3.48
cheddar-mild	per lb.	3.69	na	na	2.30
Beef, ground	per lb.	2.59	3.35	2.25	1.49
chuck steak, bone in	per lb.	3.29	na	na	2.49
round steak, bone in	per lb.	4.49	na	4.58	2.48
sirloin steak, bone in	per lb.	4.98	na	na	2.94
T-bone steak, bone in	per lb.	5.89	7.95	na	4.39
chuck roast, bone in	per lb.	3.29	na	na	1.49
rump roast, boneless	per lb.	3.09	na	na	2.44
Pork chops, bone in	per lb.	2.99	4.45	4.71	2.64
roast, bone in	per lb.	2.49	na	na	2.34
spareribs	per lb.	2.89	na	na	2.24
Ham, cured, boneless, ready-to-eat	5 lb.	23.99	na	na	8.20
Bacon	per lb.	3.19	2.65	4.25	1.59
Frankfurters	16 oz.	2.35	3.20	2.15	1.32
Bologna	16 oz.	3.59	na	na	1.74
Chicken, cut	per lb.	2.29	2.00	1.76	1.14
Turkey	per lb.	1.69	na	na	1.14
Tuna, canned	6.5 oz.	1.65	1.65	1.40	.76
*Canned meat (Spam)	12 oz.	2.85	2.90	2.40	
*Beef Stew, canned	24 oz.		3.00	na	
*Pork & beans, canned	53 oz.		3.30	na	
Canned chili w/beans	40 oz.	4.25	na	na	
Eggs, large	dozen	2.09	2.20	1.70	1.29

Table 5. continued

ITEM	SIZE	MCGRATH (1)	NIKOLAI (2)	TAKOTNA (2)	ANCHORAGE** (1)
Beans, dry, pinto	32 oz.	1.99	na	na	1.06
canned, kidney	15.5 oz.	1.15	na	.90	.55
Split peas, dry	16 oz.	1.05	.79	.90	.55
Peanuts, shelled	3 oz.	1.10	na	na	.51
Peanut butter	28 oz.	4.95	4.65	na	2.36
Butter	per lb.	3.66	3.40	3.10	1.99
Margarine	per lb.	1.35	1.35	1.25	.69
Shortening	6 lb.	9.65	11.30	an	5.58
Vegetable oil	48 oz.	6.39	5.95	6.00	3.30
Mayonnaise	48 oz.	5.69	6.15	na	2.79
*Salt, iodized table	26 oz.		1.10	1.10	
Sugar, granulated	25 lb.	19.75	19.20	na	10.50
brown	2 lb.	2.29	2.10	na	1.28
*powdered	1 lb.		1.15	na	
Syrup, pancake	36 oz.	5.19	5.95	na	2.03
Jelly, grape	18 oz.	2.25	2.55	2.25	1.07
Candy, bulk	per lb.	2.31	na	na	1.43
Pudding, dry	3 5/8 oz.	.95	.70	.80	.37
Soda pop, Pepsi	12 oz.	.75	.85	.75	.52
Drink mixes (Tang)	5 lb. 8 oz.	10.95	13.70	na	6.27
Coffee, ground	3 lb.	13.09	12.60	na	7.44
instant	8 oz.	9.35	10.75	na	4.16
Tea, bag	8 oz.	4.89	6.70	4.25	2.57

Table 5. continued

ITEM	SIZE	MCGRATH (1)	NIKOLAI (2)	TAKOTNA (2)	ANCHORAGE** (1)
Sales tax on food (%)		0%	0%	0%	0%
Electricity	first 1000 KWH	315.15 ps	500.00 ps	320.00 ps	na
Water and Sewer			na	na	na
Heating Oil	gallon	2.21	na	na	na
Gasoline	gallon	2.35	3.00	2.25	na
Propane	100 lb.	108.00	130.00	na	na
*White gas (Blazo)	5 gal. can	27.75	33.00	na	na

* - not on CES survey list
** - Anchorage prices reconverted to listed sizes from CES price per 16 oz.
na - signifies not available/not available in comparable size
ps - pre-subsidy

1 source: Cooperative Extension Service (June 1984)
2 source: this study (August 1984)

extremely high or are not carried at all. Many Upper Kuskokwim households including some in McGrath, obtain all or a portion of their groceries in case lots directly from retail outlets in Anchorage. According to several residents from all four communities, savings of up to 50 percent of the monthly amount spent locally for groceries is reportedly possible by catalog ordering of food.

In Telida, the absence of a local retail outlet necessitates either flying to McGrath to shop or using the method just described for obtaining groceries. The former method is extremely costly but the timeliness makes it attractive to many inhabitants. Additionally, petroleum products such as gasoline, propane, and white gas (Blazo) must be flown into the community from McGrath. The retail price of such products in McGrath combined with transportation costs sometimes makes the landed price of gasoline nearly five dollars per gallon.

TAKOTNA

Takotna is a small community situated along the north bank of the Takotna River approximately 15 air miles northwest of McGrath. Like McGrath, the population of Takotna is ethnically diverse, with non-Natives in the majority. Of the Native Alaskan households, only one is of Upper Kuskokwim Athabaskan ancestry. Table 6 presents a profile of the Takotna population by age and sex.

Takotna residents are, on the average, older than residents of other Upper Kuskokwim settlements with slightly more than 70 percent of the population over the age of 21. The average age in Takotna is a little over 30 years of age. Twenty-nine percent (18) of the residents

TABLE 6. AGE AND SEX CHARACTERISTICS OF TAKOTNA'S POPULATION, FEBRUARY 1984 (N=62).

	Males (N=34)	Females (N=28)
Age Class	Percent of Population*	Percent of Population*
61 and older	1.6	0.0
56-60	3.2	1.6
51-55	4.8	3.2
46-50	3.2	3.2
41-45	3.2	1.6
36-40	8.1	1.6
31-35	6.5	4.8
26-30	3.2	6.5
21-25	11.3	4.8
16-20	0.0	1.6
11-15	6.5	6.5
6-10	3.2	1.6
0-5	3.2	3.2
TOTAL	58.0	40.2

* rounded to nearest tenth
Source: Tanana Chiefs Conference, Inc. 1984.

are Alaska Native. Population levels in Takotna over the past fifty years have been relatively low, ranging from 70 in 1940 to 40 in 1960, and 62 in 1984 (Table 7).

Within the study area, Takotna is the oldest single-site community. Founded shortly before 1910 at the uppermost point of steamboat navigability, Takotna was a "jumping off" point for early Ophir District gold mining activities. A post office was opened in Takotna in 1912. Originally known as "Tocotna City," the community assumed the current spelling in 1926.

TABLE 7. POPULATION TRENDS FOR TAKOTNA, 1930-1984

Year[1]	Population
1930	65
1940	70
1950	42
1960	40
1970	no data
1980	48
1984[2]	62

[1] Darbyshire and Associates, 1984 (except for 1984)
[2] Tanana Chiefs Conference, Inc. 1984

Takotna is served by the Iditarod Area School District and had 12 students for the 1983-84 school year in grades kindergarten through 12th. The dominant local governmental entity in this unincorporated settlement is a community association to which nearly all residents belong. Somewhat less active is the Takotna Native Village Council which has primary responsibility for the administration of various programs serving Alaskan Natives. While these two governing bodies are structurally distinct in terms of programs and constituencies, there appears to be a great deal of cooperation between the two in terms of administration and goals. Gold Creek, the profit corporation established under ANCSA, merged with those of Nikolai, Telida, and McGrath in 1976 to form MTNT, Limited as discussed earlier.

Takotna features a post office operated under contract with twice weekly service from McGrath, a small grocery store, and a bar/liquor outlet. The community association operates the local electrical utility serving the core areas of the community. Pre-subsidized power rates, at the time of this writing (February 1984), are 32 cents per kilowatt hour. A washeteria/watering point, constructed from Public Health Service money, opened in the late 1970s and provides most residents with treated water drawn from Gold Creek, a small stream bisecting the community. Additionally, several individual wells have been installed by the community association in the past year. A health clinic serves the community with a part-time health aide. The single instrument VHF telephone was recently replaced by a community-wide telephone system in 1984. The community receives both the Learn/Alaska and Alaska Satellite Project television channels.

A number of Takotna households derive all or a portion of their income through employment at Tatalina Air Force Station. Originally constructed in the late 1940s as a military communications site, the Air Force and Alascom are in the process of reducing manpower at "the base" through automation. Other community residents are employed by the school in maintenance and teacher aide positions. The Native Village Council and community association also employ community inhabitants in various construction-related positions, usually during the summer. A permanent part-time clerk is also jointly funded by the two entities. An association-operated sawmill provides residents with building materials and additional employment opportunities. Some Takotna residents also obtain seasonal employment in McGrath in construction-related fields.

The Takotna airfield, originally built around 1925, is situated atop the large hill immediately behind the community. The length of the gravel runway is 1,600 feet and runway expansion potential is limited by valleys at either end. With prior permission, the community is sometimes able to utilize the Tatalina AFS runway to bring in larger types of aircraft.

Shallow draft barges were able to reach the community with difficulty during the early days of the settlement, but continuing problems with navigability led to construction of a road link to Sterling Landing on the main Kuskokwim in the 1930s (Brown 1980).

In addition to the Tatalina/Sterling Landing road system, Takotna is also road-connected to Ophir, a seasonally important site in the Innoko drainage more than 30 miles away. Both road systems are maintained by the State.

NIKOLAI

Nikolai is a community of 107 persons in 29 households located on the north bank of the South Fork of the Kuskokwim River approximately 50 air miles northeast of McGrath. Established on its present site in 1918, Nikolai was incorporated as a second-class municipality in 1969. One hundred of the 107 residents are Alaska Native, with the majority being of Upper Kuskokwim Athabaskan descent.

Table 8 depicts the age and sex characteristics of Nikolai. The average age of Nikolai residents is 27.2 years. Nearly 44 percent are under the age of 21. Fifty-three percent of the 1984 population is male while 47 percent are female. Males equal or outnumber females in 8 of the 14 age divisions depicted in Table 8. This imbalance is most evident in the 16-20 and 41-45 years of age groups. The average current household size is 3.7 members while median household income in 1979 was 5,000 dollars per year (Table 2).

The population of the settlement of Nikolai steadily increased between 1910 and 1970, reflecting a growth rate of over 1,200 percent

TABLE 8. AGE AND SEX CHARACTERISTICS OF NIKOLAI'S POPULATION, FEBRUARY 1984 (N=107).

Age Class	Males (N=57) Percent of Population*	Females (N=50) Percent of Population*
61 and older	1.9	3.7
61-65	0.9	2.8
56-60	1.9	0.0
51-55	0.0	0.9
46-50	1.9	1.9
41-45	4.7	0.9
36-40	4.7	3.7
31-35	3.7	5.6
26-30	5.6	1.9
21-25	1.9	5.6
16-20	12.1	5.6
11-15	2.8	3.7
6-10	3.7	2.8
0-5	7.5	7.3
TOTAL	53.3	46.4

* rounded to nearest tenth
source: this study

during that period (Table 9). Much of this growth is attributable to the coalescence process described in the previous chapter.

While the first known location of Nikolai (Nikolai #1) was at a site at the confluence of the Little Tonzona River and South Fork of the Kuskokwim, there are conflicting accounts about when this location was abandoned. Utilized seasonally, the first documented visit to this site was by the Spurr party in 1898 where the expedition encountered a number of "badly frightened" Indians (Spurr 1900, Brown 1980). The Herron expedition may have visited the same location the following summer although no inhabitants were encountered (Herron 1909). According to

TABLE 9. POPULATION TRENDS FOR NIKOLAI, 1898-1984.

Year	Population	Source
1898	20	Oswalt 1980
1910	9	Oswalt 1980
1928	35	P. Gregory pers. comm., 1983
1935	52	Oswalt 1980
1950	88	Darbyshire and Associates 1984
1960	85	Darbyshire and Associates 1984
1970	112	U.S. Census 1970
1976	98	Stokes
1980	91	U.S. Census 1980
1984	107	this study

Collins (cited in Oswalt, 1980), inhabitants of "Nikolai #1" or "First Old Nikolai" were advised to move from the location further downstream where a stern-wheeler was wintering. This location was to become Nikolai #2 or "old Nikolai." Hosley (1966) fixes the year of arrival of this steamboat as 1902, although the move to the new site did not occur until 1910. A third version of the abandonment of Nikolai #1 puts the arrival date of the first steamboat as the late 1880s with the associated relocation apparently occurring during the winter of arrival (Andrews 1977). Lastly, elderly residents of Nikolai report hearing of the arrival of this steamboat in 1892 with relocation to Nikolai #2 occurring during the winter of 1892 and 1893.

Beyond the obvious contradictions, the late 1880s and 1892 dates are suspect for several reasons. While there were undoubtably a few widely dispersed Americans and Europeans in the area at the time, the economic benefits of bringing a steamboat so far up the Kuskokwim at such an early date may be questionable. Likewise, if "First Old Nikolai" was abandoned between the late 1880s and early 1890s, why was the new settlement not noted by Spurr in his 1898 trip down the Kuskokwim River? If the date of the locally accepted version of the move is correct, there is a possibility that Spurr did in fact visit Nikolai #2 in 1898, although this is nearly impossible to determine. The 1910 date is equally suspect, as several older Nikolai residents believe a roadhouse was established in the second Nikolai in 1907 or 1908. The likely date of this move was probably around 1900, quite possibly in 1902.

Second or "Old" Nikolai was established about midway between the original village and the present-day community. Excepting the confusion over the date, oral accounts of the arrival of the first steamboats that led to establishment of Nikolai #2 are quite detailed. Two sternwheelers, unable to reach the Little Tonzona site arrived late in the summer. While one wintered at the future village site, the second descended to the mouth of the North Fork, eventually ascending as far as the mouth of the Swift Fork where it too wintered. According to one older Nikolai resident, the second boat was a "liquor boat," in apparent reference to its cargo, and the community forced it to leave. A single-room Russian Orthodox Church was constructed of logs at this new site at the direction of a priest who arrived that winter. While the second site afforded access by downriver steamboats, it was susceptible to annual flooding. As a result, the community moved to its present site in 1918 (Nikolai #3). The contemporary site was apparently selected by a Russian Orthodox priest who arrived shortly after a severe flood damaged most structures at the old site. The log church was disassembled and relocated to the present community where it stood until 1929 when a new structure was completed. The "new" church, completed late in 1929, is the oldest building in Nikolai. Itinerant Russian Orthodox priests serve the community's single church, the St. Nicholas' Orthodox Church.

During the 1910s and early 1920s, Nikolai received traffic along both the Rainy Pass and Nenana trails and, according to one older resident, a roadhouse was successfully operated by Athabaskan proprietors Theodore and Mary Pitka during that period. Nikolai also featured a trading post established by Dan Callighan and Charlie Holland around 1919. Holland departed soon afterwards to assume mailcarrying responsibilities between Iditarod and Big River. Closed in the mid-1920s in response to changes in the overland trail network, Callighan re-established the post near the mouth of Big River.

In 1949, postal service was temporarily established in Nikolai by missionaries who also operated the community's first school. This service was sporadic and most residents continued to travel to Medfra for their mail. Construction of a runway in 1963 facilitated establishment of a permanent contract station operated by community residents in the late 1960s. Current mail service frequency is twice weekly.

The Territory of Alaska assumed educational responsibilities from the Assembly of God in 1951, and a new school was constructed on the eastern edge of the community in 1955. A number of additions were added to the existing structure over the years and in 1983 a completely new facility opened. Enrollment is approximately 27 students served by three teachers, in a kindergarten to 10th grade program.

A number of non-certificated winter employment opportunities are available through the school where both full and part-time teacher aide, cook, and maintenance positions exist. The City employs several individuals on both a full and part-time basis during the winter in maintenance and administrative positions. Two part-time health aides alternate hours in the community clinic. Maintenance of the state-owned 2,800-foot gravel runway is a source of winter income for another person. Nikolai General Store, owned by the subregional profit-making corporation, MTNT Limited, employs several residents. One Anchorage-based airline has a part-time agent in the community and a fee agent provides basic social service assistance on a commission basis under auspices of the Alaska Department of Health and Social Services. The U.S. Postal Service operates a contract station in Nikolai and the Alaska Department of Fish and Game, Division of Subsistence, provides a full-time position to address and monitor resource use in eight upper Kuskokwim and lower middle Yukon communities.

Through capital construction appropriations, the City provides many employment opportunities to community residents, most of these in the construction-related trades. Nikolai Light and Power is a city-owned electrical utility serving the entire community. Going on line in 1979, the utility's pre-subsidied rate is 50 cents per kilowatt hour. The City also owns and operates a facility providing overnight lodging, several rental units, and a sawmill. A washeteria/watering supply point is currently under construction, as is a maintenance shop for city and privately-owned equipment and vehicles.

During fall 1983, community-wide telephones were installed. All homes receive both the Learn/Alaska and State Satellite Project television channels. Additionally, most households within Nikolai are wired to receive four channels of cable television. This cable service is provided free of charge by the city.

The 2,800-foot gravel runway accommodates many twin-engine aircraft; consequently, in 1984 Nikolai received direct passenger and freight service to and from Anchorage twice each week. The city-extended runway is capable of receiving large cargo planes as well, and air freight costs range between 18 and 23 cents per pound aboard these charters. Commercial air freight rates from Anchorage average about 50 cents per pound.

The community receives barge service at least once each summer, generally to deliver one year's supply of fuel for the village electrical utility and school. Deck cargo too bulky for air transport is often placed aboard these barges in McGrath.

TELIDA

Telida is a small unincorporated community approximately 100 air miles northeast of McGrath. It is situated atop a low bluff along the south bank of the Swift Fork of the Kuskokwim River approximately five river miles below the outlet of Lower Telida Lake. The current community population includes 26 individuals in seven households (Table 2). All but two inhabitants are of Upper Kuskokwim Athabaskan ancestry.

On the average, Telida residents are comparatively young, with all but four members of the community under 35 years of age (Table 10). Forty-four percent of the population is under 21 years of age. The average age of community members is 23. Males outnumber females in all but three of the 14 age categories. Lieutenant J. Herron, dispatched by the U.S. Government to establish an overland route from Susitna Station to Fort Gibbon near modern-day Tanana reported there were 17 inhabitants present during the winter of 1899 (Herron 1909). The largest recorded population in the past 85 years was in 1980 when 33 residents were noted (Table 11).

The name Telida is anglicized from the Upper Kuskokwim Athabaskan word tilaya'da meaning "lake whitefish place" in apparent reference to nearby Lower Telida Lake, and its lake whitefish resources.

Telida was established at its present site around 1915, the third recorded move of the community. Prior to 1915, the village was situated on the north bank of the Swift River just upstream of the Lower Telida Lake outlet. An even earlier site (#1) was reported to have been located on the north bank of the Swift Fork a short distance below Lower Telida Lake (Oswalt 1980). Local oral accounts indicate that two sisters accompanying a party of hunters were attacked somewhere north of the Kuskokwim valley by Yukon River Indians. The sisters escaped during the skirmish and as the only survivors, they traveled south, locating a large lake where they were able to catch great numbers of whitefish. They were eventually discovered by kinsmen searching for the missing hunting party. Thus, Telida was founded as a seasonally-used site. It should be noted at this point that the above version of the founding of Telida differs from earlier published accounts (Hosley 1966; Oswalt

TABLE 10. AGE AND SEX CHARACTERISTICS OF TELIDA'S POPULATION, JANUARY, 1984 (N=26).

Age Class	Males (N=16) Percent of Population*	Females (N=10) Percent of Population*
66 and older	0.0	3.9
61-65	0.0	0.0
56-60	0.0	0.0
51-55	3.9	7.7
46-50	0.0	0.0
41-45	0.0	0.0
36-40	0.0	0.0
31-35	19.2	7.7
26-30	0.0	3.9
21-25	3.9	3.9
16-20	0.0	0.0
11-15	3.9	0.0
6-10	15.4	11.5
0-5	15.4	0.0
TOTAL	61.5	38.6

* rounded to nearest tenth
source: this study

TABLE 11. POPULATION TRENDS FOR TELIDA, 1899-1984.

Year	Population	Source
1899	17	Herron 1909
1910	21	Hosley 1968
1935	7	Hosley 1968
1970	15	Collins pers. comm., 1984
1980	33	U.S. Census 1980
1984	26	this study

1980); careful cross-checking with knowledgeable residents of both Nikolai and Telida indicates local satisfaction with the version contained herein.

The oldest building in Telida is the Russian Orthodox Church which was dismantled, transported, and reconstructed from the old village site around 1918. Itinerant Russian Orthodox priests occasionally visit Telida to conduct church services.

Telida is served by the Iditarod Area School District. One teacher taught the six students enrolled for the 1983-84 school year in kindergarten through sixth grade. Telida is the only community within the study area without residential electrical power, although at the time of this writing (March 1984), a power system was expected to be installed during the summer of 1985. The school does generate electricity for its own use, additionally providing power for operation of a village-wide telephone system. The school also provides power and space for the operation of the earth station receiver which provides the community with both long distance telephone service and entertainment via the State Satellite Project and Learn/Alaska channels. Village residents view television at the school during evenings and weekends.

There are no businesses in Telida. Groceries are obtained from either McGrath or Anchorage. Fuel is purchased from McGrath. Mail service is once weekly from McGrath and is sorted and dispatched on a voluntary basis by Telida residents.

Employment opportunities are limited in Telida. Most winter wage employment in the community centers around the school where part-time teacher aide and maintenance positions are available. The clinic employs a part-time health aide and the Native Village Council occasionally hires temporary workers during the winter. Village administration is provided for Telida under contract with an individual residing in McGrath. Sesui, Inc., the village corporation formed under the Alaska Native Claims Settlement Act merged with those of McGrath, Takotna, and Nikolai to form MTNT, Limited, in 1976.

There has been a marked change in the pattern of seasonal summer employment over the previous 15 or 20 years for Telida residents. Until the early 1960s, Telida and Nikolai residents spent much of the summer together, subsistence fishing near Medfra. At the same time, male members of Telida fishing households were able to take advantage of numerous seasonal employment opportunities available in that area. With the shift in salmon fishing sites away from the Medfra area, Telida residents began spending summers in the winter settlement. Current summer wage opportunities include firefighting and employment in one of the various village council-supervised capital projects underway each summer. During the fall some Telida men participate in the guide industry in the Alaska Range foothills in the Farewell area. Telida residents seldom travel to McGrath or Nikolai for employment.

Firefighting has traditionally been the most predictable and best paying summer wage opportunity. With the decline of salmon fishing activities by Telida residents in the Medfra area, firefighting opportunities for them have also diminished. Since the Medfra contingent was permitted to join with their Nikolai kinsmen in forming full crews, a shortage of participants from either community was not a problem. Today, Telida lacks the labor pool necessary to form a complete "village" crew which consists of 12 to 16 members. It is now necessary for Telida residents to travel, at their own expense, to either Nikolai or McGrath to join a crew. In addition, increasingly stringent retraining requirements and currency ("red cards") requirements make participation difficult. The entire situation is compounded by newly implemented fire management plans by the state and federal government which mandate less than full suppression efforts on many lands. In combination, these factors have reduced Telida's opportunity to engage in this previously important type of summer employment.

Because of the shallow nature of the Swift Fork, barges are unable to reach Telida. Consequently, the only practical source of supply is via aircraft. Poor drainage and only minimal maintenance equipment makes the Telida 1,200-foot airstrip unusable during the early summer and after extended periods of rain. This dependence on aircraft to supply the community substantially increases costs of goods. Charter rates on a three passenger aircraft between McGrath and Telida range from $160 to nearly $300 per trip one way, depending on the carrier. The long distance and rough trail between Telida and Nikolai makes surface transportation of fuel and other goods between the two communities impractical. Larger items such as building materials are sometimes transported to the community via larger aircraft which may utilize a large lake southwest of Telida during the spring when still frozen. The absence of a local store precluded inclusion of comparative information about Telida in Table 5. Nonetheless, the cost of groceries in McGrath is appreciably heightened by the cost of air travel to and from that community.

SUMMARY

McGrath is viewed by Takotna, Nikolai, and Telida residents as the central community in the Upper Kuskokwim. As the regional headquarters for many of the governmental agencies serving the subregion, McGrath offers many unique services in both the public and private sector. While some of these private sector businesses are beginning to appear in some of the other settlements, McGrath is still the economic "hub" of the area. Air transportation originating in McGrath links area communities on a scheduled basis.

All communities except Telida, the smallest, feature "basic" services and facilities including schools, telephones, airports, safe water sources, electricity, health clinics, postal services, and state-funded television. The infrastructure offers cash employment in public sector jobs. Seasonal employment opportunities in the construction trades, largely fueled by the flow of capital appropriations are another source of cash employment in all four communities. This employment source offsets to some degree the declining availability of the traditionally important firefighting jobs Telida and Nikolai residents once depended on for cash.

Prices of non-locally derived foodstuffs are comparable between Upper Kuskokwim communities, primarily because of the equity provided by the U.S. Postal Service rate structure. This is particularly true for those who shop for food by catalog. However, prices of petroleum products vary widely between communities, largely because of added transportation costs.

CHAPTER 4

THE REGIONAL RESOURCE BASE AND THE SEASONAL ROUND OF SUBSISTENCE ACTIVITIES IN THE UPPER KUSKOKWIM

The purpose of this chapter is to generally describe the contemporary regional wild resource base. In addition, the chapter depicts current and historic seasonal round of subsistence activities of Upper Kuskokwim residents, including seasons and extent of harvest activities.

THE REGIONAL RESOURCE BASE

Numerous species of plants, fish, and animals occur throughout the Upper Kuskokwim area in various concentrations. While many are commonly used by residents of each study community, use of others is rare or non-existent due to relative scarcity, individual preference, and/or regulatory restrictions.

Moose occur through much of the study area on a year-round basis. This species is most palatable or desirable to area inhabitants during the early fall when the meat is richest. Nevertheless, moose are considered edible year-round, with the possible exception of bulls during the mid and late October rut. The harvest patterns of some Upper Kuskokwim communities reflect these seasonal preferences.

Caribou is another large land mammal of the Upper region. Compared with moose, the distribution of caribou in the region is much more limited. Again, with the possible exception of the late fall rut, caribou are generally considered edible year-round. Difficulties associated with access to this species during open water months tend to limit hunting activities to the winter.

Black bear occur throughout the region, while grizzly bear are relatively rare away from the salmon-bearing rivers and creeks. Black bear are desirable throughout the summer, although spring and fall bear are preferred. Hunters appear to prefer the flavor of bear meat taken in the late spring, and fall black bear are favored for their rich fat. Bear in the early winter are also considered good to residents of some communties, who may dispatch them in the den. Grizzly bear, available from early spring through early winter near salmon spawning areas, are targeted during mid-spring and late fall by some area hunters.

Dall sheep occur in the Alaska Range throughout the year. Access to this area during the summer months is by aircraft. Winter hunting of sheep is sometimes undertaken using surface transportation methods.

Bison were introduced to the Farewell area in the 1960s and are almost exclusively hunted through a drawing-permit system. The bison herd has thrived, and intense statewide competition for limited permits tends to reduce area inhabitants chances at selection for this popular hunt (R. Pegau pers. comm., 1984).

Various species of salmon run up the main Kuskokwim to the upper Little Tonzona, Salmon and Pitka forks, and Highpower Creek each summer. Runs occur between early June and middle October depending on the distance upstream and the species. Run strength varies by species and tributary. Salmon are accessed by residents of all the area communities. Takotna residents must fish at locations away from the winter community, and Telida inhabitants must travel to the main Kuskokwim for all but one species common to the area for much of the year.

Freshwater or non-salmon species including pike, sheefish, grayling, burbot, and others are seasonally available at many locations throughout the area. Pike are often available near the mouth of most clear creeks. Pike are also available in various area lakes where they are harvested both through the ice and in open water conditions. Grayling and Dolly Varden are available from the early spring until late fall in both secondary and main river locations where water conditions permit rod and reel fishing. Small mesh nets are occasionally used for grayling at a few locations. Sheefish are present in several rivers throughout the spring, summer, and fall months. This species is also taken on occasion after freeze-up with nets set beneath the ice. Whitefish occur in area rivers from shortly after break-up through early winter. The run intensity is greatest early and late in the harvest period. Whitefish also occur in relatively large quantities in selected river-accessible lakes around the study area. Other freshwater species are present throughout the study area in small quantities. These include freshwater clams, longnose suckers, and "lush" (burbot). The latter two species are found in the main rivers and selected tributaries.

Various furbearer species including marten, mink, beaver, otter, lynx, red fox, wolverine, wolf, and muskrat occur in the Upper Kuskokwim. While trapping is economically important to residents of all four winter communities, emphasis on species trapped varies between community with the species relative abundant.

Several small game species are available to area inhabitants including hare and porcupine. Seasonality of use varies between species and community. Grouse and ptarmigan are two game bird species used by area residents. Occurring throughout much of the Upper Kuskokwim at various times of the year, members of the former species group are most often hunted between late summer and mid-winter, while the latter are often harvested during the winter months.

Various types of migratory waterfowl including geese, ducks, and cranes arrive in the study area in mid-April. While many of these early arrivals are destined for other locations further north or west, an appreciable number nest in the region throughout the summer. Most waterfowl depart the Upper Kuskokwim by the middle of September.

The occurrence of both edible and non-edible plant species around the area vary with local conditions of soil, elevation, exposure, and other surface characteristics. Most edible plants including berries mature between mid-June and late September. Some exceptions include various wild plants such as rhubarb and wild celery, which may be harvested earlier in the summer. Some domestic vegetables such as lettuce and cabbage are usually started indoors from seed in early April and transplanted in late May or early June. Other domestic species including potatoes and carrots are directly planted in late May or early June. Vegetables are usually harvested between late August and early October. Non-edible plant species occurring in various densities throughout the region include white spruce, birch, and poplar. Harvested throughout the year, uses range from firewood to building material.

THE HISTORICAL SEASONAL ROUND IN THE UPPER KUSKOKWIM

Long-term residents of the area note, from personal experience, substantial changes in the general round of wild resource utilization activities during the past 50 years. The same sources also believe the seasonal round of 50 years ago was appreciably different than that characteristic of the Upper Kuskokwim at the time of contact. Emphasis on species harvested has changed in conjunction with changes in resource availability, animal population levels, harvest methods, transportation and preservation technologies, regulatory systems, and various social and economic factors.

The aboriginal seasonal round was characterized by a great deal of seasonal movement and was oriented around hunting the nutritionally important caribou. While fish were important, the value of game species apparently overshadowed these resources and for the most part, governed the pattern of resource usage (Hosley 1981). Early in the spring, before the snow disappeared, groups of Upper Kuskokwim Athabaskans moved from winter encampments in the river valleys to the Alaska Range foothills for the spring caribou hunt. Travelers carried belongings, including canoes, on hand-pulled sleds or toboggans (Hosley 1981). According to elderly Nikolai inhabitants, people spent much of the summer in the foothills and upper river areas hunting sheep, caribou, and bear. King salmon fishing occurred in these upper river areas during the late summer, often near clearwater salmon spawning grounds, while chum and coho salmon were harvested between late August and mid-October in similar locations. Following the late fall caribou hunt, area inhabitants descended Upper Kuskokwim rivers with canoes and skin boats to winter encampments (Hosley 1981). While this general pattern was seldom significantly altered, changes in caribou availability and herd range necessarily resulted in shifts in use areas.

During the winter, each local group of area inhabitants reportedly stayed at a single location in semi-subterranean dwellings. Hunting expeditions periodically originated from these sites either to retrieve food which had been cached in ground pits the previous fall or to seek fresh meat. Caribou, beaver, hibernating bears, and other small game were mainstays in the winter diet. This diet was supplemented with whitefish, grayling, and blackfish taken from lakes, rivers, and creeks near the winter camp (Hosley 1981) and the availability of one or more of these fish was probably a factor in selection of winter sites (Hosley 1966). Harvest of furbearers in the pre-contact seasonal round was probably limited to meeting the clothing needs of residents.

Although specific information is difficult to obtain, Figure 3 depicts the seasonal round as it likely existed at "contact," around the middle 1800s. Possibly the first appreciable change in the aboriginal seasonal round came with the introduction of the fur trade to the region by early Russian traders or their Tanaina emissaries. One anthropologist has speculated that initially the only change apparent in the seasonal round was an occasional trip to area trading posts or sites where beaver skins were exchanged for goods (Hosley 1966:41). Because beaver had long been an important source of food for area inhabitants, it is doubtful that much additional effort was expended for harvesting this resource. Desiring to acquire additional manufactured goods, Upper Kuskokwim Athabaskans began to increase their trapping efforts and targeted additional furbearer species. Trapping efficiency required trappers to spend longer periods of the winter in the lower river areas where these fur animals were relatively abundant (Hosley 1966). The seasonal round was further influenced, as the continued acquisition of manufactured goods may have led to some reluctance on the part of participants to leave these items behind for much of the year

Resource Harvested		Months Harvested											
English	Upper Kuskokwim Athabaskan	J	J	A	S	O	N	D	J	F	M	A	M
king salmon	gas			XXX	XXX								
chum salmon	srughot'aye			X	XXX	XXX	XXX						
coho salmon	nosdlaghe				XXX	XXX	X						
whitefish	sajila			---	XXX	XXX	X--	---	---	---	--X	XXX	XXX
sheefish	zidlaghe	---	---	---	--X	XXX	-						---
pike	ch'ighilduda	XXX	XXX	XXX	XXX	---	-			-X	XXX	XXX	XXX
blackfish	hozrighe									XXX	XXX	X	
grayling	ts'idatana	XXX	XXX	XXX	XXX	XX					XXX	XXX	XXX
black bear	shisr	---	---	---	-XX	XXX	---	---	---	---	--X	XXX	XX-
grizzly bear	tsone	---	---	--X	XXX	XXX	--					-X	XX-
caribou	midzish	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX
sheep	drodeya	---	---	-XX	XXX	X--						-	---
beaver	tso'	XXX	XXX	XXX	XXX	---	---	---	---	---	--X	XXX	XXX
small game		XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX
moose	dineje	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX
waterfowl/eggs		XXX	XX-	--X	X							XXX	XXX
game birds		XXX	XXX	XXX	XXX	XXX	XXX	---	---	---	---	---	--
plants	dlot'	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX
berries	jija'	-XX	XXX	XXX	XXX	---	-					-	---

XXX primary harvest periods
--- alternate harvest periods

(Sources: Nikolai residents; R. Collins pers. comm.; Hosley 1966)

Fig. 3. Seasonal round of resource harvesting activities, ca. mid-1800s.

(Hosley 1966:45). Nonetheless, with the exception of the winter months, the traditional seasonal round continued to be practiced with little variation by the aboriginal population.

In addition to the use of steel leg traps and snares, other technological introductions influenced the seasonal round of subsistence activities in the Upper Kuskokwim by the late 1800s. Firearms made hunting easier and more efficient and likely had a profound impact on resource use patterns as time passed, although their use was apparently slow in developing. The use of organized dog teams made overland transportation easier, increased range among area trappers, and likely reduced travel time during the winter months.

In the middle and late 1800s, moose began to repopulate the Upper Kuskokwim area in appreciable numbers. Nonetheless, caribou continued to be the primary source of protein for Upper Kuskokwim inhabitants as hunters continued to travel to the Alaska Range foothills in the spring to hunt. Based on discussions with older Nikolai residents, caribou fences were still utilized until shortly after 1900 despite the availability of firearms. In addition to caribou, hunters continued to pursue sheep, bear, and small game. As moose populations increased, the hunting of this species was incorporated into the annual cycle of subsistence activities.

As early-day inhabitants spent more time operating traplines in the winter, a number of semi-permanent winter settlements featuring log buildings developed. Many of these first log structures were constructed in the six or eight-sided pattern utilized by the Russians. These early villages were seasonally occupied by related families of the same band (Hosley 1966).

Establishment of the winter trail network and roadhouses between 1910 and 1920 further centralized the seasonal round. The aboriginal population increasingly took advantage of both winter and summer wage employment opportunities (Holsey 1966:65), as was discussed in Chapters 2 and 3.

Commercially manufactured net material (twine) made possible fishing for salmon on the lower portions of the area river. As a result, the importance of the Alaska Range as a key area for harvesting resources diminished over time as new harvest and transportation technologies and temporally conflicting activities led to subsistence resources being harvested elsewhere. Again, this shift was, by all accounts, subtle but pronounced.

After 1910, other technologies contributed to changes in resource harvesting activities. The introduction of the fishwheel into the area in 1914 facilitated salmon fishing in the main glacially-fed rivers. Area inhabitants, for the first time, remained in the river valleys during the spring to participate in the early summer king salmon fishery. After break-up, a Russian Orthodox priest annually traveled up the Kuskokwim to Vinasale to conduct services and ceremonies. In July, the priest, accompanied by some of the Vinasale residents, traveled up the river to Old Nikolai where additional services were held. From here, as many as 50 Upper Kuskokwim Athabaskans traveled as a group to the Alaska Range foothills where they primarily engaged in caribou and moose hunting. This large party descended from the foothills in September in skin boats loaded with dried meat and resumed fishing at or near their respective settlements (Hosley 1966:65). In this manner, the seasonal round came to revolve around trapping and hunting often based from the winter settlement, and main river system salmon fishing which often occurred a short distance away.

Propeller-driven engines were introduced above McGrath around 1910. These early models, while easy to operate, were little faster than the then common pole, lining, and oar methods of propulsion. According to older Nikolai inhabitants, their use did not become widespread for several more years.

With the onset of the Depression in 1929, fur values declined and trapping was no longer financially rewarding to Upper Kuskokwim Athabaskans and their non-Native counterparts. Additionally, many of the fur farms ceased operation and a number of the marginally profitable gold mines shut down (Hosley 1966:69). The introduction of aerial mail and passenger service to the area led to the closing of most of the more isolated roadhouses during this period. All of these changes tended to reduce wage employment opportunities for area residents.

Declines in caribou population and range during the 1920s and 1930s enabled moose to supplant this species as the main source of meat for area inhabitants, who by this point in time spent only comparatively short periods of time in the Alaska Range foothills. The seasonal round, by this time, had shifted to the river valleys where residents spent the spring, summer, and much of the fall engaged in fishing a4ctivities and seasonal summer employment. Instead of hunting caribou along the Alaska Range in the fall, the emphasis now shifted to moose hunting along the river corridors. Dried fish and moose meat replaced dried caribou as the main staple secured for winter use as the annual round now revolved around two locations: the fish camp and the winter village (Hosley 1966).

Shifts in winter economic patterns and population decreases due to disease caused the coalescence pattern of area Athabaskan residents to focus on three settlements: Nikolai, Telida, and Vinasale. The Russian Orthodox presence, most evident by churches at both Nikolai and Telida, was an important element in the continuing attraction of Upper Kuskokwim Athabaskan families to these two communities (Hosley 1966). One former resident of the Vinasale site attributes the eventual abandonment of that community to its lack of a Russian Orthodox church and the presence of one at Nikolai. The opening of a school at old McGrath in the 1930s and at Nikolai in the late 1940s drew most of the remaining Athabaskan residents of the single-family settlements into the winter communities.

One of the central facets of the seasonal round of Nikolai and Telida residents from the 1930s through the early 1960s was participation in "fish camp." Virtually every family in both communities left the winter settlement in early June for a summer of salmon fishing near Medfra, turning the winter villages, in the words of one 1960s mid-summer visitor, into "ghost-towns." This practice of "moving down" for the summer was significant in several ways. In addition to catching a winter supply of salmon, spending a summer in Medfra presented adult residents of both communities an opportunity to earn cash through short-term seasonal employment. Medfra, featuring a post office, store, two-way radio, and, most importantly, an airfield from which firefighters could be picked up, was the economic hub for residents of Nikolai and Telida throughout this 30-year period. As is discussed elsewhere in this report, establishment of similar facilities at Nikolai in the 1960s was a significant factor in bringing to an end what several elderly residents of Nikolai wishfully call "the good old days."

The declining use of the Alaska Range foothills continued to the point that in the late 1960s, Nikolai and Telida residents only infrequently traveled there. At the same time, salmon fishing at sites away from the winter communities peaked and began to decline in the middle and late 1960s, as the need for dog food gradually decreased and snowmobiles began replacing dog teams as the primary means of winter transportation. Salmon fishing for personal or household use increasingly took place near the winter settlements. The trend towards centralization of salmon fishing activities near the winter communities was enhanced by the increasing local availability of seasonal employment opportunities.

The seasonal round continued to change in the mid- and late 1970s and increases in the use of some species were noted. This was most evident in the salmon fishing patterns. The last Nikolai-based salmon fish camp at Medfra was abandoned in the late 1970s. After several summers of fishing near the winter settlement, a gradual dispersion of fishing sites again took place. While Medfra was largely bypassed in this trend, other earlier abandoned sites such as Salmon River and Middle Fork were again seasonally occupied by fishing families. This shift in salmon harvest effort was manifest in other ways as well, as Nikolai fishermen once again began building and using fishwheels for main river use. While the increasing popularity of recreational dog teams may have been a factor, users also noted a desire to simply "get away for awhile." Additionally, hunters and trappers again began to seasonally utilize some portions of the Alaska Range Foothills.

THE CONTEMPORARY SEASONAL ROUND IN THE UPPER KUSKOKWIM

The contemporary seasonal round of subsistence activities for Nikolai is shown in Figure 4 as an example of the current seasonal cycle of resource harvest in the Upper Kuskokwim area. Among Nikolai residents, moose are sought on nearly a year-round basis, with periods of intense hunting activities occurring during the fall, late winter, and late spring. Caribou are most easily accessible during the early and mid-winter period. Black bear are opportunistically taken throughout the year, although they are most intensively sought during the spring and early summer. Grizzly bear, on the other hand, are mainly hunted in the late fall. Various species of freshwater fish are taken during the spring, summer, and fall, with peak harvest periods varying between species. Salmon are targeted during the middle and late summer months, and early fall depending on species. Berry picking takes place during the same period. Harvest of furbearers occurs throughout the winter months, and peaks as each species reaches its most marketable condition. Wood is gathered year-round, with the greatest collection effort occurring in the late fall and late spring. Waterfowl hunting occurs throughout the summer, although the early spring and early fall are the two most important harvest periods. Other small game such as porcupine and hare are hunted sporadically throughout the year.

For comparative purposes, the resource base listed for Nikolai is utilized for the other communities' seasonal rounds (Figs. 5-7). Natural resource utilization activities among Takotna residents is shown in Figure 5. The most striking difference in the Takotna seasonal round compared with Nikolai is the relatively minimal use of caribou and

Resource Harvested		Months Harvested											
English	Upper Kuskokwim Athabaskan	J	J	A	S	O	N	D	J	F	M	A	M
king salmon	gas	-X	XXX	--									
chum salmon	srughot'aye		-XX	XXX	X--	---	--						
coho salmon	nosdlaghe			--	-XX	XXX	-						
whitefish	sajila	X--	---	---	--X	XXX	-					-	XXX
sheefish	zidlaghe	XXX	X--	XXX	X--	---	--						--
pike	ch'ighilduda	---	---	---	-XX	XX-	--			--	-XX	X--	-XX
blackfish	hozrighe									---	---		
grayling	ts'idatana	XX-	---	---	---	XXX	XX						
black bear	shisr	X--	---	---	XXX	X--						-	XXX
grizzly bear	tsone	-			XX	XX-							-XX
moose	dineje	X--	---	--X	XXX	X		XX	XXX	XXX	XXX		
caribou	midzish				--	---	---	XXX	XXX	XXX	--		
sheep	drodeya				XX	XX			-	--X	--		
beaver	tso'	X--	---	---	---	-		-	-XX	XXX	XXX	XXX	XXX
marten	suje						XX	XXX	XXX	XXX			
mink	tats'uts'a						XX	XXX	XXX	XXX			
otter	mizreya'						XX	XXX	XXX	XXX			
fox	k'altsa					X	XXX	XXX	XXX	XXX	XX		
lynx	gwhchuh						XX	XXX	XXX	XXX	XX		
wolf	tekone			--	---	---	---	-XX	XXX	XXX	XXX		
muskrat	nitoɫtroda	X-										-	XXX
hare	gwh	-			--X	XXX	XX						
porcupine	nune	XXX	XXX	XXX	XX								-X
waterfowl		---		---	-XX	X						-XX	XXX
grouse		--		--X	XXX	XXX	-	---	-				
berries	jija'	-	---	XXX	XXX	XX-							
plants	dlot'	---	-	-	--X	XXX	X						
firewood	duɫ	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX

XXX primary harvest periods
--- alternate harvest periods

Fig. 4. Seasonal round of resource harvesting activities for Nikolai residents, 1983.

Resource Harvested	Months Harvested											
	J	J	A	S	O	N	D	J	F	M	A	M
king salmon	---	-XX	X--									
chum salmon	-	---	XXX	X--								
coho salmon		-	---	XX-	---							
whitefish	XXX	---	---	XXX	X--	--						
sheefish	--	---	---	XXX	X--							
pike	XX-	---	-XX	XXX	--							
blackfish												
grayling	---	---	--X	XXX	--					-	XXX	XXX
black bear	---	---	---	XXX	XX-							
grizzly bear	-					XXX						
moose					XXX	---	XX					
caribou												
sheep												
beaver						-	--X	XXX	XXX	XXX	X	
marten						XXX	XXX	XXX	XXX			
mink						XXX	XXX	XXX	XXX			
otter						-	-XX	XXX	XXX	XXX	X	
fox						XXX	XXX	XXX	XXX			
lynx						XXX	XXX	XXX	XXX			
wolf						XXX	XXX	XXX	XXX	XX		
muskrat	X-											-XX
hare			--	XXX	XX-	---	---					
porcupine												
waterfowl	X--			XX-	--						X	XXX
grouse			-	XXX	XXX	X						
berries		-	--X	XXX	---							
plants			---	--	XXX							
firewood	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX

XXX primary harvest periods
--- alternate harvest periods

Fig. 5. Seasonal round of resource harvesting activities for Takotna residents, 1983.

Resource Harvested	Months Harvested											
	J	J	A	S	O	N	D	J	F	M	A	M
king salmon	--	XX-	-									
chum salmon	-	-XX	XX-									
coho salmon		-	XXX	X-								
whitefish	XX-	---	---	-XX	--							
sheefish	---	---	---	-XX	X-							
pike	XXX	X--	---	-XX					-	---	---	XXX
blackfish												
grayling	XXX	---	---	-XX	X--	-				-XX	XXX	X--
black bear	---	---	---	XXX	---	-						---
grizzly bear				XX	XX							
moose	-			XX			XX		--			--
caribou				XXX			-	--X				
sheep				XXX								
beaver	---		---	--			XXX	XXX	XXX	XXX		
marten						XXX	XXX	XXX	XXX			
mink						XXX	XXX	XXX	XXX			
otter						XX	XXX	XXX	XXX	X		
fox						XXX	XXX	XXX	XXX	XXX		
lynx						XXX	XXX	XXX	XXX			
wolf						XXX	XXX	XXX	XXX	XXX		
muskrat	XX											--
hare				---	XXX	XXX						
porcupine	XXX	XXX	XXX	XXX								XX
waterfowl	XX		-	XX-								
grouse				-XX	XX-	-			---	-		
berries		--	XXX	XXX	X							
plants		-	---	XXX	XX							
firewood	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX

XXX primary harvest periods
--- alternate harvest periods

Fig. 6. Seasonal round of resource harvesting activities for McGrath residents, 1983.

Resource Harvested	Months Harvested											
	J	J	A	S	O	N	D	J	F	M	A	M
king salmon		-	-XX									
chum salmon			-X	XX-								
coho salmon			X	XXX	X							
whitefish	XX-	---	--X	XXX	XX							-XX
sheefish			-	-XX	XXX	XX-						
pike	--X	X--	---	XXX	X--							
blackfish								--	---	--		
grayling	---	---	--X	XXX	---	--				-	---	XXX
black bear	---	---	--X	XXX	XXX	X--	-				-	-XX
grizzly bear				XX	XX							
moose	X--	---	---	XXX	X	-	---	---	--X	XXX	XX-	-XX
caribou						XX	XXX	XXX	XX			
sheep												
beaver	XXX	XXX	XXX	XXX	X		XX	XXX	XXX	XXX	X	XX
marten						XXX	XXX	XXX	XXX			
mink						XXX	XXX	XXX	XXX			
otter						XX	XXX	XXX	XXX	X		
fox						XXX	XXX	XXX	XXX	XX		
lynx						XXX	XXX	XXX	XXX			
wolf						XXX	XXX	XXX	XXX	XXX		
muskrat	X-											-XX
hare			-	XXX	XXX	XX						XX
porcupine	XXX	XXX	XXX	X--								-XX
waterfowl	XX-		-	XXX							XX	XXX
grouse			-X	XXX	XXX	---					-	XXX
berries		-	--X	XXX	X							
plants		--	---	-XX	X							
firewood	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX

XXX primary harvest periods
--- alternate harvest periods

Fig. 7. Seasonal round of resource harvesting activities for Telida residents, 1983.

salmon. The absence of the former species in the contemporary seasonal round is largely attributable to regulatory restrictions (no open season). The minimal salmon runs in the Takotna River make pursuit of this resource near the winter settlement impractical, so residents must move to the Kuskokwim River to fish. Other differences include shorter periods of moose, beaver, and bear harvest.

The seasonal round for McGrath is presented in Figure 6. A wide range of species is utilized by McGrath residents. The most significant difference between the Nikolai and McGrath annual rounds is evident in harvest period length and intensity levels of various species including moose, caribou, and beaver. Although not reflected in Figure 6, in calendar years 1983 and 1984, McGrath residents were the only regional inhabitants who participated, by drawing, in the bison hunt near Farewell.

The contemporary seasonal round for Telida residents is shown in Figure 7. It is most similar to that of Nikolai residents, although pronounced differences are evident in the salmon and whitefish fishing times.

As was noted earlier, resource utilization reflected in the seasonal round is the sum of all activities. Changes in the resource base reflected by decreases or increases in availability and range of one or more species has bearing in the intensity of use of both affected species and those having acceptable substitute value to the local residents. Changes in harvest, preservation, and transportation technologies play an important role as well. Individual preferences and marketability of some species affect the pattern of the seasonal round of any one household. Regulatory changes and changes in species management practices are other major factors to be considered in examining the seasonal round. Additionally, the annual round is necessarily a function of the natural seasonality of each species. All of these factors combine to make the seasonal round a dynamic, interrelated series of wild resource harvest activities.

CHAPTER 5

MOOSE HUNTING IN THE UPPER KUSKOKWIM

MOOSE HUNTING HISTORICALLY IN THE AREA

Among Upper Kuskokwim inhabitants, moose (dineje) is, by their own account, the most important source of year-round wild protein. This importance is evident in the amount of time, equipment, cash resources, and effort dedicated to the harvest of this species throughout the year. This chapter of the report discusses hunting areas, harvests, processing, and preservation techniques, and examines the succession of regulatory revisions and management practices that have occurred in the recent past.

Historic Availability

For an undetermined period of time possibly stretching over at least several centuries, moose were absent from the Upper Kuskokwim according to several older Nikolai residents. The most recent repopulation of the study area by moose began during the early 1800s, according to information provided by these informants. While the length of occupancy of the Upper Kuskokwim by the ancestors of the present-day Athabaskan Indians is not definitely known, elder inhabitants agree that moose were present in the area during an earlier period predating the above-noted absence.

As the story of the "first moose" returning to the area is told, a party of hunters, quite possibly Cook Inlet Tanainas, encountered an unusually large set of "caribou" tracks in the snow in the upper Middle Fork drainage near the foothills of the Alaska Range. Several younger members of the party followed these tracks for the better part of one day, and late in the evening observed the animal. The moose was dispatched with spears, clubs, and arrows, and a portion of the meat returned to the camp where, after several days of deliberation, an elderly member of the party voluntarily ate a portion of the unknown type of meat. After it was clear that no illness or other side effects occurred, the balance of the party partook as well.

From this point forward, moose became increasingly abundant in the Upper Kuskokwim and over the ensuing hundred years gradually gained importance in the diet and seasonal round of area inhabitants. Despite the increasing availability of this resource, area hunters continued to favor the more plentiful caribou until the 1920s, when declines in caribou populations and shifts in range combined to reduce the availability of this species.

Technology

While difficult, the taking of moose by early-day Athabaskan hunters was not impractical and parties of hunters apparently were able to regularly dispatch moose with weapons considered "primitive" by contemporary Upper Kuskokwim inhabitants. An intimate knowledge of animal behavior and "signs," excellent physical conditioning that made extended foot pursuits possible, and exceptional skill with these early-day weapons contributed to successfully harvesting these animals. In this latter category, local oral legend tells of a particularly skilled hunter who could leap into the air, nock, aim, and fire three arrows before his feet touched the ground.

Moose fences, employed by Athabaskans of the Tanana Valley (Andrews 1977) were apparently not utilized by Upper Kuskokwim inhabitants. Some older Nikolai inhabitants believe moose may have been taken with caribou hide snares affixed to stout overhanging trees during the winter as they traveled through the brush along game trails.

In the seasonal round characteristic of the early 1900s, fall hunters in the Alaska Range foothills often took several moose at a time. While a portion of the catch may have been cached for winter retrieval, makeshift boats consisting of several raw moose or caribou skins stretched over a frame of naturally curved white spruce tree roots were sometimes used to float the party, gear, and meat of caribou, sheep, and moose back downstream to one of the winter small single-family communities characteristic of the area during this period of time. The last moose skin boat trip on the South Fork, from Post Lake in the Alaska Range to Nikolai, a distance of more than 75 river miles, occurred during the late 1930s or early 1940s, according to one Nikolai resident.

With the advent of motorized boat transportation, moose hunting during the open water months took on a new dimension. Hunting parties were able to search long stretches of area river corridors both up and downstream with relative ease. The large home-built wooden boats used until the late 1960s and mid-1970s allowed successful hunting parties to transport up to five moose in a single trip. Canoes continued to be useful for hunting in the lakes along the rivers and stories relate that the taking of six or more moose by hunting parties was common.

"Market hunting" was another aspect of moose hunting during the 1910s and 1920s. In addition to hunting moose for personal comsumption, market hunting for area mines and roadhouses was a source of income for some Upper Kuskokwim residents (cf. Brown 1980:21). With the decline of winter surface transportation networks, establishment of reindeer herds in the upper Innoko, and increasing enforcement activities by the Alaska Game Commission, the market for fresh meat waned, although the practice reportedly continued intermittently until the early 1960s.

Prior to implementation of regulations which eliminated same-day-airborne hunting in the 1970s, many McGrath-based hunters were able to successfully employ aircraft in hunting activities, either immediately landing and dispatching a moose or to observe moose and take them shortly thereafter with surface transportation. This latter practice was also known to be employed at times by Nikolai hunters assisted by area pilots.

Seasonality of Harvests

Without a doubt, the most important hunting period during the early 1900s was the late summer/early fall season. Hunters frequently harvested both sexes of moose. Additionally, hunters sought moose throughout the year on both a primary and incidental basis.

Traditionally, moose were hunted on nearly a year-round basis. Several factors were taken into account by early-day hunters in choosing the sex of moose to be hunted. These factors included seasonality and availability. When availability or choice permitted, the fat content of the targeted animal was a foremost consideration. Fat moose were valued for their nutritional contribution and, among hunters, the quantity of fat was often an indication of meat quality. Generally, the meat of bull moose (ch'iyedra') was slightly favored year-round with the possible exception of late fall and early winter. Barren cows (diyozre) were most favored during the late fall and early winter, although they, like bulls, were acceptable year-round when necessary. Cow moose bearing or nursing calves, characterized as being "skinny," were avoided when possible. Hunters also avoided harvesting pregnant and nursing cows, recognizing their role in species perpetuation. Nonetheless, in the absence of alternatives, pregnant cows were sometimes taken. In these instances, mature fetuses were also eaten. Likewise, when nursing cows were harvested, hunters also dispatched the accompanying calf. The meat of calf moose (ditseje) was considered tender but bland. Other sex selection factors considered by early-day hunters included the condition of the hide. Generally, the thinner hide of early summer cows was favored for babiche production while fall bulls yielded the thicker skins area residents desired for tanning purposes. To some degree, this pattern differs little today.

Preservation of Meat

For the most part, basic preservation principles employed by Nikolai and Telida inhabitants during the late 1800s and early 1900s differ only slightly from those in use today.

One method of preservation seldom undertaken on any appreciable scale since the 1920s is the use of subterranean pits excavated into the sides of low timber and/or moss-covered hills near important camp and settlement sites. Many older inhabitants of Nikolai and Telida report using these depressions along hillsides throughout the area. These same individuals believe this storage technique predates "contact" with Europeans. From the size of these still visible indentations, upper river area inhabitants estimate some storage "caves" were as large as ten feet wide and seven feet high. The depth is unknown but the pits likely were excavated far enough into the side of the hill to keep the cached meat cool. Most of these excavations were lined with birch bark and the entrance covered with sticks or poles, bark, moss, and perhaps even dirt to both maintain storage temperatures and minimize loss of contents to scavenging animals. While these pits were primarily utilized for preserving dried caribou meat, such excavations were easily adapted to storing moose meat during the summer months in subsequent times. Although used for short-term storage, the contents of these pits in early times were sometimes left in place for retrieval during the winter months when other food supplies ran low.

Another common method of preserving moose meat was to make "dry meat." Still a contemporary practice among many area residents, this preservation technique is discussed in greater detail later in this chapter. In addition to the immediate problem of preserving fresh meat, making dry meat also appreciably reduced the weight of the harvest through evaporation of the moisture content, thereby facilitating transportation.

Earlier in this century, McGrath and Takotna hunters at least partially adapted the air-drying racks employed by the Athabaskan inhabitants of the region. According to one long-time McGrath resident, these outdoor enclosures featured one significant modification: screen-covered sides to minimize insect infestation.

Another important method of fresh meat preservation no longer evident in the Upper Kuskokwim is the use of ice houses. While the extent of their use around the area is unclear, several of the roadhouses including Berry's Landing (present-day Medfra) featured these structures. A number of the larger mines in the region apparently utilized ice houses as well, according to reports from area residents. The time and source of introduction of this storage method to the area is unknown, although early miners and merchants certainly employed this method of storage into the first quarter of this century. In the simplest of terms, these structures were essentially a building within a building. The space between the inner wall of the outer building and the outer wall of the inner building was filled with insulating sawdust often derived from nearby sawmills. Roofs insulated with sawdust or moss and heavy doors apparently permitted meat and other perishables to be preserved for extended periods of time during the summer months.

CONTEMPORARY MOOSE HUNTING BY NIKOLAI AND TELIDA RESIDENTS

Moose Hunting Areas

Nikolai hunters generally conduct their open-water hunting activities within the Upper Kuskokwim Controlled Use Area portion of

Game Management Unit (GMU) 19(D) along the Kuskokwim River between and inclusive of the Big River upstream to a point just below the confluence of the Swift and North Fork, a distance of nearly 250 river miles (Figs. 2, 8, 9). Additionally, Nikolai residents also hunt up the Salmon River as far as 130 river miles from the community, the South Fork and Little Tonzona, and East Fork, and the lower Slow Fork to a point approximately 160 river miles from Nikolai (Figs. 2, 8, 9). Of these, the North Fork is probably the most heavily utilized area among Nikolai hunters in search of fall moose. Lesser tributaries, lakes, and sloughs within area river corridors are also searched for moose during summer months. Some Nikolai households also derive a portion of their annual moose meat requirements from guide-related activities in the Alaska Range foothills of GMU 19(C). Winter moose hunting activities focus on many of the same areas used during the late summer, as well as large areas away from the river corridors only accessible when there is a snow cover (Fig. 9).

During the open water months, Telida moose hunting activities range from Wilson Hill on the North Fork of the Kuskokwim River to the west up the Swift Fork to and including the lower portions of Highpower Creek to the northeast, a distance of approximately 120 river miles (Fig. 9). Additionally, moose are sought along the various lakes, creeks, and sloughs within the river corridor. The extent of hunting areas utilized by Telida hunters greatly increases during the winter, as locations between the river corridors are accessible with snowmobiles (Fig. 9).

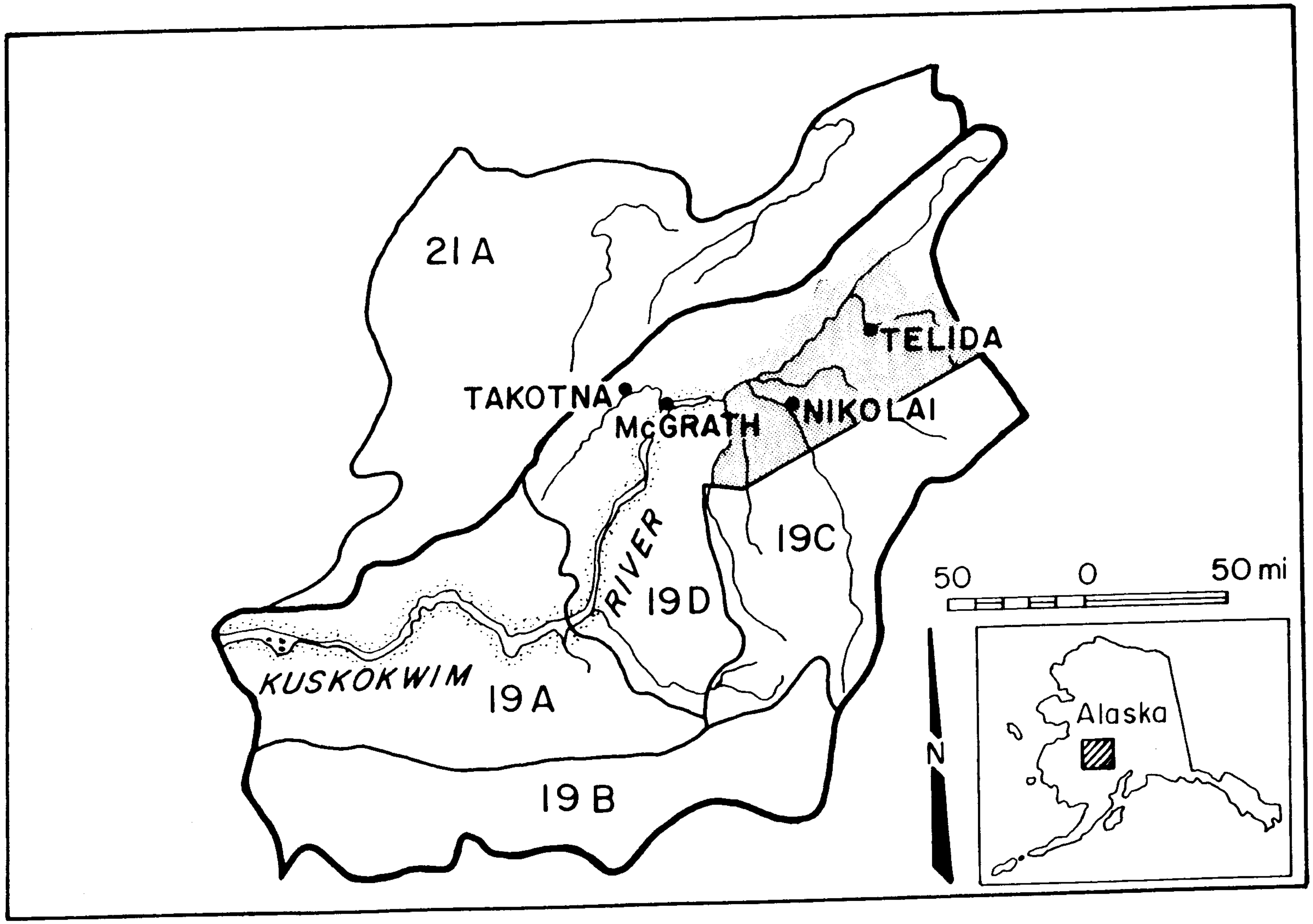

Fig. 8. Game Management Units in the Upper Kuskokwim, including Upper Kuskokwim Controlled Use Area.

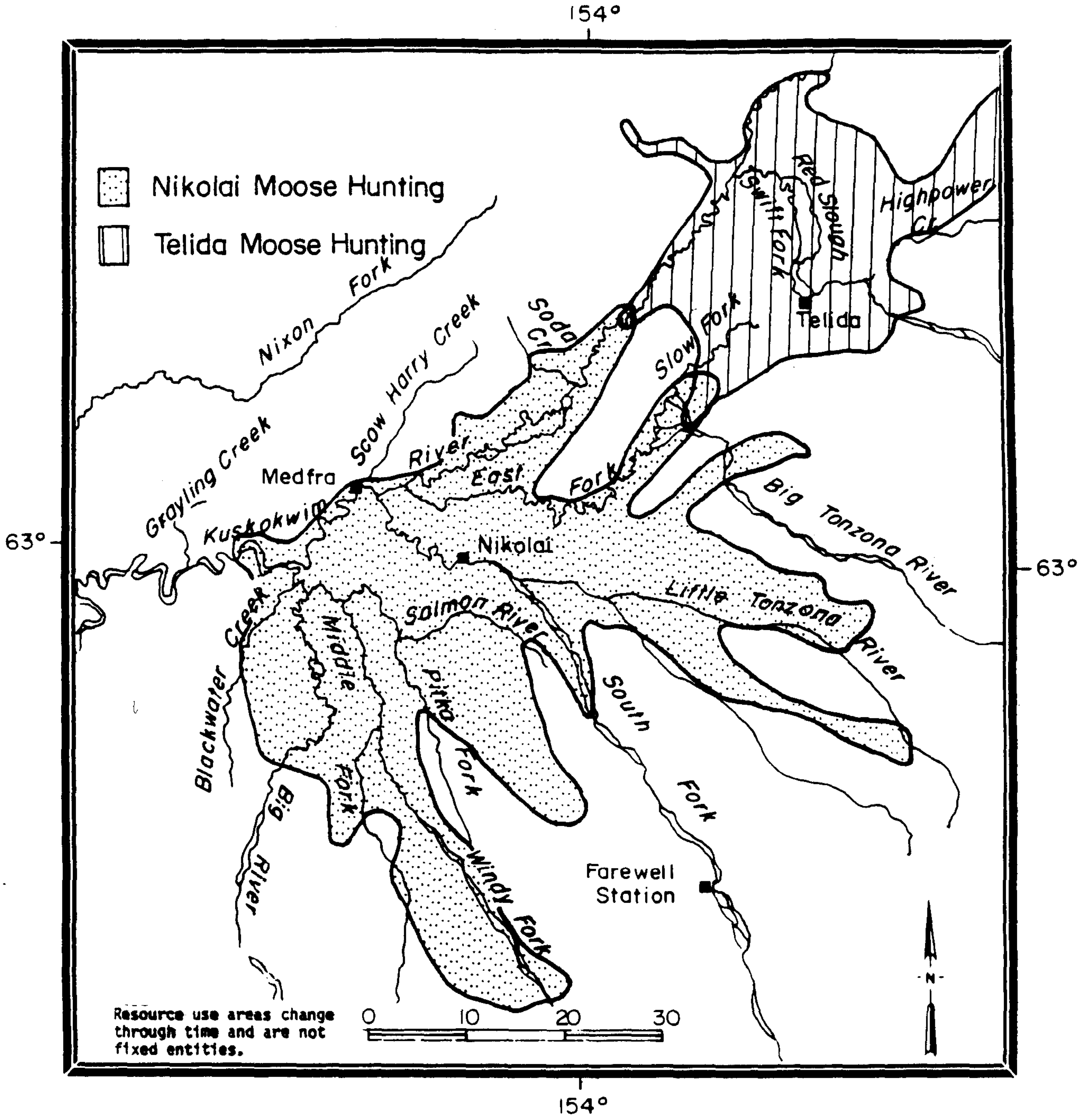

Fig. 9. Nikolai and Telida moose hunting areas, 1967–1983.

Open-water Hunting Strategies

During the open-water months, hunting activities are limited to river corridors including nearby lakes, sloughs, swamps, and navigable creeks. Even though appreciable numbers of moose are taken opportunistically, the harvest of others requires employment of certain time-proven principles or practices. There is a pronounced or recognizable series of hunting practices that make up strategies employed during the open water months. Hunting parties usually employ a search strategy along local rivers, generally confining their activities to a corridor no more than three quarters of a mile wide on either side. This corridor is usually searched using motor-driven boats and on foot to reach lake and swamp areas within the search zone. A variation of this approach is to search lake margins using canoes if a promising "sign" is found. Because many lakes extend for more than a mile away from the river, canoes effectively increase the size of search areas. These hunting strategies are most often effective when combined with the intimate knowledge most Nikolai and Telida hunters have of moose behavior.

Certain lakes and swamps have a long history of productivity (often going back 30 or more years) and are frequently visited by hunters who, at times, will wait in concealment for short periods in anticipation of a moose entering the lake or opening from the edge, especially if fresh tracks or other "signs" such as freshly broken-off (eaten or "rubbed") vegetation are found nearby. Observation of a moose at one of these locations may require waiting for the animal to leave the water or move closer to the hunting party. Wind conditions are critical in both moose movement and hunting strategy as moose tend to move with the wind to their back. Consequently, hunting from a downwind position is an essential tenet of successful strategy.

As hunters travel along a river, they watch for recently made tracks along sand bars. A substantial portion of summer and fall harvest occurs in immediate proximity to area rivers when moose are observed standing on the shore or swimming across the river. These moose often are immediately dispatched, although hunters will wait until the moose is safely away from the water to minimize the chance of it falling into the stream or river. In those instances where the animal falls into the river, the moose is towed as close to shore as possible with an engine-powered boat. A few Nikolai hunting parties carry small manual cable winches with them, making removal of the moose from the river possible, although not easy. When other hunting parties are nearby, additional help may be enlisted to bring the moose ashore.

Most hunters recognize early morning and late evening hunting as being the most productive, with the latter period viewed as somewhat better. During these periods of the day, moose are more active and consequently more visible, although during the fall bull moose are relatively active throughout the day and night. During the fall, many Nikolai and Telida hunters utilize sound to "call out" bull moose often from great distances. Sounds that attract moose include imitating the "grunting" of bull moose. Bulls will attempt to locate their audio rival, often traveling a number of miles towards the source of the sound. The vocal call is sometimes enhanced through use of a birch bark "megaphone." In addition, bulls are often attracted by scraping sounds associated with antlers in the brush. These sounds are created by scraping a boat oar, piece of rolled birch bark, portion of an antler, moose scapula, or a carved drift log root through the brush or on the side of a tree. Standing dry spruce trees are especially resonant. Calling in the vicinity of hills tends to cause the sound to carry great distances. Nikolai hunters avoid "over-calling" a moose, lest he become "spooked" or suspicious and remain hidden in the brush. After each series of calling and/or scraping, hunters stop and listen for a period of time for a response. Often the response is slow and many hunters recount incidents where a moose enters their camp at night, hours after initially being called.

Methods and Means

Aluminum river boats between 18 and 24 feet in length are most commonly employed, not only by Nikolai and Telida hunters, but by hunters from other communities as well. Most are outfitted with 15 to 40 horsepower outboard engines. Hunters and summer travelers generally operate a single engine, but a few people use two outboard motors in tandem. Most hunters believe the metal boats overall "out-perform" the longer, heavy wooden boats traditionally used. With reasonable care, an aluminum boat can last for many years, whereas rot presents eventual problems even for the best maintained wooden boat. The short length of aluminum boats makes them easy to maneuver in narrow and winding creeks and lake outlets and their light weight facilitates carrying the boat into nearby lakes. Drawbacks include their comparatively small load capacity and, according to one Telida hunter, they are difficult to pole or paddle in shallow water and winding creeks where the motor cannot be utilized.

Among Nikolai and Telida hunters, there are many common features associated with equipment employed for moose hunting. A wide range of large caliber rifles is used, although .270, 30.06, and 7 mm magnum rifles are probably the most commonly employed. Rifles of 30.30 caliber, still common in some Tanana River villages (Andrews and Napoleon 1985), are seldom used today for moose hunting among Nikolai and Telida inhabitants. While most area moose hunters utilize scope-equipped rifles, many others prefer open sights. There are advantages associated with each. Scopes are useful for long distance shots and for spotting purposes while open sights are good for close targets and low light situations. Rifle scopes are also subject to fogging in certain weather conditions and misalignment if roughly handled.

Hunting party composition varies, with members of the nuclear family often forming the optimum group. At times, party members are part of the same extended family, while other hunting parties consist of close friends. Although moose hunting is generally an activity undertaken by men, women and older girls may accompany hunting parties. Assisting in the butchering and field preservation process, older women may, on occasion, shoot a moose in the company of their husbands or other close relatives. Carrying or "packing" meat to the boat or river edge is most often undertaken by men and older boys.

In 1981, Nikolai and Telida hunting parties in pursuit of moose spent, on the average, $300 each, primarily for gasoline and oil (Stokes and Andrews 1982). When considering the capital involved in boats, engines, firearms, and other gear, the investment becomes appreciably larger. While the average household cash contribution in 1981 ranged between 5 and 10 percent of the annual household income, this operating investment figure approached 20 percent in some cases.

Winter Hunting Strategies

Snow and ice covering essentially opens much of the local area to moose hunting activities; however, winter hunting calls for different hunting strategies. The snow cover gives hunters greater latitude in terms of search areas and makes tracking of moose easier. The absence of leaves makes brush easier to penetrate visually, and sound seems to carry better during winter months.

Hunting of moose during the winter is both an incidental and primary activity, depending on the hunter. Incidental harvest occurs most often in conjunction with trapping-related activities throughout the area, while hunters engaged in deliberate harvest activities will often seek moose in areas having a history of containing wintering moose.

Because fewer moose are taken opportunistically during the winter, knowledge of winter moose behavior and terrain are important elements in the eventual success of a hunting endeavor. Consequently, many successful hunts are directed or conducted by older men. In addition to the aforementioned knowledge, older hunters are recognized as being more adept at using snowshoes than their younger counterparts, a skill apparently honed through long years of use. Experience makes these older hunters better able to determine the sex of antlerless moose from tracks and brief visual sightings. These visual clues include subtle color variations, differences in facial and body contours, and the presence (or absence) of antler pedestals.

If the winter hunter or traveler encounters moose tracks, he initially ascertains the freshness of the imprint. This is determined by the amount of fresh snow or drift snow in the hoof mark and the amount of "crust" characteristic of disturbed snow. Often hunters are able to make this latter determination by dragging a foot through the snow as they pass over the track. Most hunters also are able to quickly determine the direction the moose traveled indicated by small piles of snow pushed ahead of each foot on the leading edge of each print. If the tracks are reasonably fresh, the hunter often attempts to broadly circle the animal through interconnecting openings in the ground cover using a snowmobile. This allows the hunter to determine the general area the moose is in and confuses the moose, causing it to stop moving. Depending on the skill of the hunter, weather conditions, and the distance from the village, the hunter may return to the community to enlist help in the hunting process. Often, although not always, the decision to hunt a particular moose is based on the wind.

Wind, important during the summer, is a critical element of winter hunting activities. Wind conditions dictate the direction a hunt will take. A favorable breeze or wind permits hunters to approach the moose from downwind without being detected. This is particularly important during the winter when, as noted earlier, sound carries extremely well.

Because moose often inhabit areas of dense brush featuring deep snow, it is often impractical to undertake direct pursuit or follow the tracks with a snowmachine unless the tracks are particularly fresh. Consequently, it is often necessary to conduct at least part of the hunt on snowshoes, especially later in the winter. When several men are involved, hunters disperse themselves and wait at strategic locations around the area the target moose is believed to be in. These locations, often along the edge of a swamp, lake, or other opening, usually offer an unobstructed view where a clear shot can be made should the moose, being pursued or "driven" by hunters on snowshoes, emerge from the brush or trees. Despite the "menial" appearance of these roles, many times these observers are responsible for dispatching the hunted animal.

Depending on the size of the party, one or more of the most experienced hunters follows the moose track, attempting either to take the moose or drive it towards one of the forward observers. The tracker usually parallels the suspected course of the moose, from the downwind side if possible, occasionally examining the animal's track to determine freshness, changes in direction, and to detect any sign of alarm that may be evident in the gait of the moose. Experienced hunters frequently stop to listen for audio clues of the animal's whereabouts and to watch for any movement in the brush. This tracking process sometimes continues for less than an hour or may last over several days with the hunter(s) returning to the area the following morning and repeating the process. When the hunter determines he is drawing close to his objective, he attempts to make larger circles or loops from downwind. Using this strategy, the moose may be sighted several times before it is dispatched.

Winter moose hunting parties vary in size, from a single member to seven or more. Generally, the closer the moose is to the community, the greater the number of participants. The hunting party often includes members of the same extended family, however cooperative hunting efforts between non-related hunters are more prevalent than during the fall.

Butchering, Processing, and Use

There are variations between hunters and communities in the butchering process. A complete list of animal parts and the Upper Kuskokwim Athabaskan terms for them is included in Appendix 2.

Among Nikolai and Telida residents, an important element in field butchering of moose is keeping the meat clean. Hunters are careful to not allow the meat to come in contact with dirt, debris, and waste products from the abdominal cavity although contamination by the latter is not considered critical. Consequently, as each piece of meat is removed from the carcass, it is placed on a bed of brush, a clean tarpaulin, or in the absence of these, on the inside of the skin. Despite the absence of contaminants such as sand during the winter, hunters often place the meat on a tarpaulin or brush to prevent loss under the snow and to permit some of the blood to drain.

While the butchering process undertaken during the winter is substantially the same as that employed at other times in the year, moose are sometimes left for several hours or even overnight prior to being cut up, particularly if they are dispatched near the village. This permits the meat to cool gradually and contributes to its tenderness. In the fall, the threat of spoilage often precludes leaving the moose overnight, but the animal is not butchered immediately. Hunters believe that even a wait of 20 minutes contributes to meat tenderness through natural enzymatic processes. Like moose taken at other times of the year, virtually every edible part of a winter kill is salvaged. Additionally, easier and more direct transportation methods permit retrieval of other parts, such as the lungs and wind pipe, for use as dog food.

The head is usually removed with a knife by cutting through the first neck joint located immediately behind the ears, although in rare instances Nikolai and Telida hunters use an axe or meat saw for this task. Next, the skin is either partially or completely removed, taking care to avoid making unnecessary holes while at the same time leaving only a minimal amount of meat attached. Nikolai and Telida hunters prefer to skin one side of the moose at a time, removing the legs and "backstrap" meat from the carcass. Next, the moose is carefully rolled over onto the skin or brush pile where similar tasks are performed. At this point, the intestinal sac is carefully removed from the lower abdominal cavity in one piece. Removal of the viscera is undertaken as the animal lays on its right side, as this is said to be "the only way the guts can come out." One-piece removal often includes the windpipe, lungs, and heart. This single-piece removal can be facilitated by freeing the windpipe from the neck and pulling it back through from inside the chest cavity, after the diaphragm is cut free. Butchering usually temporarily stops at this point, as participants salvage the edible portions of the intestines and chest organs while still warm. In most cases, the next step in the butchering process is removal of the "brisket" or sternum, followed by separation of the ribs from the backbone. Skilled butchers can remove the ribs from the backbone with a knife, cutting through each joint. Others favor the use of a meat saw, or in extreme instances, some use an axe. The backbone is separated forward of the tailbone and again behind the neck. The former task is easily accomplished with a knife while the latter may necessitate use of an axe or saw. It is noteworthy that use of an axe in the butchering process is not destructive to the meat if done correctly. Clean blows of sufficient force with a sharp instrument minimize damage to both the meat and bone.

The heart, kidneys, and liver are nearly always salvaged. The exception to this occurs during the fall when the bull moose are in rut and the liver and kidneys are swollen or discolored and are considered inedible. The lower intestine is also saved for either cooking at special occasions such as potlatches or for addition to meat soups. This section is removed from the abdominal cavity as a bundle, and after the interconnecting adhesive membranes are cut, comes to resemble a long tube. People carefully roll this easily-torn intestine inside out while it is still warm and pliable. The tripe is removed from the inside of the "first stomach" (rumen) and saved for cooking. Field processing of the "guts" is most often done by men although in recent years women, when present, now sometimes undertake this task.

The head is often saved for the tongue, nose, and lower jaw. The meat on the head is used for making moosehead soup and, at times, the brain, containing a softening enzyme, is utilized in making a soaking solution for skin intended for tanned use. In some instances, only the tongue and nose are removed and the remainder of the head (with antlers removed) is boiled whole and fed to dogs, skin and all. Ingested moose hair is locally reported effective in reducing the degree of intestinal worm infestation in dogs.

Hunters generally prefer to avoid making too many small pieces of meat and even the largest arm or leg can be carried intact for short distances. However, depending on the size of the moose and the distance from the river, the meat may be butchered more extensively at the kill site to facilitate "packing." The size and weight of the front legs can be reduced by removing the lower portion at the knee and by separating the remaining upper portion into two or more pieces. Similarly, the ribs can be cut into smaller sections as can the backbone and tailbone. Antlers can be removed from the head to reduce the weight of this component. Field boning of the meat is not practiced among Nikolai and Telida hunters, probably because of the desire of residents to use bones and attached meat as central ingredients in making soup. Occasionally meat is removed from the neck bone.

One Nikolai resident notes that in the past, the lower arms and legs (beneath the knee), were regularly hung from trees with the covering skin intact for possible future use as "emergency food in starvation times."

"Packing" or carrying the meat more than a few hundred feet is undertaken in several ways. During planned hunting activities, pack boards or large external frame back packs are commonly used as the meat is either tied on or placed inside the pack. Among adult men, these loads sometimes weigh 100 pounds or more, as participants attempt to minimize the number of trips to and from the kill site. In the absence of a back pack as is often the case in incidental harvest situations, large portions of meat (such as a leg) are balanced on the shoulder of raincoat-clad hunters. Regardless of the method employed, elderly hunters encourage at least one of the packers to carry a rifle in a "ready" position should the scent of blood attract predators that might mistake the carrier for a wounded animal.

Butchering is necessarily complicated when the animal falls into water. In situations where the animal must be butchered in a lake or river, the animal is generally reduced to the largest movable pieces (sometimes only halved) which can be dragged ashore for further cutting. In these instances, as much skin as possible is left intact to minimize contamination by sand.

Interim methods for preservation of meat in the field in summer or fall vary and are determined, in part, by weather and hunting party plans. Because of the extra weight associated with fresh meat, some hunters hang the meat from a makeshift rack for at least one night to facilitate some drying and to inhibit spoilage. Alder or cottonwood smoke is used sometimes both for added flavor and to inhibit insect infestation. During periods of wet weather, this practice is even more desirable. The temporary platform is covered with a waterproof tarpaulin or, at least, a layer of brush. While the hanging of meat most often occurs near the river, at times this is done near the kill site, especially if the moose was dispatched more than one-half mile from the boat. Again, weight reduction is a key factor. In situations where the party intends to continue the hunt elsewhere, often the meat is left hanging for longer periods of time either along the river near the point of dispatch or at a central staging area such as the confluence of two rivers.

While large pieces of meat can be preserved for short periods of time through the hanging/smoking process, eventual spoilage is a real possibility, especially during periods of hot or moist weather. Consequently, the meat is consumed as rapidly as possible, when freezing is not an option. In those rare instances when spoilage does occur, the bad meat usually is cooked for dogs.

For longer periods of outdoor preservation where immediate consumption is not possible, the meat sometimes is cut into smaller pieces, making "dry meat" (nilanegwn). Dried meat is eaten like "jerky" as a snack food, or boiled and consumed in a stew or soup. Figure 10 shows moose ribs hung to dry in an area fish camp.

Distribution and Sharing of Moose

Traditionally, skillful hunters were recognized as providers by the community, and consequently their obligation voluntarily went beyond members of the immediate or extended family. While the status once associated with the productive mastery of hunting skills and the sense of community have diminished somewhat in recent years, the pattern or process of sharing from earlier times is still evident in Nikolai and Telida today.

A substantial part of the annual moose harvest is subject to sharing with members of other households. Three levels or tiers of distribution have been noted in Nikolai and Telida. Self-retention of the harvest is considered as level one. Self-retention is the initial division of meat among all participants of a particular hunt. The second level, or primary distribution, entails a sharing of the harvest among households or individuals not engaged in the taking of a particular moose. The third level and most far-reaching is secondary distribution, occurring when primary recipients redistribute a portion of their share to others within or outside the community. Ceremonial

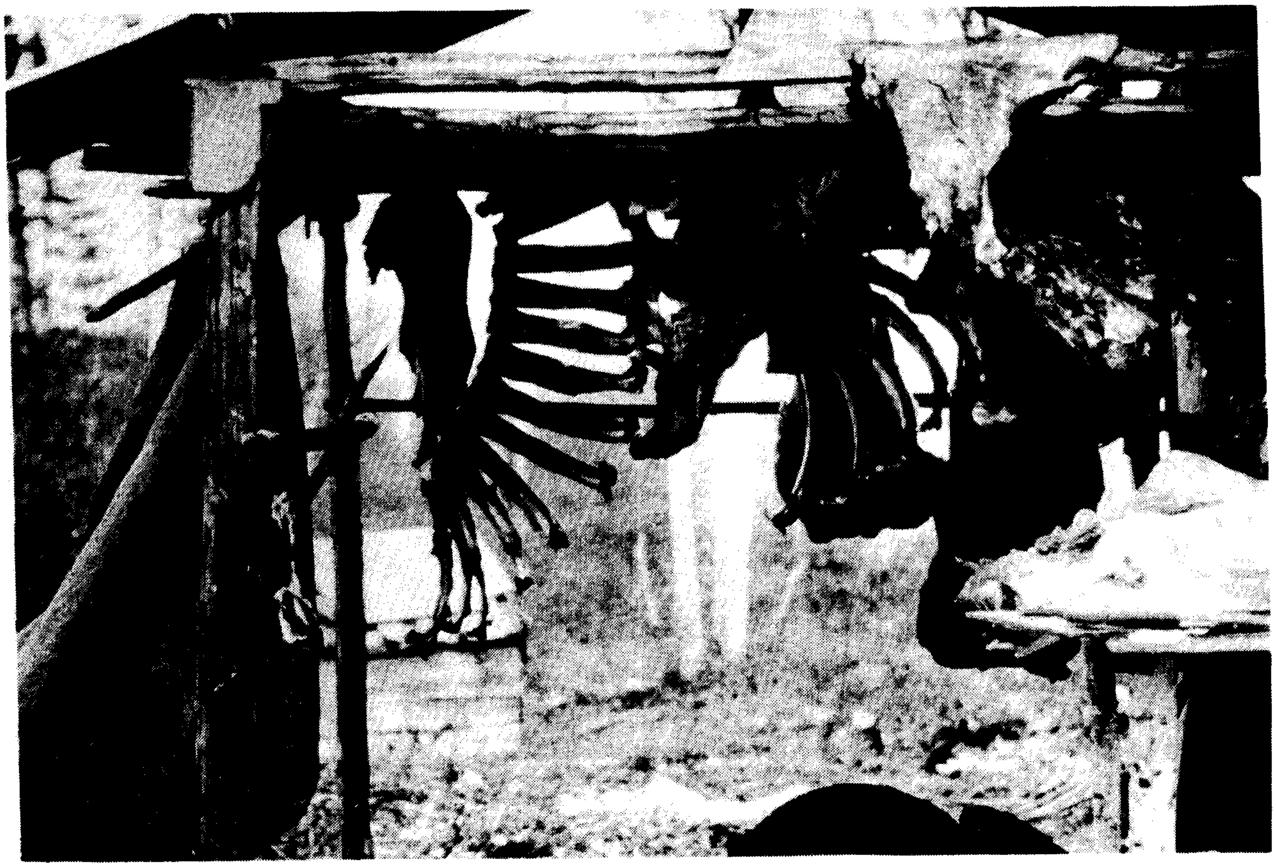

Fig. 10. Meat air drying on a rack, a method employed by Upper Kuskokwim inhabitants.

use of meat at "potlatches" held for Russian Orthodox holidays, baptisms, funerals, and other occasions falls within the secondary distribution level. Both primary and secondary distribution takes place in either selective or community-wide contexts. In any event, the hunter usually retains the largest share.

While moose are usually shared by means of the three levels of distribution reaching nearly every member of the community, primary distribution is most commonly practiced. One possible exception may be moose taken during the fall by Nikolai hunters who often retain meat for immediate household consumption. The rationale behind this possibly lies in the fact that most households successfully engage in fall hunting activities, making distribution of the harvest unnecessary and redundant. In virtually every instance where meat is retained for immediate household use, elderly members of the extended family unable to hunt for themselves receive a portion, either all at once or as they need meat.

In addition to the aforementioned cultural aspects of intra-community distribution or sharing of the harvest, there are several practical reasons for these practices. Until the recent introduction of a community-wide electrical system in 1981 in Nikolai, it was difficult for individuals to preserve large amounts of meat on a year-round basis. Distribution of the harvest in excess to that amount the hunter and his household was able to consume minimized culturally unacceptable waste. Another important factor in distribution of the harvest, particularly during the summer, is fear of enforcement actions. This concern is based less on fear of being turned in by fellow residents, centering more on the danger of discovery associated with storing large amounts of meat out-of-doors for extended periods of time. The practice of reciprocity is one other factor worth considering in understanding the continuing distribution patterns of moose meat. Other hunters at other times will prove successful and share their harvest with those who previously demonstrated their generosity. In Telida, the practice of pooling resources to engage in hunting efforts combined with the small population make primary distribution a nearly universal practice throughout the year.

Inter-community sharing of moose is evident between Nikolai and Telida inhabitants. On several occasions over the previous ten years, some older Nikolai hunters have traveled to Telida and assisted community residents, to whom they are typically closely related in obtaining one or more moose. Because there are comparatively few households in Telida, equipment failure and periods of resource scarcity can have major implications in this relatively isolated community. The close cultural and kinship ties between the two communities contribute to reinforcing this type of sharing. In addition, some Nikolai residents sometimes send small amounts of meat to their Telida relatives. This inter-community exchange of resources may be reciprocated at other times of the year as Telida inhabitants occasionally send resources characteristic of their area, such as whitefish, to friends and relatives in Nikolai.

In a general sense, moose harvested during the open-water months tend to be more widely distributed (with the previously noted exception of the fall), while primary distribution is somewhat less extensive during the winter months. Generally, the meat is divided among members of the party and/or those who assist in transporting the catch. In Nikolai, these are not necessarily the same groups since after the moose has been dispatched, the hunter may direct younger men to return to the kill site, butcher the animal, and transport it to town. While the hunter(s) will take a share, the rest is often divided among those transporting it to the village. Secondary distribution appears to be less extensive during the winter as well.

While the hunter generally retains a proportionately larger share of the meat during the winter, only rarely is the entire animal kept for immediate household consumption. This usually occurs only if the hunter was unsuccessful in the fall hunt.

Varying amounts of moose meat enter Nikolai and Telida each fall through guide-related activities occurring in the foothills of the Alaska Range. The primary recipients of this meat are usually local individuals employed in the industry. However, in some years substantial quantities are distributed throughout the communities.

Regulatory History

The regulatory history of moose hunting in the Upper Kuskokwim areas used by Nikolai and Telida inhabitants for the previous 18 years can be characterized as being in a state of nearly constant change. On balance, the trend during this period has been towards increasing restriction in season length, bag limit, and sex of harvest (Tables 12 and 13).

During the late 1960s and early 1970s, bag limits generally were two moose (either sex) which could be taken any time between mid-August and mid-March, with a total of up to 193 hunting days possible. This was still the case despite pronounced moose population declines associated with the severe winters of 1971 and 1972 (Alaska Department of Fish and Game 1976). The extension of the moose season in 1970 from February 15 to February 28 was implemented by the Board of Game at

TABLE 12. MOOSE HUNTING SEASONS, BAG LIMITS, AND POSSIBLE HUNTING DAYS IN UPPER GMU 19(D) FOR NIKOLAI HUNTERS, 1967-1984.

Year	Month								Bag Limit	Days
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar		
1984-85		XXX			XXX	XXX	XXX		1 bull	120
1983-84		XXX			XXX	XXX	XXX		1 bull	120
1982-83		XXX			XXX	XXX	XXX		1 bull	120
1981-82		XX							1 bull	15
1980-81		X							1 bull	11
1979-80		XXX		XXX					1 bull	60
1978-79		XXX		XXX					1 bull	60
1977-78		XXX		XXX					1 bull	60
1976-77		XXX	XXX	XXX			XXX		1 moose	119
1975-76		XXX	XXX	XXX			XXX		1 moose	119
1974-75	X	XXX	XXX	XXX	XXX				1 moose	134
1973-74	X	XXX	XXX	XXX	XXX	XXX	XXX		2 moose	193
1972-73	X	XXX	XXX	XXX	XXX	XXX	XXX		2 moose	193
1971-72	X	XXX	XXX	XXX	XXX	XXX	XXX		2 moose	193
1970-71	X	XXX	XXX	XXX	XXX	XXX	XXX		2 moose	193
1969-70	X	XXX	XXX	XXX	XXX	XXX			2 moose	180
1968-69	X	XXX	XXX	XXX	XXX	XXX			2 moose	180
1967-68	X	XXX	XXX	XXX	XXX	XXX			2 moose	174

(Source: Alaska Board of Game).

Department request to "facilitate legal harvesting of moose in the spring when they are traditionally taken" (Bishop 1969). As recently as the 1973-74 season, bag limit and season structure generally accommodated or fulfilled the traditional seasons and quantity requirements of many inhabitants of these two communities by permitting most households to take at least two moose of either sex during the course of a season that was nearly six months in length. Despite reports of moose being moderately abundant in the McGrath area, in 1974-75 bag limits were reduced to one moose and hunting days were decreased to approximately 120 per year (Alaska Department of Fish and Game 1976; Tables 12 and 13). Because of decreasing moose populations, the late winter season

TABLE 13. MOOSE HUNTING SEASONS, BAG LIMITS, AND POSSIBLE HUNTING DAYS IN UPPER GMU 19(D) FOR TELIDA HUNTERS, 1967-1984.

Year	Month								Bag Limit	Days
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar		
1984-85		XXX			XXX	XXX	XXX		1 bull	120
1983-84		XXX			XXX	XXX	XXX		1 bull	120
1982-83		XXX							1 bull	30
1981-82		XX							1 bull	15
1980-81		X							1 bull	11
1979-80		XXX		XXX					1 bull	60
1978-79		XXX		XXX					1 bull	60
1977-78		XXX		XXX					1 bull	60
1976-77		XXX	XXX	XXX			XXX		1 moose	119
1975-76		XXX	XXX	XXX			XXX		1 moose	119
1974-75	X	XXX	XXX	XXX	XXX				1 moose	134
1973-74	X	XXX	XXX	XXX	XXX	XXX	XXX		2 moose	193
1972-73	X	XXX	XXX	XXX	XXX	XXX	XXX		2 moose	193
1971-72	X	XXX	XXX	XXX	XXX	XXX	XXX		2 moose	193
1970-71	X	XXX	XXX	XXX	XXX	XXX	XXX		2 moose	193
1969-70	X	XXX	XXX	XXX	XXX	XXX	XX		2 moose	180
1968-69	X	XXX	XXX	XXX	XXX	XXX	XX		2 moose	180
1967-68	X	XXX	XXX	XXX	XXX	XXX			2 moose	174

(Source: Alaska Board of Game).

was eliminated and hunters were restricted to bulls only during 60 days of open season in 1977. In the 1980-81 season, a single 15-day September season was imposed on portions of Game Management Unit 19(D) used by Nikolai and Telida hunters (Tables 12 and 13).

The Upper Kuskokwim Controlled Use Area was established by the Alaska Board of Game in 1981 and season length was slightly increased to 32 days. The Alaska Board of Game established a controlled use area for the upper portions of Game Management Unit 19(D) in response to Department, advisory committee, and community concerns over pronounced increases in fly-in hunting activities and continuing declines in the moose population within the area (Fig. 8). In the spring of 1982, hunting days for the Controlled Use Area were increased to 120 days in both a fall and mid-winter season (Tables 12 and 13). Telida residents were initially inadvertently excluded from this expanded season, and revisions during the spring of 1983 rectified this oversight. Currently, Nikolai and Telida residents are permitted a single bull during 120 possible hunting days.

In the fall of 1982, after the Upper Kuskokwim Controlled Use Area was implemented, Nikolai hunters noted a marked decrease in float-equipped aircraft activities. The moose population has remained low, but the decline in numbers has apparently slowed (R. Pegau pers. comm. 1984). In addition to outside hunting pressure, Nikolai and Telida hunters note that several recent severe winters have impacted the subunit moose population. Predation is also considered to be a serious problem by community residents, the local advisory committee, and Department of Fish and Game personnel, especially in the North Fork drainage where low moose populations are particularly acute. The predation issue is discussed further in Chapter 12.

To ascertain information about moose movement patterns in the Upper Kuskokwim, the Alaska Department of Fish and Game, Division of Game, initiated a study of moose movements utilizing radio telemetry techniques in the upper river areas in 1984. This continuing study concentrates on bulls collared along the East and North Fork and around the Bear Creek Burn. A number of older Nikolai inhabitants believe moose hunted during the longer guide-oriented season in the Alaska Range foothill sections of 19(C) are those which at certain times of the year move to the lower river valleys and reside seasonally in portions of adjoining GMU 19(D). While area residents believe wolf and bear predation continues to be a major factor in the low moose population levels, many feel that since the Upper Kuskokwim Controlled Use Area was created there have been slight yearly increases in the availability of moose, particularly along the North Fork. Nonetheless, population levels are believed to be less than those of 12 or more years ago.

Harvest Levels

Since the mid-1960s, between 50 and 70 moose have been taken each year by Nikolai and Telida hunters (Stokes and Andrews 1982; Stokes 1983; Andrews and Stokes 1984; Stokes 1984; Stokes 1985). Discussions with longtime Nikolai residents indicate annual moose harvest levels have been fairly consistent during this period. Based upon detailed information gathered during the 1981 season, the average harvest that year was a little greater than 1.5 animals per household. Clearly, this falls below the generally agreed minimum need of two moose per household average acknowledged by the Alaska Board of Fish and Game in 1970 (Bishop 1969). Despite the twelve-fold decrease in season length (Tables 12 and 13), users continue to indicate that harvest levels have been essentially unchanged throughout the period. In comparing these figures to harvest ticket returns over the four regulatory years from 1981 to 1984, it appears only one-fourth to one-third of the annual harvest is reported (R. Pegau pers. comm. 1984). Consistency in the comparison of Division of Subsistence and Division of Game harvest numbers indicate the harvest-to-returned ticket ratio is fairly consistent, at least during the study period.

Numerous discussions with individual Nikolai and Telida hunters indicate that restrictive regulations have little effect on the continuation of traditional harvest levels and patterns and likely serve, in one manner of thinking, to inhibit the flow of information useful to the Department of Fish and Game for formulating practical resource management plans. While most Nikolai and Telida hunters probably well recognize the importance of harvest tickets in resource management, fear of retribution may contribute to the continued poor return rate of these reports. Nonetheless, the Alaska Board of Game has been able to receive a fairly accurate depiction of Nikolai and Telida hunting activities, including harvest levels, through the presentation of Division of Subsistence reports during the past three years (Stokes and Andrews 1982; Stokes 1983; Andrews and Stokes 1984).

MOOSE HUNTING BY MCGRATH RESIDENTS

As is the case in Nikolai and Telida, moose probably contribute the largest source of wild game protein for many McGrath households. By their own account, McGrath moose hunters invest appreciable amounts of time, money, and effort in harvesting this species each fall.

Moose Hunting Areas

Similar to hunting patterns characteristic of Nikolai and Telida residents, the Kuskokwim river system in GMU 19(D) serves as the primary means of access for most McGrath-based hunting parties during open-water months. Generally limiting their activities to a corridor of similar dimensions to that described in previous sections of this chapter, McGrath hunters usually hunt along the main Kuskokwim between Deacon's Landing and the mouth of Big River, a distance of over 100 river miles. The Takotna River and Nixon Fork within GMU 19(D) are also regularly hunted during the fall and, according to several residents of that community, this tributary system yields the greatest share of the fall harvest (Figs. 8 and 11). Additionally, some McGrath hunters report utilizing the upper Takotna River in a portion of GMU 21(A) as well.

The hunting area of McGrath residents during the winter months is appreciably larger than that accessible during the summer and fall. Traplines and other winter trails provide access for hunters on snowmobiles to the large geographical areas between rivers.

Moose Hunting Methods

Most McGrath hunters employ search strategies along river corridors similar to those described for Nikolai and Telida hunters, although discussions with individual hunters indicate opportunistic harvest accounts for a greater share of the fall take in comparison to the upriver villages.

There appears to be considerable variation between McGrath residents in the amount of time spent afield during the fall. Those with permanent employment obligations tend to limit their hunting activities to weekends and weekday evenings. Others, seasonally employed or out of work, tend to engage in the fall moose hunt in a manner similar to their Nikolai and Telida counterparts. Because areas hunted by most McGrath residents fall outside of the Upper Kuskokwim,

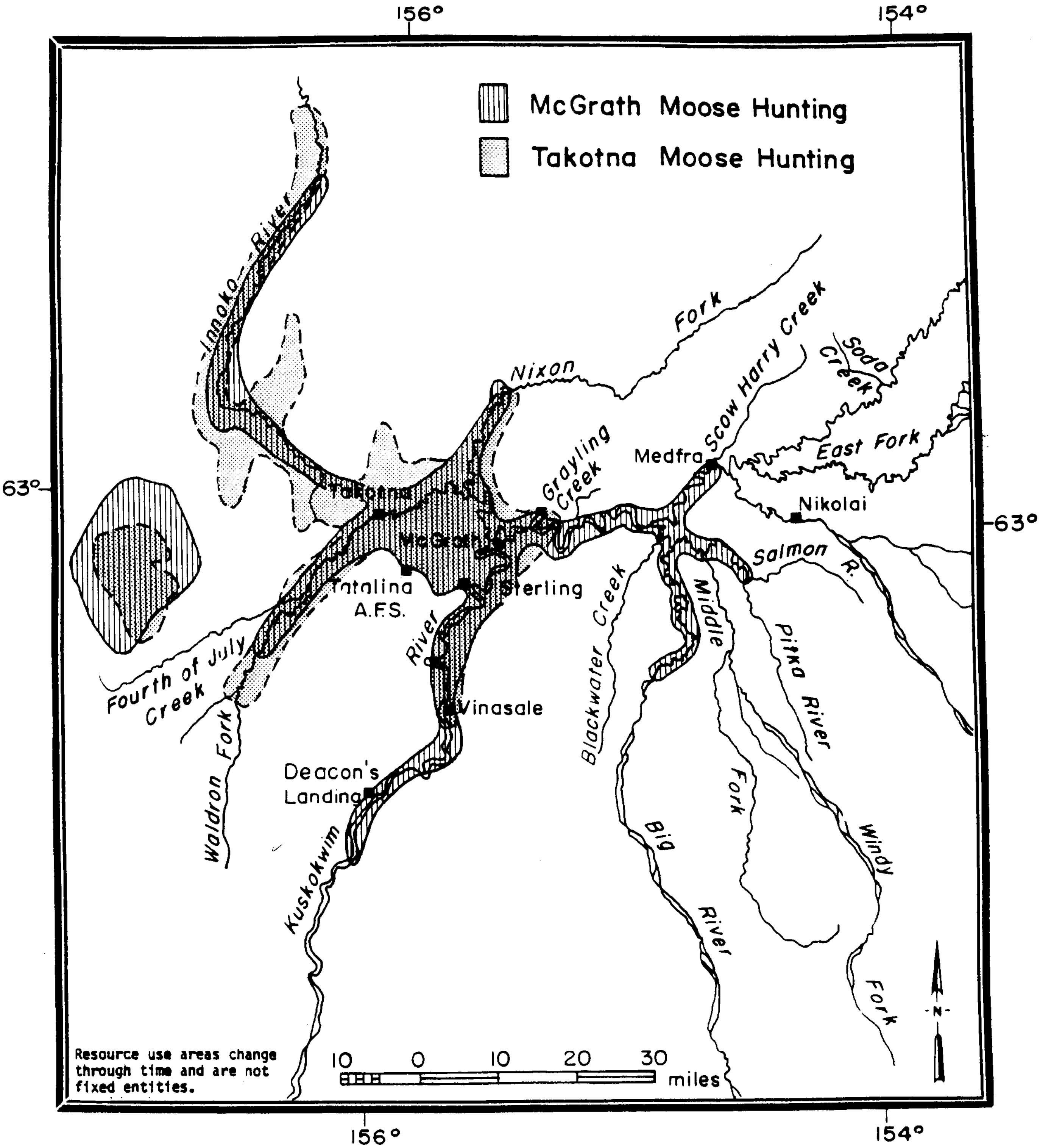

Fig. 11. McGrath and Takotna moose hunting areas, 1967-1984.

Controlled Use Area portion of GMU 19(D), some utilize either wheel or float-equipped aircraft for moose hunting-related activities. While aircraft provide McGrath moose hunters a wide range of hunting area possibilities outside of the Upper Kuskokwim, including the Beaver Mountains and upper Innoko River, this method of transportation is also used for access to many locations within Game Management Units 19(C) and 19(D). Although participation levels during in-season moose hunting activities are high among McGrath residents, discussions with several key community inhabitants indicate out-of-season hunting activities during the summer seldom occur.

Many of the hunting strategies designed to draw out bull moose as described for Nikolai and Telida hunters are also employed by McGrath residents. Additionally, some McGrath hunters note success in luring bull moose by scraping three-pound coffee tins on the side of a tree to simulate the sound of antlers rubbing against a tree.

Winter hunting by McGrath residents appears to be more incidental to other activities such as trapping. Overall less organization and effort is generally applied to the pursuit of moose during this time of year in comparison to Nikolai and Telida hunters. As a result, the legal winter harvest is believed to be "almost nil" (R. Pegau pers. comm. 1985). Additionally, the December 1 to December 15 season in the lower GMU 19(D) coincides, at times, with periods of unstable weather and poor surface travel conditions. As a result, moose hunting during this second season is, in some years, almost impossible.

Field observations indicate that McGrath hunting party composition tends to consist less of nuclear or extended family members than is the case among Nikolai and Telida groups engaged in moose hunting. While several members of one household may hunt together, other non-related individuals are likely to be included as well. Party sizes range from a single individual to six or seven persons. Although most McGrath hunters are male, a number of women are active moose hunters as well.

Some McGrath households receive meat from guides operating in the foothills of the Alaska Range, the Beaver Mountains, and the upper Innoko River drainage. Many of these households contain one or more members engaged in the guiding industry, and meat which is considered surplus to their own requirements may be given to selected individuals in either McGrath or neighboring communities. Additionally, meat confiscated by area enforcement agencies is occasionally distributed to selected McGrath households on a "need" basis.

Conversations with McGrath hunters indicates that field butchering and meat processing closely resembles those of Nikolai and Telida hunters, although some hunters reportedly remove the bone from the meat. The most pronounced differences occur in the secondary butchering processes where some McGrath residents further reduce the meat into "western" cuts, producing steaks, roasts, and ground meat prior to wrapping and freezing. A number of hunters regularly ship a portion of their fall moose to Anchorage for commercial conversion into sausage. Moose taken during the fall are most often preserved by freezing, although a few residents may first "flavor" the meat by smoking it in a manner not unlike that employed by Nikolai and Telida residents.

Use of Moose

The primary importance of moose among McGrath residents is as a food source and the meat has high value in terms of commercial equivalence. Some McGrath hunters salvage the skin for tanning purposes and, with few exceptions, virtually all tanning is done commercially, either by sending it directly to a tanning company outside Alaska or through sale of the raw skin to local business establishments that, in turn, have the hide processed for retail sale.

There appears to be a slightly greater interest among McGrath hunters in taking moose with a relatively large antler spread in comparison to hunters from upriver communities, although most view this species, first and foremost, as a source of meat. While some hunters might forego shooting a small bull early in the season with hopes of taking a larger one, most attempt to harvest the first bull they encounter.

Regulatory History

From 1967 through 1985, those portions of 19(D) used by McGrath hunters, like their Nikolai counterparts, were subjected to regulatory decreases in season length, bag limits, and sex (Table 14). During that period, hunting days decreased from a high of 193 as recent as 1974 to the present 45. During the same period, bag limits were reduced from two moose of either sex in the 1973-74 season to the current single bull restriction. Most recently, the second season length was decreased to 15 days (1981-82) and moved from late November to early December (1982-83) (Table 14).

TABLE 14. MOOSE HUNTING SEASONS, BAG LIMITS, AND POSSIBLE HUNTING DAYS IN GMU 19(D) FOR MCGRATH HUNTERS, 1967-1984.

Year	Month: Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Bag Limit	Days
1984-85		XXX			XX				1 bull	45
1983-84		XXX			XX				1 bull	45
1982-83		XXX			XX				1 bull	45
1981-82		XXX		XX					1 bull	45
1980-81		XXX		XXX					1 bull	60
1979-80		XXX		XXX					1 bull	60
1978-79		XXX		XXX					1 bull	60
1977-78		XXX		XXX					1 bull	60
1976-77		XXX	XXX	XXX			XXX		1 moose	119
1975-76		XXX	XXX	XXX			XXX		1 moose	119
1974-75	X	XXX	XXX	XXX	XXX				1 moose	134
1973-74	X	XXX	XXX	XXX	XXX	XXX	XXX		2 moose	193
1972-73	X	XXX	XXX	XXX	XXX	XXX	XXX		2 moose	193
1971-72	X	XXX	XXX	XXX	XXX	XXX	XXX		2 moose	193
1970-71	X	XXX	XXX	XXX	XXX	XXX	XXX		2 moose	193
1969-70	X	XXX	XXX	XXX	XXX	XXX	XX		2 moose	180
1968-69	X	XXX	XXX	XXX	XXX	XXX	XX		2 moose	180
1967-68	X	XXX	XXX	XXX	XXX				2 moose	134

(Source: Alaska Board of Game).

Harvest Levels

As noted earlier, McGrath hunters tend to harvest a greater amount of their meat within established seasons in comparison to Nikolai and Telida hunters. This statement appears to be supported by the information recorded on returned harvest tickets which in 1983, were returned at a rate exceeding the statewide average (R. Pegau, pers. comm. 1984).

For the 1983-84 season, Division of Game estimates place the 1983 moose harvest at between 65 and 75 animals, or between about .36 to .42 moose per household. For the 1982-83 season, harvest levels are believed to have been similar. Estimated harvests for McGrath hunters during the 1981-82 regulatory year was between 50 and 60 moose, for 1980-81 between 45 and 55 animals, and for the 1979-80 regulatory year between 40 and 50 moose. During this same period, McGrath has nearly doubled in population as noted in an earlier chapter.

MOOSE HUNTING BY TAKOTNA RESIDENTS

Moose Hunting Areas

Takotna inhabitants undertake moose hunting in portions of Game Management Units 19(D) and 21(A) (Fig. 8). Takotna hunters utilize the Takotna River corridor from the mouth of Fourth of July Creek downstream to the community to McGrath at the confluence of the Takotna and Kuskokwim rivers, a distance of 95 river miles (Fig. 11). Takotna residents also utilize the State-maintained road system as both a hunting corridor and for access to other river systems. The road to Ophir, 35 miles distant, provides the community with access to the Innoko River system as far downstream as Cripple, while the 25-mile road to Sterling Landing provides residents with a surface means to reach the main Kuskokwim below McGrath. Hunters report traveling as far downstream along the main Kuskokwim as Deacon's Landing, although most tend to utilize the Wilson Slough area, approximately 20 miles below the landing. Several hunters also noted use of the lower Nixon Fork tributary of the Takotna River at times.

The Takotna River flowing in front of the community is probably the most important summer hunting corridor area for residents. Although relatively shallow for extended portions of the summer, the river still provides access to areas both up and downstream of the community. Hunters who are knowledgeable of the river channels and have suitable equipment, such as shallow draft or jet-equipped boats, are able to effectively travel in the upper river.

Moose Hunting Methods and Means

Despite the absence of the large lakes and sloughs along the upper Takotna and upper Innoko rivers which are characteristic of the main Kuskokwim, search strategies employed by Nikolai, Telida, and McGrath hunters during the summer months are commonly used by Takotna inhabitants as well. Numerous channel changes along the upper Takotna River have created many small lakes and brushy sloughs that are seasonally inhabited by moose. Consequently, chance encounter is an important element of hunter success. A few Takotna hunters reportedly use rafts which they put in the Innoko River at Ophir and float down the Innoko River up to 120 miles in quest of moose. However, this practice necessitates flying the party and any harvest back to the home community.

Opportunistic hunting also is extended to the road system which connects Takotna with Sterling Landing and Ophir. Hunters drive a portion of the road in the evenings in search of moose. While some of this hunting is "passive" in terms of effort, many participants stop in some valleys along the road and employ a "call out" strategy similar to that described for hunters in other area communities.

One common contemporary fall hunting practice involves a combination of floating and motoring by boat down the Takotna River to the main Kuskokwim at McGrath in search of moose. This 60-mile trip undertaken in this manner may take several days. From McGrath, some Takotna hunters continue to Sterling Landing where the hunters, their boat and equipment, and, if successful, meat are picked up with a vehicle and returned by way of the road system to the home community.

Discussions with Takotna inhabitants indicate that moose hunters tend to spend less time afield than Nikolai or Telida participants in search of moose, exclusive of daily trips along area roads. Like McGrath hunters, conflicts with permanent employment situations likely limit the time hunters are able to devote to this activity. Takotna hunters predominately hunt during the fall season rather than the winter season, and like McGrath hunters, the winter harvest often occurs incidental to other seasonal activities, particularly trapping.

Discussions with community residents indicate moose are seldom taken outside of established seasons. Most of this unreported harvest occurs during the winter as community meat supplies run low. While hunters retain the largest share for immediate household use, limited primary distribution also occurs in most instances.

Use of Moose

Like other study area communities, the primary importance of moose in Takotna exists in its protein value. Until community residents began obtaining home freezers during the 1970s, meat taken during the early fall was often air dried in storage sheds or smokehouses. According to one resident, most moose taken during early September was at least partially distributed in a selective manner around the community. As the weather cooled, hunters tended to retain most, if not all, of their catch. With the increased use of freezers in recent years most Takotna inhabitants now cut, wrap, and freeze their meat. Still, many Takotna hunters continue to selectively share their catch, often giving to others small frozen portions at various times throughout the year.

Regulatory History

Because those portions of Game Management Units 19(D) and 21(A) utilized by Takotna hunters each feature different season lengths, possible hunting days are numerous. Nonetheless, residents of Takotna have experienced pronounced decreases in legal hunting days, ranging from a high of 193 possible hunting days in 1974 to 60 days during the 1980-81 season (Table 15). Like other area communities, Takotna residents have observed marked reductions in both sex and bag limit options since 1974, when hunters were able to harvest two moose of either sex. Although legal hunting days for Takotna hunters exceed those of their McGrath neighbors, the inability of community residents to utilize much of the November period serves to decrease, in a practical sense, possible hunting days.

TABLE 15. MOOSE HUNTING SEASONS, BAG LIMITS, AND POSSIBLE HUNTING DAYS IN GMUS 19(D) AND 21(A) FOR TAKOTNA HUNTERS, 1967-1984.

Year	Month								Bag Limit	Days
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar		
1984-85		XXX		XXX	XX				1 bull	75
1983-84		XXX		XXX	XX				1 bull	75
1982-83		XXX		XXX	XX				1 bull	75
1981-82		XXX		XXX	XX				1 bull	75
1980-81		XXX		XXX					1 bull	60
1979-80		XXX		XXX					1 bull	60
1978-79		XXX		XXX					1 bull	60
1977-78		XXX		XXX					1 bull	60
1976-77		XXX	XXX	XXX			XXX		1 moose	130
1975-76		XXX	XXX	XXX			XXX		1 moose	130
1974-75	X	XXX	XXX	XXX	XXX				1 moose	133
1973-74	X	XXX	XXX	XXX	XXX	XXX	XXX		2 moose	193
1972-73	X	XXX	XXX	XXX	XXX	XXX	XXX		2 moose	193
1971-72	X	XXX	XXX	XXX	XXX	XXX	XXX		2 moose	193
1970-71	X	XXX	XXX	XXX	XXX	XXX	XXX		2 moose	193
1969-70	X	XXX	XXX	XXX	XXX	XXX	XX		2 moose	180
1968-69	X	XXX	XXX	XXX	XXX	XXX	XX		2 moose	180
1967-68	X	XXX	XXX	XXX	XXX				2 moose	134

(Source: Alaska Board of Game)

Harvest Levels

Discussions with Takotna residents indicate the annual moose harvest ranges between 15 and 20 animals (or about .69 to .90 moose per household), with around two-thirds of the households (15) in Takotna hunting moose each fall season. Based on Division of Game harvest ticket statistics for McGrath and user provided information from Takotna, the average annual household harvest for these two communities is around one animal per year (R. Pegau pers. comm. 1984). While this is significantly lower than the average evidenced among Nikolai and

Telida hunters, it nonetheless demonstrates the importance of moose in these two communities. Part of this difference may be attributed to the greater permanent employment opportunities in both Takotna and McGrath that likely create a different balance between cash and wild resources for many residents.

SUMMARY

Since at least the earliest historical times, moose hunting has been central to the economy of the people of the Upper Kuskokwim. Among contemporary inhabitants, moose is, by far, the most important source of wild food protein. This importance is evident in the amount of time, effort, equipment, and cash annually invested in the pursuit of this animal. While many of the issues and concerns noted within the study area are particular to one or two settlements, others present area-wide implications.

CHAPTER 6

CARIBOU HUNTING IN THE UPPER KUSKOKWIM

Caribou (midzish) continue to contribute to the annual diet of Upper Kuskokwim inhabitants. Contemporary caribou populations are comparatively low and the range of these animals has decreased from those characteristic of earlier times. However, many area residents continue to apply appreciable amounts of time, effort, and money to the harvest of this big game species. This chapter examines both early-day and contemporary caribou hunting practices including pursuit, processing, and preservation techniques; harvest levels; and the recent regulatory history of caribou hunting.

Within the Upper Kuskokwim region, five distinct groups of caribou have been identified. These include the Big River/Blackwater herd which occupies areas from Nikolai southward to the Alaska Range foothills, the Nixon Flats/Sunshine Mountains group inhabiting areas northwest of McGrath, and the Beaver Mountains caribou that range throughout the upper Innoko drainage west of Takotna (R. Pegau, pers. comm. 1983) (Fig. 12). The Rainy Pass group, inhabiting the upper South Fork, occasionally enter the southern portions of areas used by Nikolai, Telida, and McGrath hunters, while the Tonzona caribou are accessible at times to hunters from Telida (R. Pegau pers. comm. 1984) (Fig. 12).

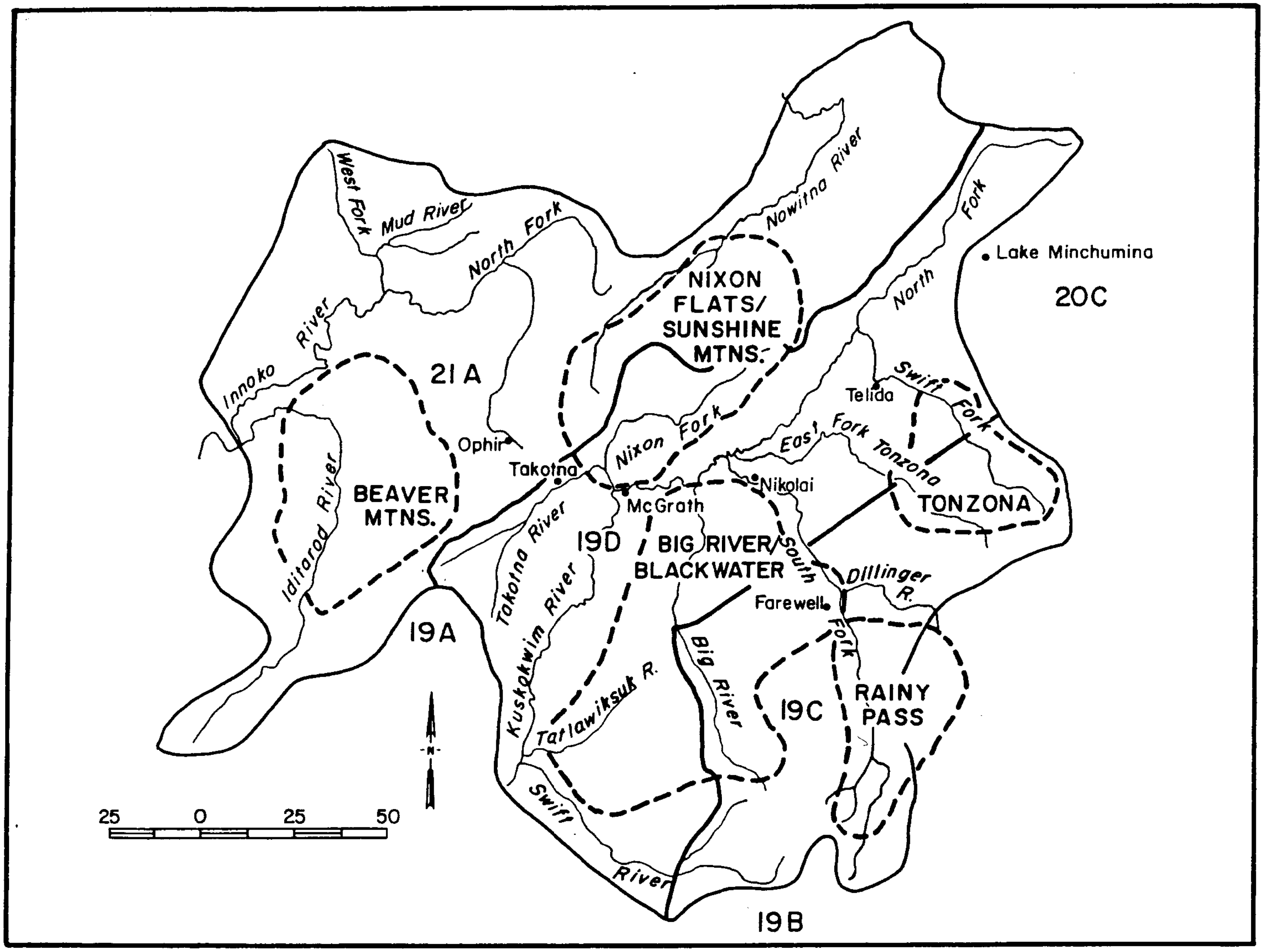

Fig. 12. Location of caribou herds in the Upper Kuskokwim region. (source: R. Pegau - Division of Game, Alaska Department of Fish and Game)

HISTORICAL CARIBOU HUNTING PRACTICES

From times predating the moose repopulation of the Upper Kuskokwim during the 1800s, caribou have been an important species to area inhabitants. Older Nikolai residents report that prior to the arrival of the Russians, caribou was the primary source of meat for the aboriginal population. Caribou were actively hunted on nearly a year-round basis as noted in the seasonal round and geographic use patterns described in Chapter 4. Caribou hunting areas and harvest sites, were principally determined by the movements or migrations of these animals. According to several life-long residents of the region, changes in the movements of caribou at times brought about periods of catastrophic famine and starvation.

Caribou fences were an important method employed to intercept caribou by early-day hunters. Although no living resident of Nikolai or Telida recalls seeing these fences in use, many remember hearing of fences located in the Vinasale and Middle/Windy Fork areas. There are conflicting accounts over the form these fences took. Anthropologist Edward Hosley described caribou "surrounds" (corrals) constructed of poles into which animals were driven along a short fence for slaughter (Hosley 1966). On the other hand, older Nikolai residents believe corrals were not an aspect of Upper Kuskokwim fences. Instead, they describe a fence consisting of brush, small poles, and occasional posts situated between natural barriers (such as large hills, lakes, or rivers). These natural obstructions served to funnel caribou towards the fence. According to local accounts, openings were placed intermittently along the length of the fence where rawhide snares or nooses were suspended at neck level. When caribou encountered the fence, they reportedly followed it in an attempt to locate an opening. While the lead animals became snared as they passed through the opening, subsequent caribou were able to pass around the hanging animal, continuing the migration. Hunting parties checked the fence on foot every day or two, removing dead animals and making repairs to the fence as needed. Any caribou still alive in a snare were dispatched with spears, arrows, or clubs. Most fence segments were, at the most, only a mile or two in length, and hunters operated from nearby seasonal encampments. Apparently fences were utilized year-round, although hunting efforts were the most intense during the fall and early winter.

Because fences were labor intensive both in terms of maintenance and construction, and suitable harvest sites were reportedly limited, not every group or band of people employed this caribou harvest technique. Others hunted caribou on foot with spears and bows and arrows. In all cases, pursuit of caribou was undertaken on foot. According to Nikolai residents, certain hills and small mountains were climbed regularly, which enabled hunters to visually search large areas for caribou.

By all accounts, excellent physical conditioning was necessary to permit hunters to run for extended periods on either snowshoes or on bare ground with only minimal rests. According to one older hunter, it was sometimes possible to eventually overtake fleeing caribou in this manner, particularly when snow conditions prevented the animals from reaching top speeds. Caribou also were stalked. This practice was probably employed in some of the less open areas when wind conditions were favorable and was probably most successful during the periods when caribou were moving with less purpose. Other Nikolai residents recall hearing of or even seeing caribou lured towards waiting hunters by a waving piece of fabric or skin. This technique was reportedly particularly productive during the fall.

In addition to their food value, caribou parts were used for making a wide variety of articles including clothing, footwear, and fish nets. "Thread" was obtained from the sinew in the backstrap, and caribou babiche or rawhide had many uses. According to older Nikolai residents, the basic shirt worn by these earlier people were made from tanned caribou hide. Knife handles and other tools were made from the antlers. Skin boats, tents, and sleeping gear were made from the skins as well.

Despite the repopulation of the area by moose during the 1800s, hunters continued to focus their hunting activities on caribou as the species of choice. By virtue of their smaller size, caribou were easier to carry, more abundant, and the meat was said to be preferred for its taste. Increasing availability of repeating firearms made caribou even easier to take and harvest levels subsequently increased. Reports of large-scale slaughter of caribou with repeating rifles during the 1920s (Hosley 1966) have not been locally substantiated, although harvest levels by area residents were likely high in response to the demand for market hunting for area roadhouses and nearby mining camps. Certainly the market for caribou meat was tempered by the availability of commercially obtainable alternatives such as reindeer from the Twitchell herd, particularly in the vicinity of Takotna and McGrath.

Continued increases in the area moose population combined with major declines in the range and numbers of caribou, along with geographic shifts in use areas and the seasonal round, discussed in Chapter 4, led to a gradual and partial replacement of caribou hunting with moose hunting. Although moose assumed a more prominent place in the diet and seasonal round, caribou continued to be hunted actively, and even as their range was reduced, hunters traveled further afield to hunt them. Caribou were still pursued on foot unless encountered within firearm range of a dog trail.

With the introduction of snowmobiles, the strategy of caribou hunting appreciably changed. Hunters were able to cover greater distances over all types of terrain in shorter periods of time. Often caribou could be pursued through open country until the prey tired. Likewise, in brushy or forested areas, hunters now were able to quickly circle the animals and determine their general location, minimizing the need for pursuing them on foot. Lone hunters were able to enhance their likelihood of success. Although snowmobiles contribute to increased efficiency in caribou hunting, hunters often must travel considerable distances (up to 40 miles) to reach the areas that caribou now inhabit.

CARIBOU HUNTING BY NIKOLAI AND TELIDA RESIDENTS

Virtually all caribou hunting by Nikolai and Telida inhabitants occurs during months of snow cover, although caribou are occasionally taken opportunistically incidental to other seasonal activities during the summer. Nikolai hunters focus virtually all of their caribou hunting on the area of the Big River/Blackwater herd (Figs. 12 and 13). Telida hunters pursue caribou associated with the Tonzona herd near the mouth of the Big Tonzona River, but also harvest animals near the

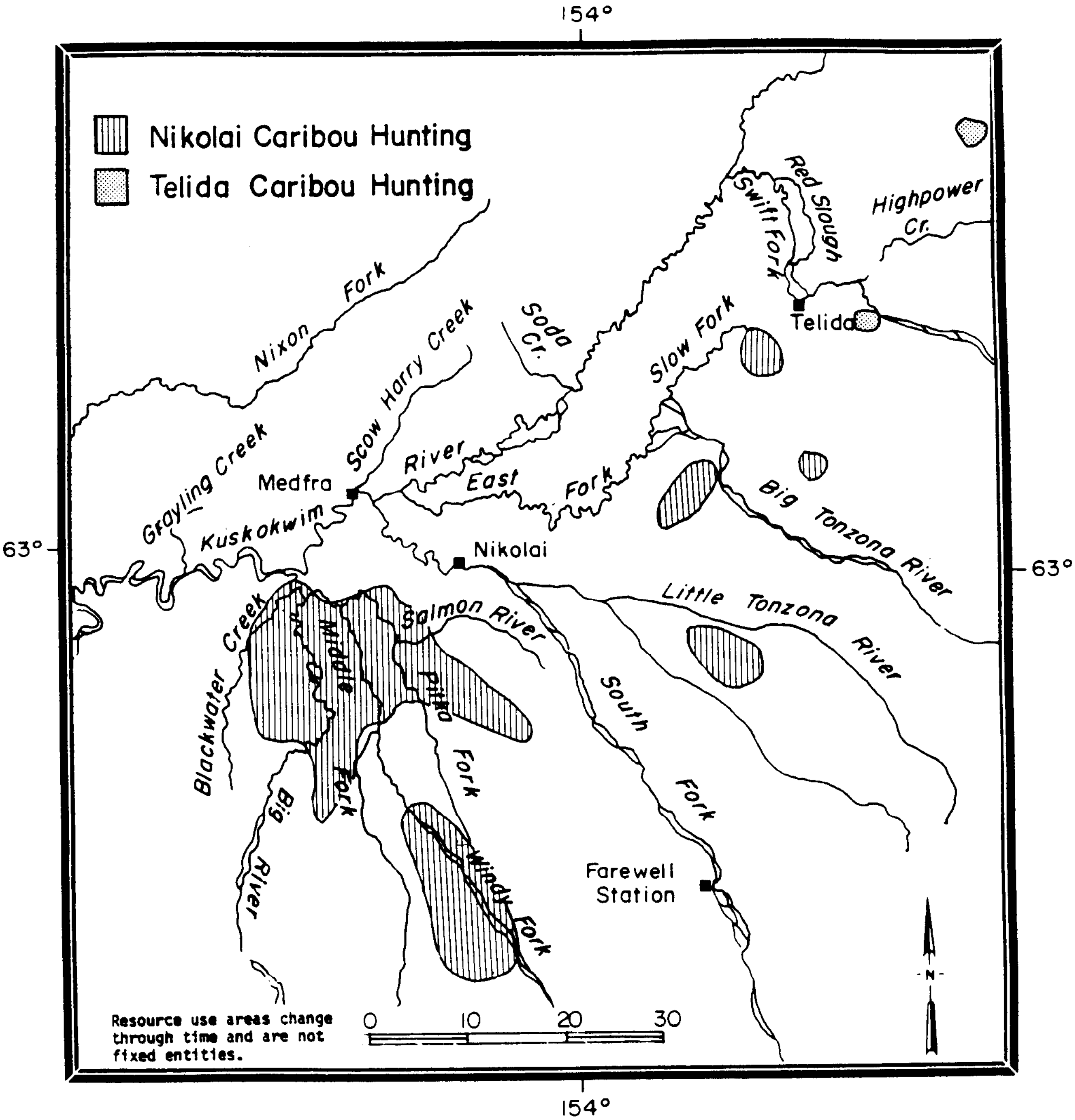

Fig. 13. Caribou hunting areas utilized by Nikolai and Telida hunters, 1967-1983.

community, north of Highpower Creek, and along the Slow Fork when caribou are in those areas (Figs. 12 and 13).

Area-wide declines in caribou range and population occurred in the 1920s and 1930s as previously noted. In addition, the 1964 earthquake may have contributed to the recent absence of caribou from the lowlands southwest of Telida, since it is believed that slight changes in elevation following the earthquake have resulted in flooding in most of this area each spring and summer.

Caribou Hunting Strategies

Contemporary caribou hunting by Nikolai residents is generally a one-day activity. Hunters usually leave the community one to one-and-a-half hours before daylight and arrive at the hunting area shortly before sunrise. This is necessary to allow hunters to maximize use of daylight during the short December and January days of the hunting season. Party size ranges from two to six people, although larger groups sometimes hunt together. Each hunter usually drives his own snowmobile, although at times another person may ride astride the runners on a sled towed behind. Often the passenger is a close relative, such as a son, brother, or grandson, of the driver. Wives occasionally accompany their husbands. Driving duties sometimes are shared with passengers.

The hunt starts from a "regrouping point" to which participants agree to return at the end of the day should separation occur. Hunters begin their search in close proximity to each other, often following one hunter who leads on his snowmachine. This person is often the member of the hunting party most familiar with the geographic characteristics of the area. Deep snow conditions sometimes requires that another member of the party with equipment best suited for trailbreaking drive in front. At times, hunters occasionally become temporarily "lost," particularly during periods of poor visibility. Confusion is compounded as hunters cross and recross snowmobile tracks. Consequently, at least one member of any caribou hunting party is intimately familiar with the hunting area, generally through on-going activities such as trapping or a number of prior hunting trips.

In the past, Nikolai hunters climbed low hills throughout the area to scan surrounding locations for caribou. Areas used for caribou hunting now, such as the Big River Flats, are generally lowland areas lacking suitable look-out sites.

Nikolai hunters utilize large caliber rifles such as 30.06, .270, or .30-.30 for caribou hunting. Many prefer open sights for this activity while others use scope-equipped firearms. Scope-equipped rifles tend to be more sensitive to cold temperatures and snow which are prevalent during caribou hunting periods. Scopes sometimes fog-up and misalign due to rough handling associated with using snowmobiles for transportation to caribou hunting areas. Rifle mechanisms can jam easily during winter caribou hunting and care is taken to protect firearms from snow for this reason. Some Nikolai and Telida hunters store their rifles out-of-doors to prevent snow from sticking to the otherwise warm metal. On the other hand, longer shots are difficult with open sights.

Most hunters periodically check the operation of their rifle during the course of a hunting trip. Most hunters carry the rifle in the sled until the hunting area is reached. From that point, the magazine is filled with ammunition and rifle is often carried over the shoulder by the sling as the hunters continue driving. Some drivers, upon reaching the hunting area, unplug or turn off their headlights to avoid visually alerting the caribou.

If caribou or their relatively fresh tracks are encountered, a number of hunting strategy decisions are made. Factors which influence the pursuit include wind and weather conditions, snow depth and consistency, the geographic characteristics of the area, and the number of hunters in the party. Parties sometimes are split into two or more groups to pursue the caribou. If hunters sight caribou in open country, they usually attempt to shoot them if the range is less than about 200 yards. In the early winter caribou tend to stop running if the hunter does the same. Sightings at greater distances require hunters to attempt to get closer. In open areas this may be done by approaching the caribou at high rates of speed on a snowmachine, attempting to close the distance. One difficulty associated with this approach is that by the time the hunter stops his snowmachine to take aim, the caribou have often sprinted beyond range. Nonetheless, this technique can often be successful, particularly in deep snow conditions when the animal has difficulty in obtaining and/or maintaining top speeds. A variation of this technique when caribou are encountered at long ranges is for the fastest snowmachine to attempt to circle the animals, to confuse them and temporarily halt their escape. Because caribou can out-run most snowmobiles for short periods of time, this technique only works in openings of one-half mile or more in length or when deep snow conditions impede the caribou's ability to accelerate.

A third option for open area encounters is to wait for the animals to move closer. This method is successful only when wind conditions are favorable and the caribou have not seen or heard the hunters approach.

Because much of the area frequented by caribou is characterized by dense stands of narrow diameter black spruce timber (locally referred to as "islands"), small openings, and periodic stretches of brush which may limit or impede the line of sight, other strategies are employed. When caribou are encountered in this type of terrain, it is sometimes difficult to fire more than a single shot before the caribou enter the stands of trees or are otherwise screened from view. Hunting parties often split into smaller groups and attempt to circle the animals, seeking to intercept the caribou in adjacent openings. Knowledge of the hunting area is beneficial for this approach and this method often is successful, particularly when the party is using two or more snow-machines. At times, one or more hunters are positioned in a large opening while other party members attempt to chase the caribou from wooded areas towards the waiting members of the party.

When relatively fresh tracks are encountered, a modification of this strategy is employed. Hunters parallel the tracks, recrossing them periodically. As the tracks become fresher, the loops become tighter or closer together, and when the hunter believes the caribou are nearby, a circling strategy may again comes into play.

Butchering, Distribution, and Harvest

When caribou are taken, the successful hunter often removes the head and viscera, leaving the carcass for retrieval later in the day.

This enables him to continue hunting with other members of the party. Afterwards, caribou are transported whole (minus head and viscera) to the home settlement or central gathering point where the animal is butchered. Often the decision whether to completely butcher the catch in the field is based on the number of animals which have to be transported to the community, the time of day, and the desired take levels. Cutting the caribou into basic components permits several animals to be transported as one sled load. Successful hunters who do not have sleds with them often butcher the animal and return later or send a relative back with a sled the following day to retrieve the meat. When meat is left overnight, it usually is covered with the skin to discourage scavenging by small predators and birds. In addition to the meat, the head, skin, and selected viscera are retrieved. Of the latter, the lungs are often cooked for dogs. The skin is sometimes locally processed and used as a "mattress" or sleeping pad for both camp and home use. The skin from the lower back legs continues to be used at times for making moccasin leggings. This particular portion of the skin is usually left attached to the lower leg until the meat is ready for consumption.

Most caribou meat is preserved through freezing, often out-of-doors in a cache. For frozen caribou transported whole to the home community, reduction of the animal into its basic parts is sometimes undertaken indoors and in these instances, the animal is carried into the house and placed on a large piece of polyethylene sheeting or "visquene" on the floor where it is butchered after thawing.

While self-retention is fairly common, a substantial share of the annual harvest is also distributed in both a primary and secondary manner, described in the previous chapter. Intercommunity sharing, primarily between close friends or members of the same extended family is commonplace. Variations in availability of caribou between communities may contribute to this sharing pattern. The extent and quantity of distribution of caribou meat appears to be somewhat dependent upon the total harvest -- the more caribou harvested, the more meat shared. Distribution levels are also tied to the success of fall and early winter moose hunting activities. Unsuccessful moose hunters tend to retain more caribou meat. Based on conversations with hunters and from direct observation, Nikolai hunters between 1980 and 1984 have taken, on the average, between 15 and 25 caribou per year. Further discussions with hunters indicate this average is representative of harvest levels over the prior 12 years (1967-1979). However, within this 12-year period, there have been winters of both lower and higher harvests. Fewer caribou have been taken by Telida residents during the same 12-year period, particularly since in recent years the caribou range has shifted away from Telida.

Regulatory History

The Big River/Blackwater caribou group utilized by Nikolai and McGrath hunters has been subject to major regulatory revisions since 1966. Presently it is estimated that this herd numbers less than 500 animals which seldom travel in groups of more than 15 (R. Pegau pers. comm. 1983). Hunting days totalled 233 each year between 1966 and 1976 (Table 16). Annual bag limits during this same 10-year period varied between three and five animals. During the 1976-77 season, the bag

TABLE 16. CARIBOU HUNTING SEASONS, BAG LIMITS, AND POSSIBLE HUNTING DAYS IN THE BLACKWATER CREEK/BIG RIVER PORTIONS OF GMU 19(D) FOR NIKOLAI AND MCGRATH HUNTERS, 1967-1984.

Year	Month							Bag Limit	Days
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar		
1983-84	XX	XXX		XXX	XXX	XXX			1	143
1982-83	XX	XXX		XXX	XXX	XXX			1	143
1981-82	XX	XXX		XXX	XXX	XXX			1	143
1980-81	XX	XXX		XXX	XXX	XXX			1	143
1979-80	XX	XXX		XXX	XXX	XXX			1	143
1978-79	XX	XXX							1	51
1977-78	XX	XXX							1	51
1976-77	XX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	2	233
1975-76	XX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	5	233
1974-75	XX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	5	233
1973-74	XX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	5	233
1972-73	XX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	5	233
1971-72	XX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	5	233
1970-71	XX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	5	233
1969-70	XX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	3	233
1968-69	XX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	3	233
1967-68	XX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	3	233
1966-67	XX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	3	233

(Source: Alaska Board of Game)

limit was reduced to two animals, and the following year, was set at one per regulatory year (Table 16). The season was essentially closed for Nikolai residents during 1977-78 and 1978-79, as the 51 open days occurred during the late summer and fall, a time when caribou in the lowlands are nearly impossible to take along the river corridors. The following year the season length was increased to the current 143 hunting days, although the bag limit remained fixed at one animal (Table 16). Discussions with Nikolai hunters, as noted above, indicate little appreciable reductions in harvest levels during this period because, as one hunter viewed it, they had no other choice.

Hunters attribute the decrease in caribou populations in the Big River/Blackwater vicinity to shifts in range, predation by bears and wolves, and dramatic increases in aerial hunting prior to the implementation of the same-day-airborne regulations in the 1970s. In view of slight caribou population increases in recent years (R. Pegau pers. comm. 1983) in the face of continued harvest by Nikolai participants, local hunting pressure probably was a relatively small factor in the herd's size in comparison with these other factors.

Continued shifts in caribou winter range combined with major habitat changes brought about by the 1964 earthquake are believed by some area residents to be the underlying reasons for declines in caribou availability in the Telida vicinity. Regulatory restrictions have, by and large, been of little application, at least until recent years (Table 17). Regulatory language that inadvertently precluded Telida from hunting near the community was revised by the Board of Game in 1982 in response to reports of caribou tracks near the community.

Nikolai and McGrath caribou hunters question the rationale for fall season currently in place in GMU 19(D), for few caribou are taken during this period. Several residents have expressed interest in seeking to delete the fall season in favor of an extended late winter season that would make the trapping and caribou hunting seasons more parallel. As McGrath continues to grow in population, increasing winter harvest pressure is likely to be applied to the recovering Big River/Blackwater group, particularly in view of hunting restrictions in force on the Nixon Flats/Sunshine Mountains group.

TABLE 17. CARIBOU HUNTING SEASONS, BAG LIMITS, AND POSSIBLE HUNTING DAYS IN THE TELIDA PORTION OF GMU 19(D) FOR TELIDA HUNTERS, 1966-1984.

Year	Month								Bag Limit	Days
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar		
1983-84	XX	XXX		XXX	XXX	XXX			1	143
1982-83									0	0
1981-82									0	0
1980-81									0	0
1979-80									0	0
1978-79	XX	XXX							1	51
1977-78	XX	XXX							1	51
1976-77	XX	XXX							1	51
1975-76	XX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	5	233
1974-75	XX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	5	233
1973-74	XX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	5	233
1972-73	XX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	5	233
1971-72	XX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	5	233
1970-71	XX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	5	233
1969-70	XX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	3	233
1968-69	XX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	3	233
1967-68	XX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	3	233
1966-67	XX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	3	233

(Source: Alaska Board of Game)

Additionally, Nikolai hunters continue to note the presence of aerial hunting activities in the vicinity of the Blackwater/Big River caribou herd. According to several hunters, some airborne hunters apparently land, taxi within range, and shoot caribou in violation of the same-day-airborne restrictions. Ski-plane tracks reportedly attest to this.

CARIBOU HUNTING BY MCGRATH AND TAKOTNA RESIDENTS

To some McGrath and Takotna households, caribou is a welcome alternative to moose meat. Discussions with a number of hunters from both communities indicate that the intensity of contemporary harvest activities is tempered by the current regulatory restrictions which prohibit caribou hunting near both communities. In most instances, those caribou that are taken by residents of McGrath and Takotna often require a greater commitment of resources by virtue of the extra travel distances.

As was previously noted, the Big River/Blackwater caribou herd is accessible by snowmobile to McGrath residents (Fig. 12), particularly late in the winter when the animals may shift their range down toward the White Mountain "cat" road. Several McGrath residents also regularly take caribou from this group in the vicinity of Lone Mountain and the lower Blackwater Creek incidental to both surface-access and aerial trapping activities (Fig. 14). Several McGrath respondents said they occasionally use private aircraft to reach caribou hunting areas during the fall around the Beaver Mountains a distance of approximately 60 air miles (Fig. 12). Additionally, an undetermined amount of caribou meat enters the community each fall through residents engaged in the area big game guiding industry. Prior to reductions in season length in the late 1970s (Table 18), caribou were occasionally taken in conjunction with fall moose hunting activities along both the Nixon Fork and Takotna River (Fig. 11) by McGrath and Takotna inhabitants.

McGrath and Takotna hunting parties generally tend to be smaller (two to four members) than those of Nikolai and Telida described

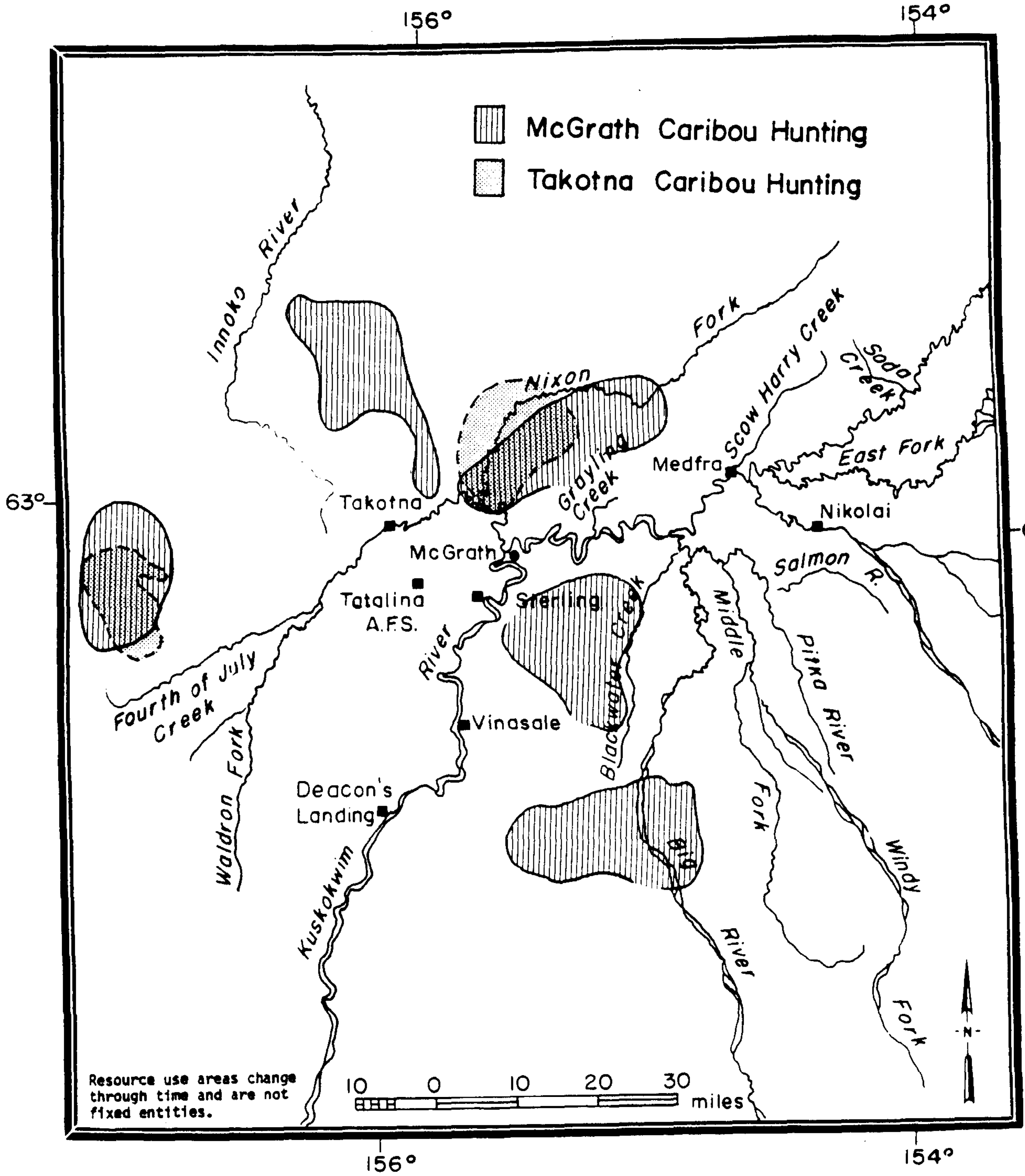

Fig. 14. Caribou hunting areas utilized by McGrath and Takotna hunters, 1967-1983.

TABLE 18. CARIBOU HUNTING SEASONS, BAG LIMITS, AND POSSIBLE HUNTING DAYS IN THE NIXON FORK PORTION OF GMU 19(D) FOR MCGRATH AND TAKOTNA HUNTERS, 1966-1984.

Year	Month								Bag Limit	Days
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar		
1983-84									0	0
1982-83									0	0
1981-82									0	0
1980-81									0	0
1979-80									0	0
1978-79	XX	XXX							1	51
1977-78	XX	XXX							1	51
1976-77	XX	XXX							1	51
1975-76	XX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	5	233
1974-75	XX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	5	233
1973-74	XX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	5	233
1972-73	XX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	5	233
1971-72	XX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	5	233
1970-71	XX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	5	233
1969-70	XX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	3	233
1968-69	XX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	3	233
1967-68	XX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	3	233
1966-67	XX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	3	233

(Source: Alaska Board of Game)

earlier. McGrath hunters indicate that in comparison with caribou hunting strategies at Nikolai, McGrath hunters tend to spend more time visually searching areas from their snowmobilesadjacent to established trails .

Like Nikolai residents, McGrath hunters generally preserve the caribou harvest through freezing, although many prefer to reduce the animal into smaller pieces suitable for individual packaging prior to freezing. Many McGrath hunters distribute a portion of their harvest to friends and relatives.

While harvest ticket returns for McGrath and Takotna were not reviewed, residents indicate the combined annual harvest has ranged between 8 and 12 animals in recent years.

Regulatory History

As noted earlier in this chapter, the Nixon/Sunshine Mountains group of caribou (Fig. 12) has historically been the primary source of caribou for Takotna and McGrath inhabitants. Winter hunting of this herd which ranges north of McGrath was restricted in 1976, greatly limiting the ability of most Takotna and many McGrath residents to legally pursue animals in this area (Table 18). The reduction in available hunting days in 1976 was combined with a reduction of the bag limit from five animals to only one. From 1976 until 1979, what little legal harvest that did occur was incidental to September moose hunting activities along the Takotna River and Nixon Fork (Table 18). There has been no open season for the Nixon/Sunshine Mountains herd since 1979. These revisions have essentially eliminated Takotna's participation in caribou harvest activities. Hunters from both communities perceive increases in the Nixon/Sunshine Mountains caribou population over the previous few years.

Users of the Nixon/Sunshine Mountains group believe the declines leading to season closure were associated with wolf and bear predation as well as shifts in range. Evidence of wolf predation has been reflected in radio telemetry studies of caribou mortality (R. Pegau pers. comm. 1984).

SUMMARY

From times predating the moose repopulation of the upper Kuskokwim Valley during the 1800s, caribou have been an important species to area inhabitants. Over the past one hundred years, area residents have pursued caribou afoot, astride dog sleds, aboard snowmobiles, and inside aircraft. Harvest technologies have included caribou fences, spears, arrows, single-shot firearms, snares, and repeating rifles. While area caribou populations have markedly decreased since the 1930s, residents of Nikolai and McGrath continue to hunt for this species. Takotna and Telida residents also harvest caribou occasionally. In the face of population decreases, regulatory restrictions reducing bag limits and season length have most severely limited the hunting activities of Takotna and McGrath residents. Hunters attribute low caribou populations to wolf and bear predation and to largely unexplainable shifts in the seasonal range of this species. Hunting most often during the winter months, caribou hunters continue to invest time, effort, and money to the harvest of this species.

CHAPTER 7

OTHER HUNTING IN THE UPPER KUSKOKWIM

While moose and caribou comprise the major game components of the contemporary regional resource base, a variety of lesser species is also important and serves to seasonally supplement or diversify the diets of many residents. This chapter depicts the extent of small and large game use in the Upper Kuskokwim, methods of harvest and season of use, and, when possible, harvest level ranges.

Sheep are limited to the Alaska Range while grizzly bears are most common in the headwater areas of salmon-bearing rivers. Black bear, beaver, migratory waterfowl, grouse, hare, porcupine, and other small game occur throughout the Upper Kuskokwim in various population densities. While some small game populations are highly cyclic, others are fairly stable from year to year. In general, the harvest of small game usually occurs either near the home settlement or incidental to other resource use activities.

BEAR

After moose and caribou, black bear (shisr) is the next most important large game species in a contemporary regional context. Most are usually taken during the summer and fall. McGrath and Takotna inhabitants tend to place a greater emphasis on harvesting black bear for food, while cultural beliefs about bears tend to limit their use by

Nikolai and Telida people. In these communities, bear meat preparation and consumption is generally limited to men and elder women.

Historic Bear Hunting Practices

Local oral legend speaks of lone winter hunters awakening hibernating bears that rushed from their den only to be impaled on a spear planted in the ground immediately in front of the opening. In reality, traditional hunting practices were more conservative with black and grizzly bears ideally being dispatched in the den. These activities were undertaken by parties of at least three hunters. Hunters approached the den quietly and if the hibernating bear could be seen through the opening, it was immediately dispatched with arrows and spears. In the case of hibernating black bears that could not be seen through the main opening, brush or trees often were used to block the exit; the hunter then opened the side or top of the den and dispatched the animal through this hole. Vigilance was important as hunters prepared to open the side or top of the den of "blocked in" bears in case the animal awakened and suddenly exited through the thin area or "hidden roof" characteristic of many dens. In the case of denning grizzly bears, hunters reportedly situated themselves above or adjacent to the opening. As the awakened bear emerged, it was dispatched from these relatively safe vantage points. The higher positions were always favored as local hunters believed that emerging bears always initially traveled downhill. Bear spears were much heftier than those used for general hunting and one individual believed a double-ended spear was sometimes employed, although the practicality of such a weapon is not clear.

While spears were not set up in front of grizzly bears dens to impale an emerging bear, this was apparently one hunting option hunters employed in late fall near salmon spawning sites on the upper reaches of tributaries. Often, a short spear was planted in a bear trail passing through the brush near these "fishing holes." Hunters enticed the bear to "charge" along the trail, causing the bear to drive the spear point deep into its own chest. As the bear hit the spear, other hunters opened fire with both arrows and spears to dispatch the animal.

Information about traditional (pre-firearm) summer hunting strategies for black and grizzly bears is scarce, possibly because this was not a common practice. The element of surprise was an important factor in summer grizzly hunts. Hunters armed with spears approached the animal from downwind while it was eating, taking advantage of its poor eyesight. Black bears, according to one individual, were sometimes taken with braided caribou rawhide snares set during the summer months along game trails. For both species, mid-summer hunting was opportunistic. Fall and early winter were the preferred harvest periods.

Cultural Beliefs and Modern Use of Bear

Of all the game animals, Nikolai and Telida inhabitants attach the greatest supernatural significance to black and grizzly bear (tsone). These animals are believed to be more intelligent than other animals and today Upper Kuskokwim Athabaskan hunters continue to go to extra lengths to avoid "insulting" these species. Bears and the behavior of humans toward bears play a major role in the religious system and ideology of

Upper Kuskokwim Athabaskan people. Women of child-bearing age continue to scrupulously avoid any physical contact with the meat, blood, skin, and other parts for fear of harm befalling unborn children. Consequently, the meat is only cooked and eaten by males and older women, thus limiting the beneficiaries of bear harvests. While hunters are circumspectful about all animals with gall bladders, this practice is most scrupulously followed with bears. Before hunting, older Nikolai men avoid discussing bears by name, often referring to the animal as "it" or "something" in apparent belief that the bear may learn of their plans, possibly from other animals. After the bear is dispatched, the successful hunter often speaks to it in a low voice, reportedly apologizing for mistakenly killing the animal and at the same time thanking the bear for allowing itself to be seen and taken. In the butchering process, which is often undertaken or supervised by older men, the successful hunters often remove one or both eyes, to prevent the dispatched animal from seeing the hunter. A small tendon beneath the tongue is also removed by the hunter to prevent the animal from speaking to others, something older Nikolai hunters believe will decrease their ability to take other bears. After butchering, the bear head is sometimes impaled on the top of a short tree or stick and left, apparently permitting the bear's spirit to rejoin that of its brothers. Because of these cultural taboos associated with bears and the resulting restrictions on consumption, bear meat does not contribute significantly to the annual diet of Nikolai and Telida inhabitants. Bear meat set aside for human consumption is mostly eaten at "potlatches" and other ceremonial occasions. Most bear meat is cooked for consumption by dogs.

Older Nikolai and Telida residents sometimes render bear fat into bear grease (shisr ha). This grease is usually eaten by men with dried fish or dried meat during hunting trips. Many believe that medicinal properties are associated with bear grease and it is sometimes applied to burns, sores, and severe rashes. Bear bones sometimes are placed in the water near log jams or portages along the river, since Nikolai and Telida residents believe the bones will cause the river to wash through at these points.

Among McGrath and Takotna hunters, black bear meat is consumed by hunters and their families, and also serves, in some instances, as food for dogs. To many McGrath and Takotna hunters, the skin has value as a wall decoration, rug, or furniture cover and consequently is often saved for processing.

Contemporary Bear Hunting and Hunting Areas

With the exception of spring and fall hunts by Nikolai and Telida hunters, black bears generally are taken incidental to other activities occurring within area river corridors. Figure 15 depicts areas utilized by area inhabitants for both black and grizzly bear hunting.

Nuisance bears in or near settlements or area fish camps are a problem at certain times of the year. Usually observed in the vicinity of landfill dumps around communities, they are often dispatched by community inhabitants to minimize potential confrontations. Because of the frequency of black bears, most individuals engaged in berry picking, wood cutting, and other outdoor summer activities usually carry a large

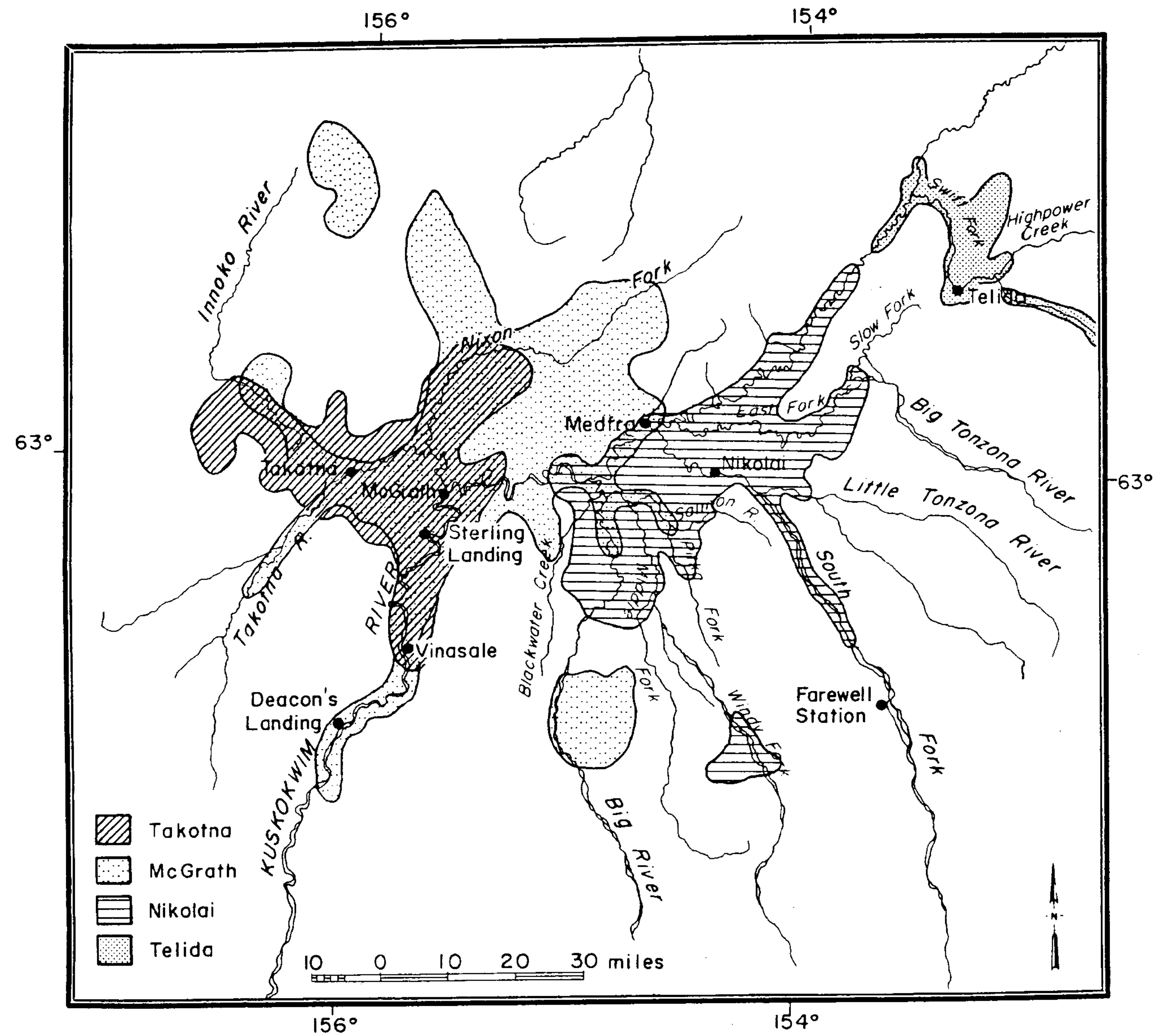

Fig. 15. Areas utilized by Nikolai, Telida, Takotna, and McGrath black and grizzly bear hunters, 1967-1983.

caliber firearm for defense. Bears sometimes also present problems at seasonal sites such as fish camps, trapping cabins, and other camps.

To divert bears away from fish processing areas, fish scraps are sometimes transported to sandbars away from the cutting site as a diversionary tactic. Occasionally these fish scraps are used to bait bears into the open, although the meat of bears taken as a result of this technique reportedly features a distinctively fishy odor and taste which make the meat somewhat less desirable for human consumption.

Consistent with traditional practices, black bears are sometimes hunted by Nikolai men during the early winter. Known denning sites are checked and, if occupied, the bear is dispatched with firearms through either the entrance or a small hole on the top or side. Yearling cubs found with the sow in this manner usually are dispatched, too. Because of the limited demand for bear meat, few are taken in this manner. These hunts often involve large hunting parties, with the meat being divided among the hunters and shared with elderly residents of the community. Overall, the annual black bear harvest area-wide probably numbers less than 40 animals.

Bears dispatched in their dens often are dragged some distance away for butchering. Likewise, hunters generally remove the straw and moss "bedding" from the hole and scatter it away from den. Both of these practices are believed necessary to maintain the future productivity of a particular den.

Since they have little food value among contemporary Upper Kuskokwim inhabitants, most grizzly bears are hunted for "sport" and for the "trophy" value associated with the skin. They are primarily sought during the fall at upper river locations proximate to salmon spawning areas. Grizzly bear hunting among Nikolai and Telida men involves parties which generally consist of at least one older man and range in size from two to five members. The party usually camps on the open sand and gravel bars characteristic of the braided upper reaches of major rivers. This provides maximum visibility. As the party travels, they watch for bear signs, such as tracks and partially-eaten salmon along the river bars.

Many of the beliefs and practices associated with black bears extend to grizzly bear as well. Grizzly bear meat is generally saved for "potlatches" among Nikolai hunters and the remaining meat discarded or fed to dogs in the spring. Favored potlatch cuts include the ribs, backbone, and the paws, although other parts are sometimes also prepared.

Grizzly bears encountered along area trails during the early winter are reportedly fearsome in appearance. In cold weather, the frontal body portions are often covered by a sheet of ice formed from the animals breath, water from "fishing" activities, and melted snow. The unique sound created by their breath passing through this facial coating of ice can be intimidating to those who encounter them. Travelers are always cautious when they encounter grizzly bear tracks in the winter, both because of their reportedly poor temperament and the inability of bullets to more than superficially penetrate this ice covering.

Inclusive of nuisance bears, the annual combined grizzly bear harvest among Nikolai and Telida hunters averages four or fewer animals per year.

SHEEP

In the past, hunters regularly traveled great distances to obtain sheep (drodeya) in the Alaska Range. Areas hunted included the upper Middle, Windy, South, and East forks (Fig. 2). Hunters also sought sheep in the mountainous portions at the headwaters of the Big River. According to both oral and written accounts, Athabaskans from the Cook Inlet area periodically traveled through the mountains to hunt sheep on the western slopes of the Alaska Range (Hosley 1966; Fall pers. comm. 1983).

Knowledgeable Nikolai residents report that sheep hunters employed a variety of passive and active strategies in the pre-firearm period. Camouflage clothing of white skins and, later, canvas often was worn when hunting in or around snow patches characteristic of the area. Men who were swift runners were able to approach and dispatch sheep in brushy canyon bottoms using both spears and hatchet-type weapons. Knowledge of sheep movements made ambush a viable approach to hunting this species, as hunters sometimes waited for sheep to appear along side-slope trails. Larger parties also employed "drives," as sheep were chased past concealed hunters who dispatched large numbers with arrows. During the fall "rut," sheep located several ridges distant could sometimes be "lured" toward hunters hidden in the brush who fluttered a piece of skin or, in later times, cloth. Likewise, movement attracted the attention of these animals, and unattended "lures" sometimes mesmerized sheep that were stalked and taken from behind.

Sheep meat was an important component of the diet in those days. In addition, sheep skin provided material for mattresses, bedding, and moccasin liners. Although it is difficult to elicit harvest levels for those times, contemporary Nikolai inhabitants believe they dwarfed the annual take in recent years among all user groups for the same geographic areas.

Changes in the seasonal round and resource use patterns have resulted in the decrease of sheep hunting among Nikolai residents, yet the meat is still highly prized. While a few sheep continue to be taken incidental to other activities, most meat entering Nikolai and Telida is obtained in conjunction with guide-related activities in the Alaska Range foothills, where non-local trophy hunters sometimes leave the meat with guides. Sheep meat is also valued among some McGrath hunters, who utilize aircraft for access to the Alaska Range during the fall season.

BEAVER

According to older Nikolai residents, beaver (tso') were second in importance only to caribou among the aboriginal population. In the seasonal round of the late nineteenth and early twentieth centuries, this was especially true during the winter when beaver were often the sole source of fresh meat (Hosley 1966:14). Winter hunting in earlier times often entailed opening the top of a beaver house and spearing or gaffing the beaver as they re-entered the house from the lake. According to one individual, on lakes with more than one house, a successful hunt necessitated opening all of them and stationing a hunter at each. While many animals were reportedly taken in this manner, hunters avoided taking beaver from the houses closest to their winter encampments, saving these animals for "emergency food." Summer hunting was approached in a different manner, and several strategies were apparently employed. One method entailed quietly waiting until a beaver surfaced in the lake, at which point it was dispatched with a spear or arrows. Another method reportedly involved blocking the submerged exits, opening the house, and dispatching one or more beaver. Yet another method was employed in small creeks or interconnected ponds by breaking the dam. After much of the water had drained, the house was opened and the beaver taken as they tried to escape in the now shallow or dry lake. A variation of this approach was to dispatch the animal as it attempted to repair the breached dam. While the skin reportedly had clothing value, it was not until the introduction of a fur market in the middle 1800s that this species became especially valuable in terms of cash or trade goods (see Chapter 2).

Today, beaver generally are snared through the ice during the winter and spring when they are sought for their pelts, human food, and dog food (see Chapter 8). Additionally, Nikolai, Telida, and occasionally McGrath residents sometimes take beaver throughout the summer months for food. In nearly all instances, this harvest is most often undertaken in the absence of alternate game species, although at times beaver meat is sought as a welcome change of diet.

Beaver hunting during open water months is an opportunistic activity as the hunter travels along the river. Usually .22 caliber rifles are employed. Although beaver are taken throughout the summer, spring and fall appear to be the favored harvest periods. Those taken in the spring tend to float, making their recovery from the river easier. The pelts of beaver taken in the summer are sometimes saved for home tanning and used as trim on mittens, moccasins, and for hats, although many are discarded because of poor quality.

The meat from beaver taken during the summer is often smoked for at least one day, enhancing the flavor before being consumed. The high fat content of beaver meat makes long-term outdoor preservation difficult and consequently, most summer harvest is limited to a single animal at a time.

SNOWSHOE HARE

Historically, snowshoe hare (gwh) harvest activities were an important facet of the seasonal round. Snowshoe hare were snared, chased, and clubbed, or shot with arrows during the fall, winter, and early spring. Hare provided a major source of food. Also, their skins were used for winter clothing linings and for bedding.

Snowshoe hare or "rabbits" as they are locally known, generally inhabit willow thickets common to area rivers. Today, they are hunted or snared during the fall and early winter, although harvest occurs sporadically throughout the year. Hare are probably the most cyclic of the small game common to the area, and harvests and hunting activity vary accordingly. Mid-summer flooding in the upper river and spring flooding in the lower stretches have dramatic impacts on species population levels. Many local residents believe the hare populations are also periodically reduced by disease and that, surprisingly, predation by other animals has comparative little impact on hare numbers. In some locations in some years, the population densities are such that hunters report taking more than 50 hares in a single day from a single willow covered bar or island.

During the late fall, snowshoe hare are hunted with small caliber rifles or shotguns. The .22 rifle is more commonly used, probably because of the increased range, accuracy, and lower cost per round of ammunition. Ideally, hare are most easily seen during the fall in the brush after their coats have become white in the absence of snow cover. Such hunts involve hunters who, as they systematically walk through the brush, watch for fleeing animals. While these hunts seldom are organized undertakings, two or three hunters working together is common. Most hunters are young adult males. Particularly successful hunters sometimes distribute to other community residents portions of the unprocessed harvest in excess of their own requirements. In many instances, hares are processed at home by women. Some of the skins are saved and home-tanned for making children's mittens or for use as inner liners for larger mittens made of beaver fur.

Winter hare trapping is usually undertaken with lightweight steel snares suspended along "rabbit runs" or trails through the brush. Small sticks or brush often are placed perpendicular to and on both sides of the snare to discourage them from skirting the set. Until light swivel snares become commercially available in recent years, these nooses were often made from picture-hanging wire. Winter snaring is generally undertaken by older boys and adult women. Most lines are within walking distance of the community and are usually checked daily to minimize loss or damage from fox, lynx, and loose dogs. When deep snow and cold temperatures occur in December or January, the snaring of hare usually ends. Most hare meat is utilized for human consumption, although some trappers reportedly use hare meat as trapping bait.

The cyclic nature of this species results in wide variations in year-to-year harvest levels. Discussions with hunters from all four communities indicate the average annual harvest is fairly small, and likely averages less than 500 or 600 animals per year within the entire study area, with most hare taken in and around McGrath.

PORCUPINE

Porcupine (nune) occur throughout the region in fairly low densities. These animals are considered "emergency food" by Nikolai and Telida residents because of the ease with which they can be dispatched without contemporary weapons. Like other small game species, porcupine provide a welcome variation in the diet of many Nikolai and Telida households, and travelers seldom pass up the opportunity to catch a porcupine when they are encountered incidental to other summer boating activities. The use of firearms to dispatch porcupine is still strictly avoided despite the extra work this sometimes entails. The belief of not using modern weapons when pursuing porcupine persists in an effort to ensure that this animal will continue to willingly present itself to hunters during emergency situations. Porcupines generally are clubbed to death with a stout stick or oar. Haste is important in dispatching porcupines since they sometimes disappear into holes or climb trees. When the latter occurs, the tree is chopped down in order to dislodge the animal.

Porcupine generally are processed in the field soon after they have been dispatched. One or both front legs are wrapped with a short length of wire attached to a long pole. The animal is then suspended over a large fire and the quills are burned off. Because of the thick or matted nature of the quills, the carcass is removed periodically from the flames and the burned material scraped off with a stick. This process continues until the animal is free of quills. Most hunters also eviscerate the animal at this time. Discussions with some hunters from McGrath and Takotna indicate that some people favor skinning the animal when taken.

Porcupines are preferred during the fall when they are the fattest and taste less wild. They are usually consumed in soup. They are also a favored summer "potlatch" dish among Nikolai and Telida inhabitants and are occasionally preserved through freezing for such events. In Nikolai, the annual take ranges between 20 and 40 animals. The extent of the annual porcupine harvest among McGrath, Telida, and Takotna residents is unknown.

WATERFOWL

Waterfowl harvested throughout the spring, summer, and fall were an especially important component of the aboriginal diet. During the early spring when other foods often were in short supply, waterfowl offered a welcome break from the tedious winter diet of dried meat. Several different harvest techniques were reportedly employed by hunters. Most commonly, waterfowl were taken with arrows fired at both stationary and airborne birds. One elder resident of Nikolai speculated that waterfowl were also taken by hunters throwing rocks or using heavy clubs. According to one story, some hunters were able to creep to within a few feet of the birds and capture them barehanded. In addition, waterfowl were taken using nets. It is unclear whether nets were thrown over the target bird(s) or molting birds were driven into them, and it is possible both methods were employed at times. Eggs from migratory waterfowl were gathered and eaten and, according to one Nikolai elder, the feathers had ceremonial value, although the exact nature of use is unknown. Swan skins, with only the outer layer of large feathers removed, were used in making some winter garments. The skins of mallard duck heads were fashioned into caps worn by infants. Waterfowl taken in the spring which were surplus to immediate food needs were cleaned and air dried for later use.

Today, waterfowl are actively sought by many area inhabitants along area river corridors throughout the Upper Kuskokwim during the spring, summer, and early fall, and are a significant contribution to the diet of some households. Figure 16 depicts waterfowl hunting areas utilized by Nikolai and Telida hunters, while Figure 17 depicts areas used by McGrath and Takotna hunters.

Ducks (tugaga), geese (dolmoya), and cranes (daɨ) are targeted by Upper Kuskokwim waterfowl hunters. The meat of loons (dodzine) is generally not favored because of its texture and fish taste, while swans (tomo) are generally avoided by contemporary hunters because they are believed to mate for life. In general, geese are the most desirable migratory waterfowl species among area hunters; however, various species of ducks comprise the largest part of the annual catch because they are much more abundant and somewhat easier to take.

Throughout the area, several duck species are avoided. "Fish ducks" are a loosely-defined group of diving ducks that are generally

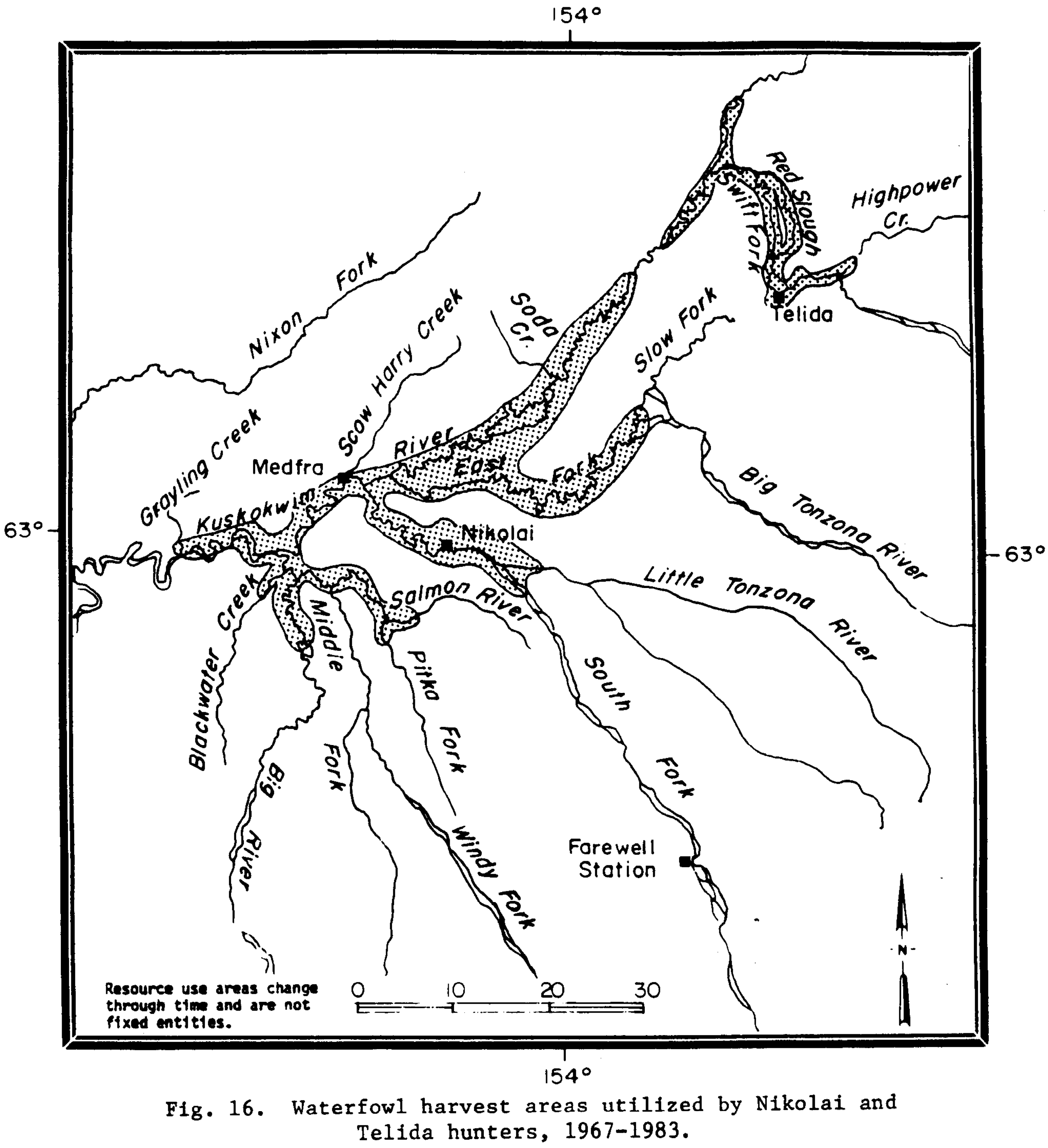

Fig. 16. Waterfowl harvest areas utilized by Nikolai and Telida hunters, 1967-1983.

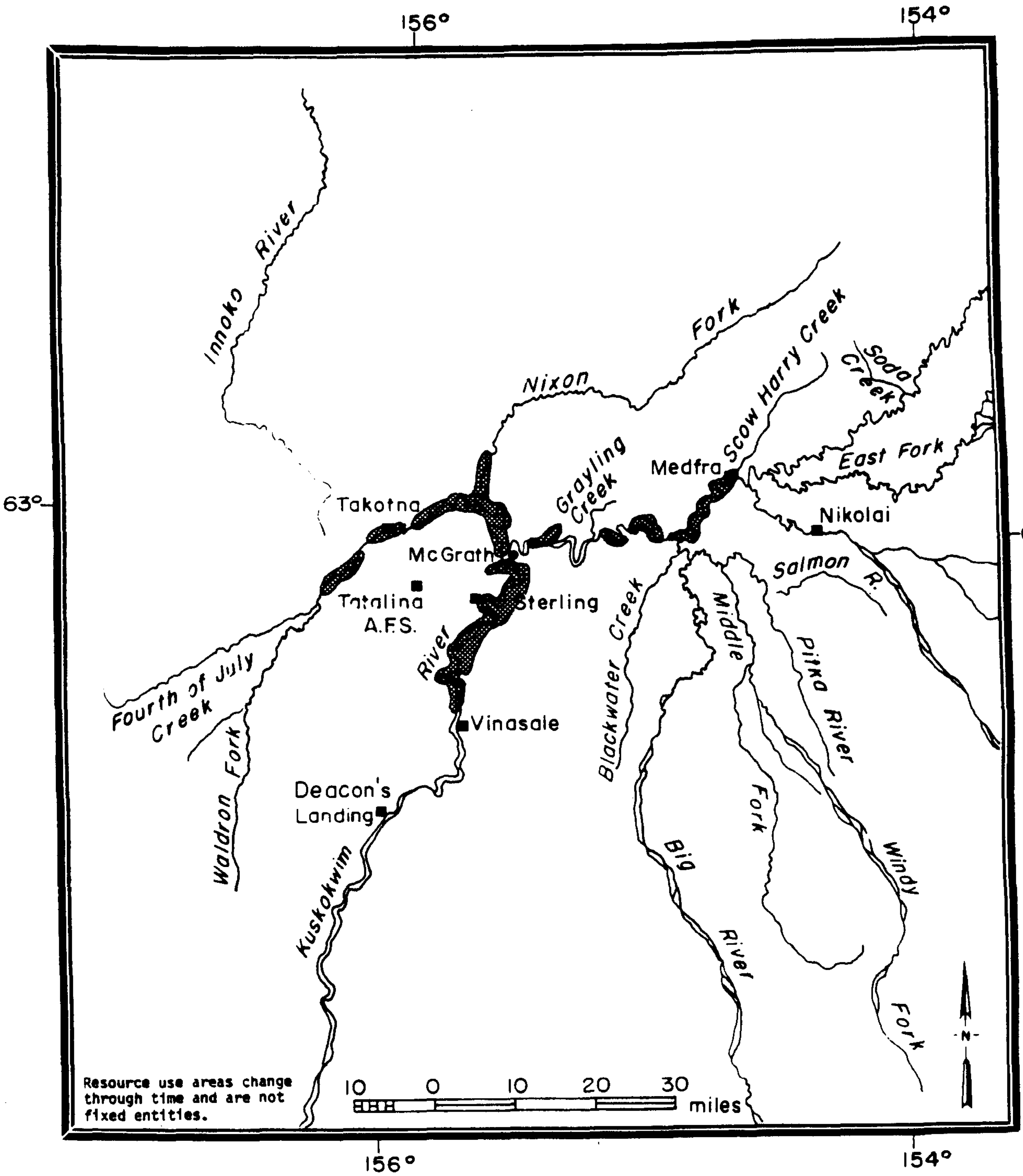

Fig. 17. Waterfowl harvest areas used by McGrath and Takotna hunters, 1967-1983.

not hunted because of the fish taste associated with the meat. While some ducks such as buffle heads and mergansers fall into this category throughout the spring and summer, others, such as goldeneyes, are viewed as edible during the early spring and harvested accordingly.

Hunting opportunities among Nikolai and Telida waterfowl hunters are best in the early spring (mid-April to early May) before large stretches of river and area lakes open up. Access to hunting locations is often by snowmobile, especially in April. During this period, comparatively large groups of birds concentrate near small areas of open water or exposed wild grasses. While some McGrath and Takotna waterfowl hunters hunt during this same period, others commence hunting a little later in the spring.

Among Nikolai and Telida hunters, waterfowl hunting tapers off in late May or early June "when their eggs start getting big" in the oviduct, although some harvest may occur throughout the summer if the need arises. This pattern resembles that reported by McGrath and Takotna residents, although the primary hunting period may extend well into June. In late summer and early fall, hunting activities increase again as young birds mature, although harvest levels at this time are markedly lower than those during the spring. Fall hunting is fairly limited among area residents as the birds are often difficult to approach and many have already departed the area by the September first season opening.

Waterfowl harvest among Nikolai and Telida hunters is both opportunistic and planned. At sites with a long history of productivity in the early spring, blinds of brush, upended stumps, or driftwood are sometimes constructed. These are situated near certain lakes and swamps, or along the river on large sandbars frequented by migratory waterfowl. Productivity is sometimes enhanced through the use of decoys. Cardboard silhouettes are cut out and placed along bars frequented by migratory birds. Small pieces of driftwood which resemble the outline of waterfowl are sometimes used as well. Other hunters effectively use dispatched birds "propped-up" with sticks as decoys. Few hunters in the upper Kuskokwim area use floating or commercially manufactured decoys.

In addition to the use of decoys, waterfowl, especially geese, may lured through calling. Some area hunters, particularly those residing in Nikolai and Telida, are proficient at vocally imitating geese. Others utilize either homemade or commercially manufactured callers. One of the most common homemade callers is an expended shotgun shell with a hole melted in the side. Used in a flute-like manner, this device is reported to be fairly effective.

Shotguns are nearly the universal choice for contemporary waterfowl hunting. While most hunters favor 12-gauge weapons, 10-, 16-, and 20-gauge firearms are also utilized. Shot size varies with number 2 and number 4 most commonly used. At times, .22 caliber rifles are also employed, although generally their use is of a secondary nature, mostly to dispatch a wounded bird. Larger caliber rifles such as .30-.06 are also utilized at times to take cranes which often fly at altitudes beyond shotgun range, although success rates are low. Hunters generally make reasonable efforts to retrieve wounded birds that fall away from the immediate hunting area. Additionally, hunters often attempt to drive out or quietly wait for injured birds taking refuge beneath ice overhangs during late spring river outings.

Hunting party composition and size varies between communities. Among Nikolai and Telida hunters, parties are often relatives, while in Takotna and McGrath, acquaintances are more likely to hunt together. For river corridor hunting, parties typically consist of an engine operator and one or more "gunners." Because the driver is often unable to fully participate in the hunt, other party members usually share a portion of their catch with this individual. Solo hunting from a boat in all four communities, is generally avoided for safety reasons. Women occasionally travel with waterfowl hunters and assist in retrieval and processing activities, but seldom hunt. A few area waterfowl hunters use dogs for retrieving downed birds, although well-trained hunting dogs are rare in the region.

In anticipation of spring hunting, aluminum river boats are sometimes transported by snowmobiles to locations along area rivers historically known to open up early. Left in place until after break-up, hunters are able to seek waterfowl along stretches of river which do open early.

The responsibility for cleaning the bird varies between households and communities. Many hunters at least partially clean the birds in the field. Hunters sometimes assist cleaning birds at home and in some cases the entire dressing responsibility falls to the hunter. This is especially the case among younger hunters. Some area hunters find removal of feathers easier by "peeling" the skin from the bird, although most prefer to leave the skin intact and pluck the feathers instead. Generally, the feathers are most easily plucked while the bird is still warm, and often hunters waiting for additional birds to approach their location may partially pluck their catch. Some McGrath residents noted that feathers are easily removed by dipping the bird in hot wax and peeling the feathers off after cooling.

After the feathers are removed from the waterfowl, the catch is often singed over a fire to remove pin feathers and further clean the skin. As the bird in singed or "burned," the skin is scraped with a stick to remove residue. This task is most often undertaken in the home community. The wings of geese and cranes sometimes are saved by Nikolai and Telida hunters for use as hand brooms in community saunas. These wings are tacked into place on a board or other flat wooden surface in a slightly fanned shape for drying. Striking the wing against the user's body localizes intense heat - an effective treatment for stiff or sore joints.

Waterfowl usually are preserved through freezing after the bird has been plucked, singed, and gutted. The viscera are discarded with the exception of the gizzard, which is sometimes cooked along with the meat. In situations where freezing is not possible and spoilage may occur, processed birds are air dried for relatively short periods of time. One apparent drawback associated with this preservation technique is that the bird becomes dried out and, in the words of one Nikolai resident, "only the old-timers were used to eating them like this." Consequently, in situations where freezing is not an option, the harvest tends to closely parallel immediate food needs.

Waterfowl eggs are seldom collected by contemporary area residents, although older Nikolai and Telida residents recall that eggs were gathered and consumed in the recent past.

GAME BIRDS

Game birds, including grouse and ptarmigan, were seasonally harvested by early day hunters in great numbers during the fall and early winter, primarily near the Alaska Range. Willow and sharp tail grouse (ch'iɨwe, trok'wda), spruce grouse (dish), and ptarmigan (k'ots'ima, dilgima), are sometimes taken by area inhabitants. Spruce grouse or "chickens" as they are locally called, are the most commonly sought game bird species among area residents. Hunted in the late fall and early winter, spruce grouse often are taken along gravel bars in the early morning or in the woods during the day. Most hunters employ .22 caliber rifles for hunting these birds. They are processed in a manner similar to that described above for waterfowl. Willow and sharptail grouse generally are hunted during the fall months along rivers. Profiled in leafless cottonwood (aspen), alder, or willow plants and trees, grouse are usually shot with .22 caliber rifles. All three species of grouse are generally most intensively sought by younger men, although spruce grouse also are taken by older men and by some women of all ages as well.

The appearance of ptarmigan in the riverine areas near Upper Kuskokwim settlements during the winter is not an annual occurrence, but instead occurs when they leave their wintering areas in the Alaska Range foothills due to adverse weather conditions that make feeding difficult. Ptarmigan are most often taken with .22 caliber rifles or small-gauge shotguns. While some area households occasionally eat ptarmigan, many consider the meat to have an unpleasant taste. Consequently, it is not an important element in the contemporary Upper Kuskokwim diet.

SUMMARY

While moose, and to a lesser extent, caribou are important wild food sources, other small and large game, migratory waterfowl, and game birds make important seasonal contributions to the diet of many area residents.

Migratory waterfowl are most intensively sought by area hunters during the spring and early summer. Bears are taken from early spring through mid-winter, although cultural beliefs restrict the consumption of these animals by Nikolai and Telida residents. While sheep harvest levels have diminished since early times, the meat is still prized by hunters of Nikolai, Telida, and McGrath. Other small game and game birds bring a welcome variety to the diets of many area households. Harvest of these species is both incidental and primary in nature, depending on individual taste, time of year, and food needs.

CHAPTER 8

TRAPPING IN THE UPPER KUSKOKWIM

Among Upper Kuskokwim inhabitants, the trapping of furbearers during the winter months is an important component of the seasonal round. Conversion of fur into cash continues to contribute to the income of virtually every Nikolai and Telida household, and is of significance to a number of McGrath and Takotna families as well.

This chapter presents a brief historical overview of trapping in the Upper Kuskokwim, describing the resource base, harvest and processing methods and technologies, and strategies employed by area trappers. Use areas are presented, and in the case of Nikolai and Telida, many of the actual access trails utilized by trappers from each community over the previous 15 years are shown. The economic and cultural importance of furbearers to area residents is discussed, as are the issues and their implications for the continuation of this important aspect of the seasonal round.

TRAPPING IN HISTORIC CONTEXT

According to Nikolai elders, the use of furbearers predates the arrival of the first Russians into the Upper Kuskokwim region as noted in earlier chapters. The skins of certain furbearers were valued as a source of warm and utilitarian clothing. Additionally, the meat of muskrat, lynx, and, most importantly, beaver was nutritionally important in the diet, a fact reflected in the seasonal round described for the mid-1800s (see Chapters 2 and 4). According to older Nikolai residents, beaver were taken on nearly a year-round basis by these earlier inhabitants of the area, as this species was second in importance only to caribou as a food source to many Upper Kuskokwim Athabaskan bands during the 1800s. The most common method of beaver harvest at that time was to open the beaver house or dam and dispatch the resident beaver with spears, arrows, or clubs (see Chapter 7).

Other land-dwelling furbearers such as lynx, fox, wolverine, and wolf were taken with deadfalls, snared with caribou hide nooses, or dispatched with arrows or spears as they were encountered. For the most part, the taking of these species was limited to fulfilling clothing requirements.

There is some question about the nature and extent of early-day fur trading in the Upper Kuskokwim. The Russians came into contact with Tanaina Athabaskans occupying the Cook Inlet area through the establishment of competing Lebendev-Lastochkin and Shelikov Company posts on the Kenai Peninsula in the late 1700s. This historically aggressive aboriginal group already traveled periodically through the Alaska Range in pursuit of sheep and caribou, and willingly adopted the role of middleman in the fur trade between the Russians and Upper Kuskokwim Athabaskans (Hosley 1966). Continued hostilities between the Tanaina and Upper Kuskokwim Athabaskans and establishment of Russian-American Company posts along the middle and upper Kuskokwim River at Kolmakov and Vinasale in the middle 1800s brought the region's aboriginal population into direct contact with company employees. A shift in trade patterns soon followed, as the role of the Tanaina diminished in favor of direct trade in the Kuskokwim drainage. Initially people reportedly limited their sale or trade activities to the skins of the nutritionally-important beaver, an arrangement that was viewed by area residents as highly advantageous as the skin was of secondary importance to the meat.

The increasing desirability of trade goods which could be obtained in exchange for furs led to annual trips to these posts being incorporated into the seasonal round. With this new element in the aboriginal economy, Upper Kuskokwim Athabaskans at some point began targeting other species in the area. Likewise, corresponding increases in time dedicated to the pursuit of furbearers probably occurred in combination with shifts in traditional wintering locations from the edge of the forest near the Alaska Range foothills to the more heavily timbered areas inhabited by land-dwelling furbearer species (Hosley 1966).

One Nikolai elder thought the Russian-American Company agents might initially have provided area inhabitants with steel traps on a lease or loan arrangement to encourage greater participation by them in the fur trade. As the exchange of fur for material goods accelerated, Athabaskan trappers apparently willingly deployed more traps as they recognized that continued or increased acquisition of trade goods hinged on their level of production.

Intimate knowledge of the behavior of the various furbearer species as well as the terrain likely made these earlier Athabaskan trappers more "productive" than their Western counterparts just then entering the region. With the introduction of organized dog teams, individual trappers were able to greatly increase the size of their trapping areas and, consequently, their earnings. According to some people, the concept of "straight" or linear traplines and trails that followed the same route from season to season through timbered and open areas alike was introduced in the Upper Kuskokwim around 1900 by prospectors and other individuals wintering in the area, replacing the nomadic or wandering trapping pattern previously employed by the aboriginal population. Interestingly, many of the traplines utilized by contemporary residents of the area were "inherited" by their ancestors from those early Caucasian trappers as they, for one reason or another left the region.

Generally, all the furbearer species common to the area, with the exception of beaver and muskrat, were targeted by area trappers from the late fall through mid-winter. From late winter through the early summer, the emphasis shifted to beaver and muskrat. Beaver trapping extended into early June, with leg traps and firearms being used to take this species after river ice moved out in the late spring.

Until the late 1960s, many area trappers participated in furbearer harvest activities on nearly a full-time or primary basis during the winter. Most households maintained several trapping areas, often targeting different species in each; and combined family line lengths sometimes exceeded 100 miles. These areas were trapped either concurrently in an alternating manner or, when different species were targeted in each, consecutively by season of availability. Because most area trappers relied on small dog teams for access to trapping areas, some of the longer traplines required up to one week to check and return. Trappers often hunted along these long lines, particularly those that ended or passed near the Alaska Range foothills. Targeted game animals included sheep, moose, caribou, and, at times, black and grizzly bears.

In many instances, trapping partnerships were arranged to manage these lines as trappers pooled their dogs, equipment, and labor. The catch often was divided, although divisions or shares were not necessarily equal. While canvas wall tents served as the primary camping enclosure for intermediate stops, many of these longer lines featured a cabin somewhere along the trail. During the first trip of the season, trappers often established these intermediate camps, leaving them in place until the last run of the season. Additionally, trapping trails and camps were utilized by other individuals who sometimes followed or accompanied the trapper enroute to hunting areas along the Alaska Range.

Fur farms specializing in domestic fox and mink production appeared in the area after 1915 and, according to older area inhabitants, many were moderately profitable. Most of these enterprises were operated primarily by non-Native roadhouse and trading post proprietors. Fluctuations in the fur market and enforcement of laws limiting commercial use of fish and game in the Upper Kuskokwim contributed to the demise of these businesses, with the last one reportedly closing shortly before 1950. Market fluctuations also appeared to impact the activities of trappers who periodically modified the intensity of their trapping efforts and species targeted in response to changes in pelt value.

As dog teams were replaced by snowmobiles in the late 1960s, area trappers were able to cover great distances in a fraction of the time previously devoted to furbearer harvest activities. During the early 1970s, trapping activities decreased as the economic contribution to individual household annual income was dwarfed by an increasing diversity of both seasonal and permanent employment opportunities (see Chapter 3) as well as a decline in market value of furs.

Although trapping levels decreased, people retained the technology and in the late 1970s, trapping activities intensified, albeit on a somewhat diminished scale. Possible factors in this re-emergence of trapping included an influx of newcomers to the Upper Kuskokwim having interest in trapping, recent improvements in the fur market, the desirability of beaver meat for both personal and commercial uses, and (possibly the most important to many individuals) concern over possible loss of long-time use areas to individuals from outside the area.

Among area trappers, the "status" associated with being a successful trapper is not as evident as it once was, particularly among Nikolai and Telida residents. While almost anyone could "catch" marten, only especially skilled trappers could regularly take some of the more elusive species such as wolverine, wolf, and lynx. Skill was certainly a factor in success, as well as other less tangible aspects of being a good trapper. According to one Nikolai trapper, each trapper had a "trapping song" that served to enhance his take by convincing the animals to enter his sets. Likewise, correct care or respect of each trapped animal was and is important for continued success. The capture of furbearers colored or marked in certain ways was viewed as an indication of the course the season would take. Some of these beliefs are discussed later in this chapter.

FURBEARER SPECIES

Target species making up the Upper Kuskokwim furbearer resource base in varying numbers include beaver, fox, marten, lynx, mink, muskrat, otter, wolf, and wolverine. Many of these species are present throughout the Upper Kuskokwim region and are utilized by residents of all communities, while others occur only sporadically. The year-to-year abundance of many of these species is naturally cyclic. Consequently, use areas, harvest levels, and to a lesser extent, harvest techniques vary between seasons.

Based on harvest information from all area communities, marten (suje) is probably the most consistently abundant furbearer in the Upper Kuskokwim. This species is present throughout the area. It is an animal easily taken, with steel leg traps and the most commonly trapped by trappers from all four communities each season.

Fox (k'altsa), like marten, are generally present throughout the area. These animals are comparatively more difficult to catch according to trappers, but are nonetheless taken in fair numbers each season with both steel leg traps and small-bore firearms.

Beaver (tso') are extremely abundant in some areas of the Upper Kuskokwim. Inhabiting lakes, rivers, and creeks, beaver not only have valuable pelts but also are an important source of meat for both human and dog consumption (see Chapter 7). Beaver trapping is both labor intensive and time-consuming and consequently presents the most amount of work for area trappers.

Lynx (gwhchuh) are periodically abundant in various areas around the Upper Kuskokwim, although some places are noted for consistently good lynx trapping season after season. This species is reportedly moderately difficult to take.

Wolverine (niłtresh) are probably the most difficult furbearer to catch for area trappers. Occurring throughout the study area in small numbers, this species sometimes disrupts individual trapper activities for an entire season by preying on captured furbearers.

Land otters (mizreya') occur in varying numbers around the area. Some trappers observe large numbers near areas they utilize while others seldom see otter sign. Inhabiting lakes and creeks, otter are considered moderately easy to trap.

Mink (tats'uts'a) are fairly rare in the Upper Kuskokwim. Like otter, mink appear to occur in some selected areas in fairly high concentrations.

Muskrat (nitoɨtroda) occur throughout the study area in varying numbers. Often present in selected lakes and creeks, most muskrat are shot with small caliber rifles in the late spring and early summer. "Push-ups" are sometimes trapped in the late winter and early spring.

Wolves (tekone) are rarely taken by Upper Kuskokwim trappers. Those that are taken are most often shot with small caliber firearms. Wolves are reportedly difficult to trap or snare because of their movement patterns and wariness.

TECHNOLOGY AND STRATEGY

Deadfall devices (dichin-aɨ - literally "tree trap") were traditionally utilized by aboriginal inhabitants to take a number of furbearer species. While specific details about the construction of these sets is sketchy, the basic principle of operation was simple. Depending on the species, bait was affixed to a central support that, when moved, caused a large object such as a log to fall on the unsuspecting animal, often killing it instantly.

Snares of caribou babiche or hide were also employed for some species during early contact periods. These were placed over the trails frequented by furbearers in a manner probably resembling contemporary steel snare sets.

Steel snares, now central to beaver trapping, did not come into widespread usage until the early 1940s. Prior to the introduction of this technology, beaver trappers utilized steel leg traps affixed to poles for harvesting beaver through the ice. According to several Nikolai trappers, steel leg traps placed under the ice were less productive than the steel snares in use today. Consequently, trappers tended to extend their beaver harvest efforts well into early summer as they utilized both firearms and traps deployed along riverbank "slides" to obtain additional animals.

Contemporary technology almost exclusively consists of the use of steel leg traps (<u>aɨ</u>), steel snares (<u>gaguɨ</u>), and to a lesser degree, conibear-type traps in various configurations. Generally, there are three types of land sets employed by Upper Kuskokwim trappers: the ground or "cubby" set, snare sets, and the pole or elevated set. Ground sets are used for all species of land-based furbearers. Snares are primarily employed for wolves, wolverine, and at times, fox and lynx. Pole or elevated sets are utilized for marten. Each of these methods is discussed in greater detail later in this chapter. In addition, steel snare and conibear traps are still utilized on occasion for trapping beaver beneath the ice. Specialized tools of either original or modified design are employed by area trappers, and are described below.

The frequency of trips to area traplines varies between trappers. In instances where the trapper resides on his line, traps are sometimes checked daily. Other lines may be "ran" once each week, often on weekends, to accommodate the wage employment schedule of some trappers. Most are checked somewhere in between these two extremes. During extended periods of extremely cold weather (generally below -30° Fahrenheit) area trappers may not check their lines for several weeks since few furbearers are believed to be moving around during these periods, making such trips only marginally productive. Too much time between each check, in periods of moderate weather, increases the potential for loss or damage of fur from cannibalism, small rodents, or predation. Trapping among Upper Kuskokwim residents today is almost exclusively undertaken by males although some women accompany their husbands on trapping trips.

Nearly all contemporary Upper Kuskokwim trappers utilize snowmachines and use their year-round residence as a base of operation. Additionally, a few McGrath-based trappers utilize aircraft for transportation to and from their trapping areas. While most of these aerial trappers own their planes, a few charter commercial aircraft to reach their trapping areas. Most trappers engaging in the latter practice remain on their line for extended periods. A few Upper Kuskokwim trappers continue to use small dog teams for trapping from both the home community and in remote line situations.

A sled of some sort is usually towed behind the snowmobile to hold supplies and the catch. Sled types vary from locally-built birch "basket" sleds to commercially-manufactured folding metal sleds. The former are both lightweight and durable, and consequently are favored by many trappers.

Within the region, traplines range from just a few miles to nearly 100 miles in length. Typically, a variety of traps and sets occur along the length of the line intermittently spaced from less than one to four or more per mile. The placement of traps is most often determined by the presence of habitat judged to harbor the target species. Certainly the abundance or absence of furbearer tracks or signs influence the initial placement of a trap, particularly for larger species. Lastly, a trapper's experience along a particular line often dictates where traps are most effectively placed, as some locations have consistently yielded large numbers of certain species.

Trapping is a fairly expensive undertaking today. The commitment of time is appreciable. Trapping for some species is physically demanding as well. In addition to fuel costs, local trails cause significant wear on snowmobiles and sleds. The smallest traps (no. "0") currently sell for more than $25 per dozen. For those trappers dependent on trapping or those who forego other income activities in favor of trapping, a poor year in terms of harvest can be financially painful. Lower than expected fur prices and late season market collapses can also present a financial hardship to serious trappers.

Most trappers are conscious of natural fluctuations in furbearer populations and often adjust their activities accordingly. Usually trappers are acutely aware of the long range financial dangers or results inherent from overharvest of any one species. Area-wide, many trappers practice self-limiting furbearer management apparent in the practices of limiting catches of some species and by "resting" a trapping area for one or more seasons to permit repopulation by target animals.

TRAPPING BY NIKOLAI AND TELIDA RESIDENTS

Virtually every Nikolai and Telida household contains at least one member who has trapped within the previous three years for one or more species of furbearers common to the area. Commencing in the early winter, residents of these communities continue their trapping activities until early April, harvesting a number of species of furbearers either concurrently or in succession depending on individual desires, species availability, and market conditions. All trapping areas used by Nikolai and Telida trappers begin near the communities or are accessed by interconnecting arterial trails radiating outward from the settlements.

With the increasing mechanical reliability and availability of snowmobiles, most Nikolai and Telida trappers today trap alone or only receive assistance from within their immediate household. Many of the partnerships that are formed, primarily for beaver trapping, often consist of members of the same household or extended family. Young males are encouraged to accompany relatives on trapping trips during periods of moderate weather. Most of these boys gain trapping experience by setting and maintaining small lines near the community that often consist of only a few traps. Often less than a mile long, these younger trappers are able to check their "line" after school. Targeted species include marten, hare, and other small game.

Trapping areas utilized by Nikolai residents range from the Alaska Range foothills to the south and southeast, to the Slow Fork Hills to the east, Grayling Creek to the west, and the base of the Kuskokwim Mountains to the north and northwest (Fig. 18). Telida trappers

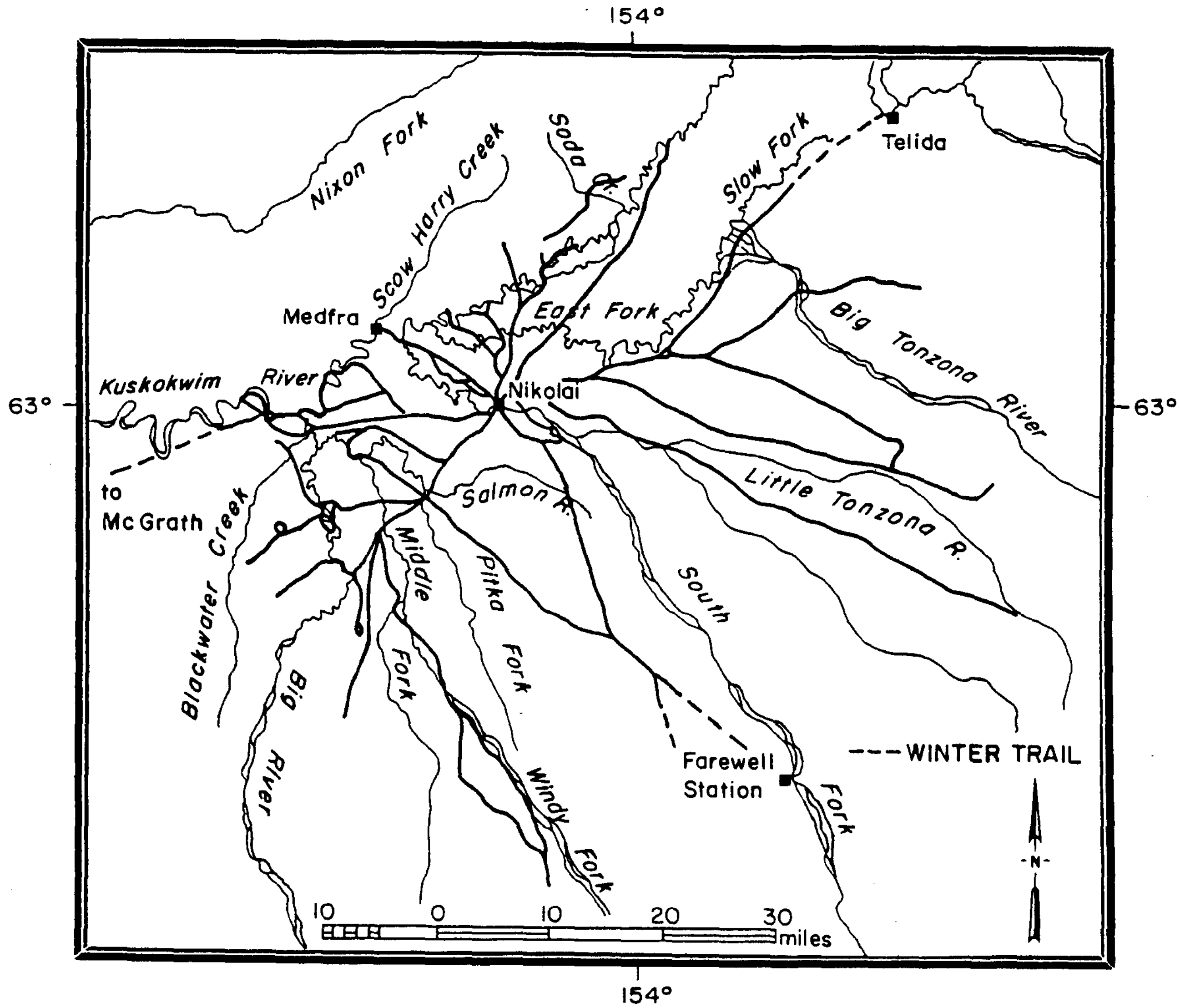

Fig. 18. Selected trapping trails of Nikolai residents, 1967-1983.

undertake furbearer harvest activities from the Slow Fork northeastward to the Thirty-Eight Mile Lake area halfway between Lake Minchumina and Telida, and from the base of Stony Mountain southeastward to a point near the Slow Fork Hills (Fig. 19)

Trapping activities usually begin in early November, depending on ice and snow conditions. Often, open water or the lack of snow forces some trappers initially to limit their early season activities to areas near the winter community. As trail conditions improve, the range of trapping activities increases and with few exceptions, most lines are in operation by the first week of December. Nikolai and Telida trappers usually leave sprung surface traps in place over the summer. Consequently, initial trips on the line usually only entail clearing any fallen trees or brush from the trail, constructing ground sets where used, placing bait, and setting the traps.

Marten

Marten is the most commonly sought species among residents of both communities. Pole sets are the primary technique employed to capture marten. They consist of a wooden pole between 2-1/2 and 4 inches in diameter at the trap end set diagonally. They are usually constructed by cutting down a small spruce tree about three feet above the ground and placing the bottom of the cut tree in the notch at the top of the stump so as to extend from 6 to 12 inches beyond the trunk (Fig. 20).

Most Nikolai and Telida trappers employing leg hold traps for marten use no. "0" or no. "1" single-spring traps. The trap chain is affixed to the pole with either a cinch ring or nail, and placed in an

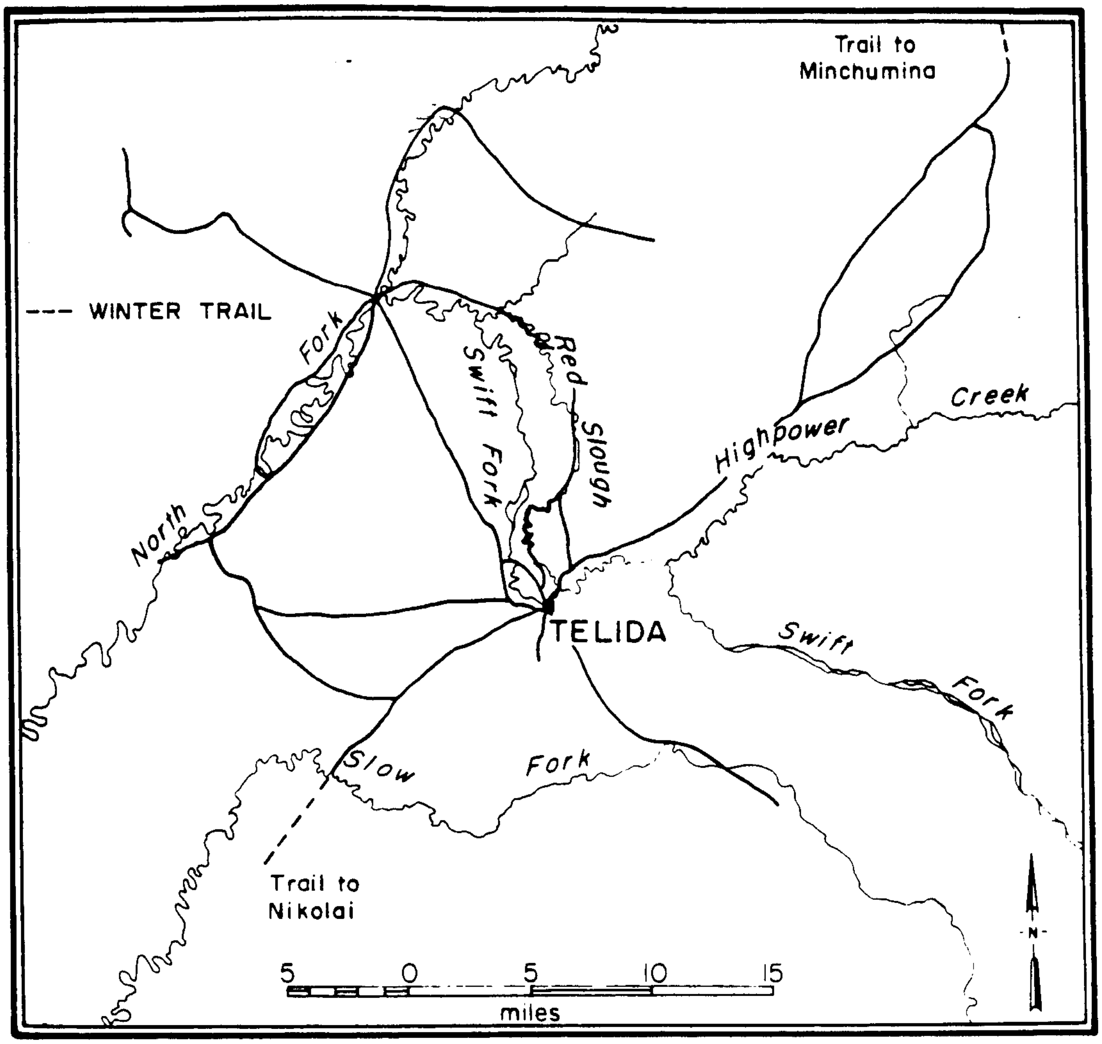

Fig. 19. Selected trapping trails of Telida residents, 1967-1983.

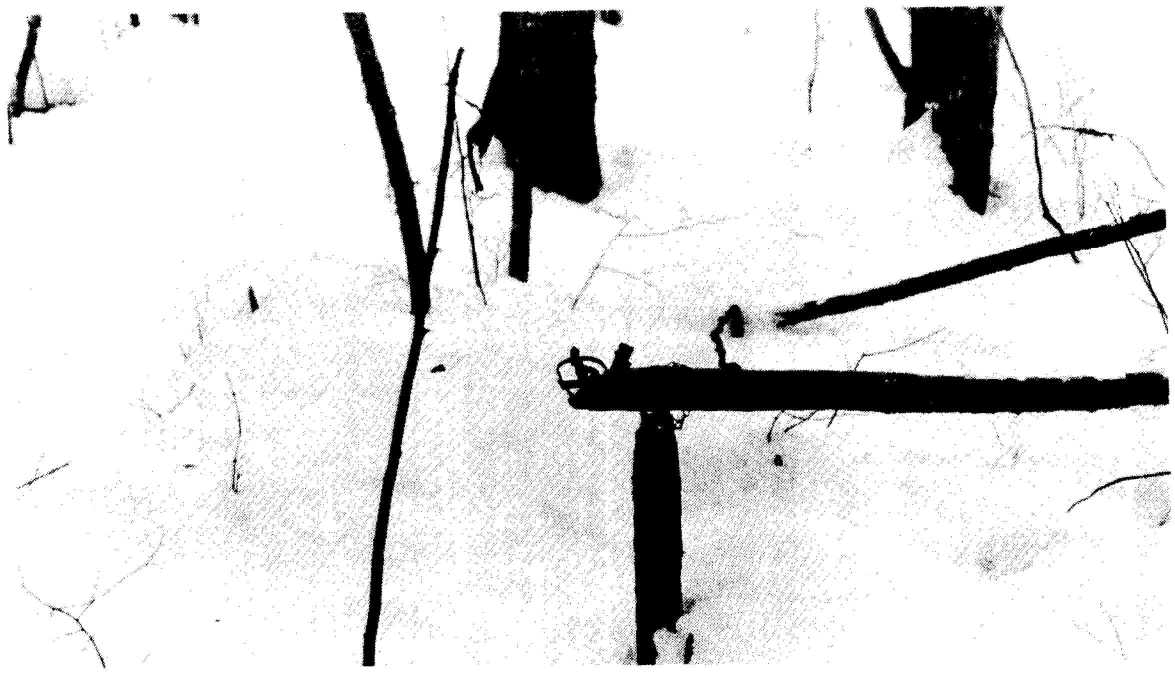

Fig. 20. Pole set in place typical of those used by Nikolai trappers.

open position in a notch on the end of the pole. The bait is placed on the end of a small willow pushed into the ground or snow to be situated one foot higher and further out from the end of the trap. Care is taken to place the bait pole in as vertical a position as possible to prevent marten from pushing it to the ground and escaping with the bait. Bait is either affixed directly to the end of the bait stick or dangled from the end of the stick on a piece of string, thread, or ribbon.

Choice of bait varies although dried salmon is the most commonly used. To "whet" the marten's appetite, fish is rubbed on both the base of the pole set and near the bottom of nearby trees and small pieces of fish are sometimes left nearby. While dried salmon is the primary choice for bait, some Nikolai trappers have noted success over the years with bait as diverse as leftover moose bones, perfume, or pancake syrup, and as simple as a fluttering piece of cloth. With very few exceptions, commercially-sold bait or lure is not employed. In most instances, the bait is replaced ("freshened-up") every few weeks as the expended bait is most commonly thrown on the ground near the trap to further entice passing marten.

Marten encountering the bait scent investigate the ground, and as they discover the bait overhead, climb the diagonal trap pole, and step in the trap as they reach out from the apex of the set for the bait. Properly constructed pole sets leave the expired marten hanging by the captured arm or leg a short distance off of the ground beyond the reach of mice and other small animals that often damage the unattended fur. Occasionally, a passing marten will partially eat a trapped one as will foxes and wolverines. At times, birds will also damage the fur.

Ground sets are somewhat more time-consuming to construct and maintain but advantages associated with this type of arrangement include enticing those marten considered "too lazy" to climb a pole into a trap, and having a set available for other ground-dwelling furbearer species such as fox. Bait is pinned to the ground on a small stick, often at the base of a tree. By building a "house" or corridor of brush, small sticks or other debris, the approaching marten is forced to step in a trap placed immediately in front of the bait (Fig. 21). Because fox and other species may investigate a ground set, the trap is sometimes disguised with a thin layer of straw, tissue paper, or leaves. Because these other species may frequent the sets, trappers tend to use larger traps in single-spring, double-spring, or jump-trap configurations ranging in size from no. "1" to no. "2-1/2" traps. Disadvantages associated with the groundset technique include the trap being rendered useless by small amounts of fresh or drifting snow, the need to reconstruct the set after each capture, loss of bait to small mammals such as mice, potential damage to expired furbearers left on the ground, and a tendency for ground sets to capture small animals such as squirrels.

Live marten are generally dispatched by crushing the heart through the rib cage. Initially, a blow is delivered to the head with a stick, momentarily stunning the marten. The animal is gripped around the neck and the trapper "works" the heart until the marten expires. This method is apparently favored because it minimizes subcutaneous bleeding that may damage the skin and reduce the pelt value. To minimize damage to the fur, some Nikolai trappers separately wrap each marten in burlap bags or other soft material to reduce hair loss from rubbing or bouncing around in the sled during transportation.

Wolverine, Wolf, Lynx, and Fox

Modified ground sets are also utilized for wolverine, fox, and lynx. With these species, there appears to be more variation in techniques between participants. Often, a major factor in going to the trouble of setting traps for the larger furbearers is the presence of tracks or "sign." Sets for these larger animals are sometimes placed in fairly open areas. Bait may be scattered around a hidden trap affixed with a concealed snare or cable to a large tree or "toggle" log. Ideal locations for open area sets include winter caribou or moose kills made

Fig. 21. Ground set in place typical of those used by Nikolai trappers.

by hunters and, when they are found, kills made by wolves. According to one Nikolai trapper, wolverine, wolves, and fox tend to be less wary of traps placed in fairly open areas. Sometimes several traps are placed in these types of sets in hope of the target species being taken by one that it failed to detect.

For large furbearer sets in wooded areas, ground sets often resemble those employed for marten. Bait is placed in the back of the set or, in some instances, reportedly suspended from an overhead tree or limb by rope four to six feet off the ground immediately over one or more concealed traps. Large traps ranging between no. "2" and "4" are generally used, as are double-spring and jump-style traps. The trap is secured by a heavy chain or cable to a stout tree or "toggle" consisting of a log between four and eight feet in length. This is particularly important for wolverine and wolf traps. Animals dragging toggles are easily tracked and often become tangled with trees or brush as they drag the log behind.

Choice of bait varies among Nikolai and Telida trappers who seek the larger furbearers. For sets not involving a moose or caribou kill, aged meat, larger pieces of raw or dried fish, beaver castor, and other odorous items are sometimes used for bait. Many lynx trappers utilize dead hares for bait, although some report success at trapping lynx by simply placing a concealed trap along trails frequented by lynx and hares. These larger furbearer species are sometimes dispatched by strangulation after a stunning blow to the head or more commonly, with small-bore firearms. For luck, many trappers avoid striking the head of furbearers with "unnatural" objects, instead favoring a heavy limb or stick obtained near the captured animal.

Beaver

Among Nikolai trappers, beaver trapping is considered the most time-consuming and physically demanding trapping activity. For many, it is also the most rewarding. Trappers may spend up to one-half hour opening the ice over a beaver set to find their snares are empty and the bait is gone. Processing beaver skins for sale also requires more work and time than other furbearers trapped in the area. The technology employed by Nikolai trappers for beaver trapping is altogether different than for the other land-dwelling furbearers. Beaver are generally taken in snares dangled around bait poles beneath the ice of lakes, creeks, or rivers in the immediate vicinity of their houses. Figures 22 and 23 depict beaver harvest areas utilized by Nikolai and Telida residents, respectively.

While beaver dwellings on area lakes are obvious during the winter, it is often difficult to locate river houses. Consequently, trappers planning to trap beaver along area rivers often mark house locations during the fall by boat. Markings vary from simple axe blazes on nearby trees to surveyor tape (ribbon) hung from nearby brush.

Beaver trapping activities usually commence during February, although some trappers begin earlier in the winter. Trappers open the ice near the target house with an "ice pick" and axe, creating a roughly circular hole approximately four feet in diameter. "Ice picks" (tudzeł) are essentially chisels attached to a birch handle between 8 and 12 feet in length. The chisel or cutting edge is often handmade from old rifle barrels, pry bar handles, or other hard tubular pieces of steel between 1/2 and 1 inch in diameter. The cutting edge is ground or filed down to a diagonal offset point. Most hand-carved ice pick handles feature a "knob" at the upper end to minimize the possibility of the pick slipping from the user's hand. Additionally, a length of rope is sometimes affixed to the handle end in a loop which can be wrapped around the user's hand to avoid loss through the ice during use. In recent years, metal ice pick handles made of pipe have appeared and many trappers now utilize these instead, finding advantage in their durability, shorter length, and greater weight. Shovels are used to remove chunks of floating ice from the hole. These may be modified by creating a series of small holes in the shovel face that permit the water to drain out while holding the ice fragments. A bait pole consisting of a birch or

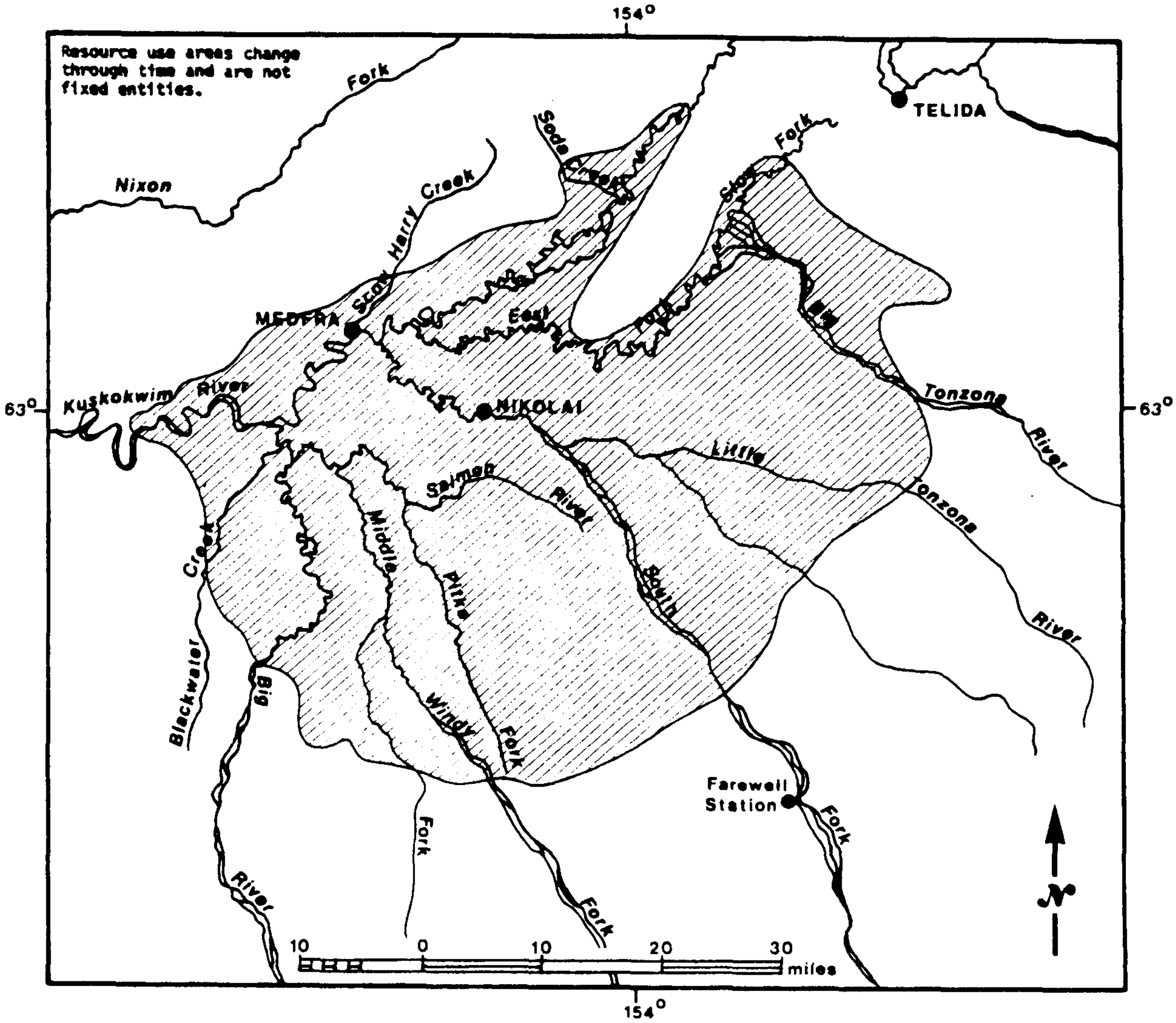

Fig. 22. Nikolai beaver trapping areas, 1967-1983.

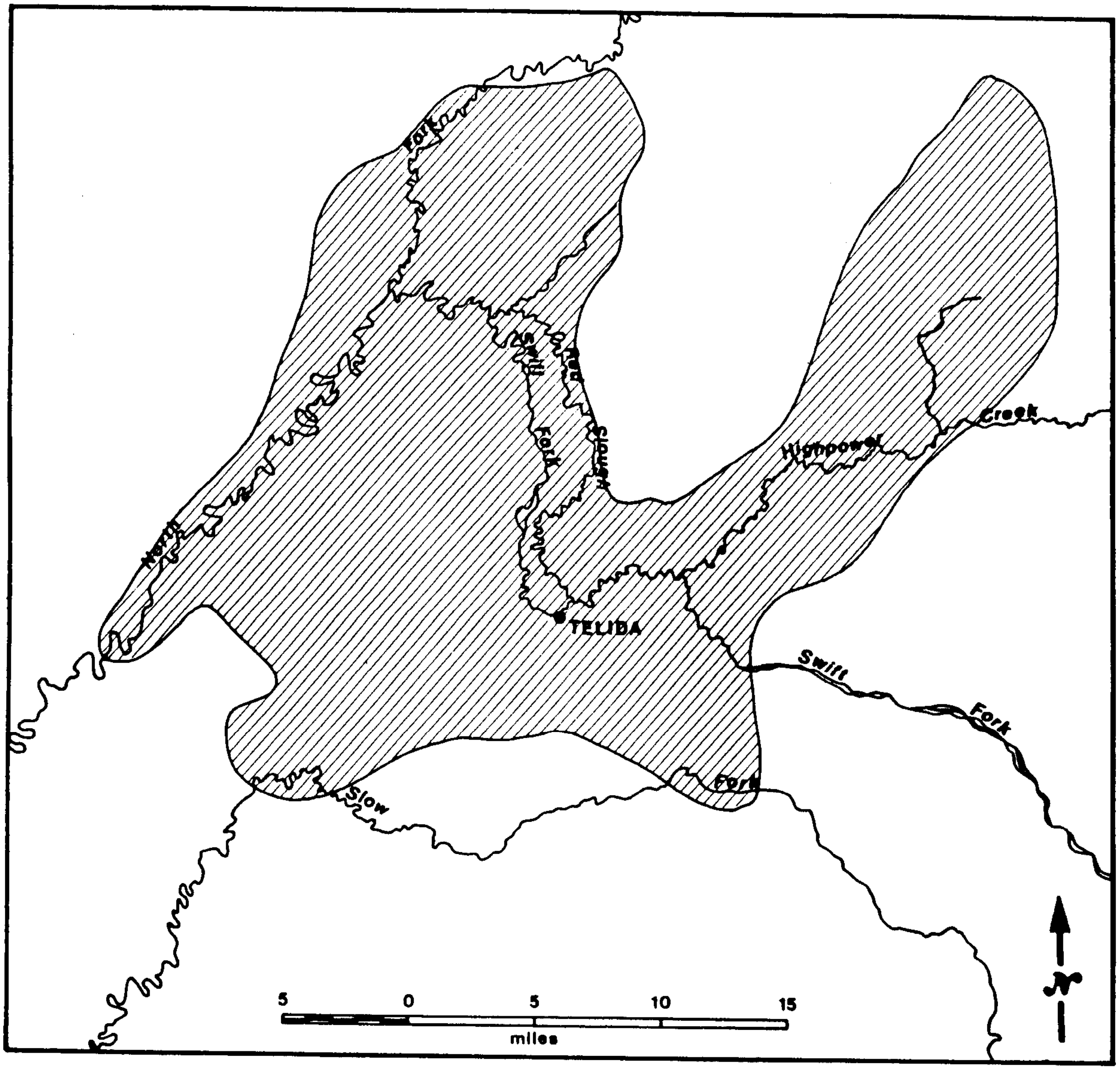

Fig. 23. Telida beaver trapping areas, 1967-1983.

aspen sapling with upper limbs attached is pushed into the river or lake, top first. Three to seven steel swivel snares are then suspended from a series of poles laid across the open hole. Snare depth varies between two and five feet around each bait pole. Once skim ice forms over the hole, it may be back-filled with insulating loose snow to slow the formation of ice.

Beaver sets are usually checked every few days. If more than a few days pass between each check, it permits the ice to thicken to the point that any snared beaver may freeze into the ice. Thick ice also requires additional work for the trapper to reopen the hole. Beaver lines seldom follow those used for taking other furbearers. Instead, a broad area is traversed, not in a linear fashion, but from set to set, often via interconnecting lakes or openings. Typically, established winter trails or traplines are utilized primarily for access to beaver trapping areas where trappers may range as far as 15 miles off the trail to set their snares. Beaver trappers are conscious of the effects of overtrapping and therefore limit the number of beaver taken from each house. Among Nikolai trappers, two adult beavers appears to be the general self-imposed limit for each lake house. Harvest from riverbank houses may exceed this amount as beaver in a river tend to repopulate empty houses each year.

Another important activity or aspect associated with beaver trapping is spring camping. While this practice has diminished somewhat in recent years, some trappers and their families look forward to spending time camped near their trapping area. By late February or early March, weather conditions usually moderate to the point that staying in a canvas wall tent is fairly comfortable. People sometimes engage in skinning and drying their catch in camp. Camping while beaver trapping also serves as a break in the often less active routines of winter.

SKIN PREPARATION

Processing and preparation of the skin for sale varies between each species. Generally, trappers recognize that prompt and careful attention in the skinning, stretching and drying process brings a better price at the time of sale. For most species two steps are involved in bringing fur from its raw form to a saleable pelt. These are skinning, drying, and stretching.

To prevent hair loss, skinning is often undertaken soon after the animal is taken. While some species require starting from the nose, others start from the back legs. Beaver is the only furbearer species in which the skin is cut lengthwise. While it is important to remove all residual fat and meat, care is taken to avoid cutting any holes in the skin, something that will appreciably reduce the sale price of the pelt. For marten, mink, otter, wolverine, wolf, and red fox, the legs are skinned in a manner that leaves the paws and claws intact.

Beaver are skinned from the belly in a process similar to that utilized for skinning larger game. A metal scraper or "fleshing tool" (donish) is used to carefully remove as much of the fat as possible. Traditionally made of caribou bone, these scrapers can also be fashioned from wood. After the skin is removed, it is stretched on a "beaver board" approximately four feet square. Starting with the head and "tail," small nails are driven into the skin fur side down at approximately one-inch intervals around the outside edge until, upon completion, the skin is nearly circular in shape. After the inside dries, the beaver skin is reversed and the fur side is dried for a short time.

For marten, mink, otter, wolverine, muskrat, wolf, and lynx, the stretching board is characterized by an increasing taper from a rounded point. Each species requires a slightly different shaped and sized board. Generally, the board is placed within the inside-out skin through the continuous cut made along the inside of the hind legs beneath the tail. For marten, small leg stretchers are tightly inserted into the forearms. The animal is pulled tightly into place and the back legs are tacked along the sides of the stretchers. A tapered pole is then inserted inside the skin along the backbone to further stretch the skin for drying. The tail is tacked to this back pole as well.

Drying takes from a single day to nearly a week, depending on the species and conditions. While the skin must be kept warm during the drying process, care is taken to avoid exposure of the skin to excessive heat which might over-dry the skin and cause cracking or tears. After the skin is dried, it is removed from the stretcher, turned fur side out, and stretched for an additional period. Any limbs torn or damaged are sewn into place or otherwise repaired during this secondary stretching process. Following removal from the stretcher, most pelts are kept in a cool dry place prior to sale to minimize rotting or mildew which will reduce the price paid.

Among Nikolai and Telida trappers, the carcass of the skinned animal is often left indoors for one night in the belief that promptly discarding the body may make the furbearer feel unwelcome and adversely affect subsequent trapping success. In the case of wolverines, some trappers reportedly decorate the animal "like a king" the day before skinning it. The carcasses of beaver and, among some older Nikolai trappers, those of lynx and muskrat are sometimes preserved for human consumption. For good luck, some trappers carefully save the bones of the beaver, returning them to the river through a hole in the ice. Likewise, care is taken to avoid rupturing the fallopian tubes, as the carcass is gutted. Other species, except otter, are eventually placed in the woods or other areas where the animal might be trapped during another season. This is done "out of respect," as one trapper stated, "to their soul." Otter carcasses are eviscerated for good luck before being discarded. Discarded carcasses are very rarely used as trap bait by Nikolai trappers, again, because of the beliefs associated with these species.

Several sale options are available to Nikolai and Telida trappers. Several businesses in McGrath purchase furs. Itinerant fur buyers periodically visit the community as well. Trappers also have the opportunity to mail their catch to one of several Pacific Northwest auction establishments in hope of good prices. The majority of Nikolai trappers prefer to sell their fur to McGrath-based buyers, although dissatisfaction with prices may lead some to pursue sale through one of the other options. Fur quality, and subsequently the price, is based on the size, color, and condition of the offered skin. After a sale, Nikolai trappers seldom look at the extremes offered for specific skins, instead evaluating the price by the average for their lot. Depending on cash needs and success, furs of like species may be sold by individuals in groups or lots ranging from a single animal to more than 60.

A small amount of the annual furbearer take may be retained by some households for use in manufacturing hats, mittens, and other items for both personal use and for sale. Those skins retained for use in this manner are often of unusual color, small size, or in poor condition. All the aforementioned conditions may adversely affect the price if sold to a fur buyer. Furs inadvertently taken after the season has closed may be utilized in this manner as well. Locally retained furs may be processed or "tanned" by women in the community or shipped to outside businesses specializing in this type of work. Home-tanning is fairly popular in Nikolai because of high prices and the relatively poor quality of commercially-tanned pelts.

The home processing technique employed among Nikolai users entails cutting the "tubular" skin open, rubbing or working soap into the inside skin, and then scraping the pelt with a sharp object. Several sets of master patterns circulating through the community are used for cutting out the various components of each article. As most hats, mittens, and other items require several different skins, care is taken to match the color and texture closely.

TRAPPING BY MCGRATH AND TAKOTNA RESIDENTS

Many McGrath and Takotna residents engage in trapping activities, ranging from a few traps near the community to operating several lines extending more than 80 miles in length. Discussions with approximately 30 trappers interviewed in 1983 indicates that contemporary areas used by McGrath trappers extend from the Susulatna River southward into the upper Tatlawiksuk River (Fig. 24). McGrath residents pursue furbearers

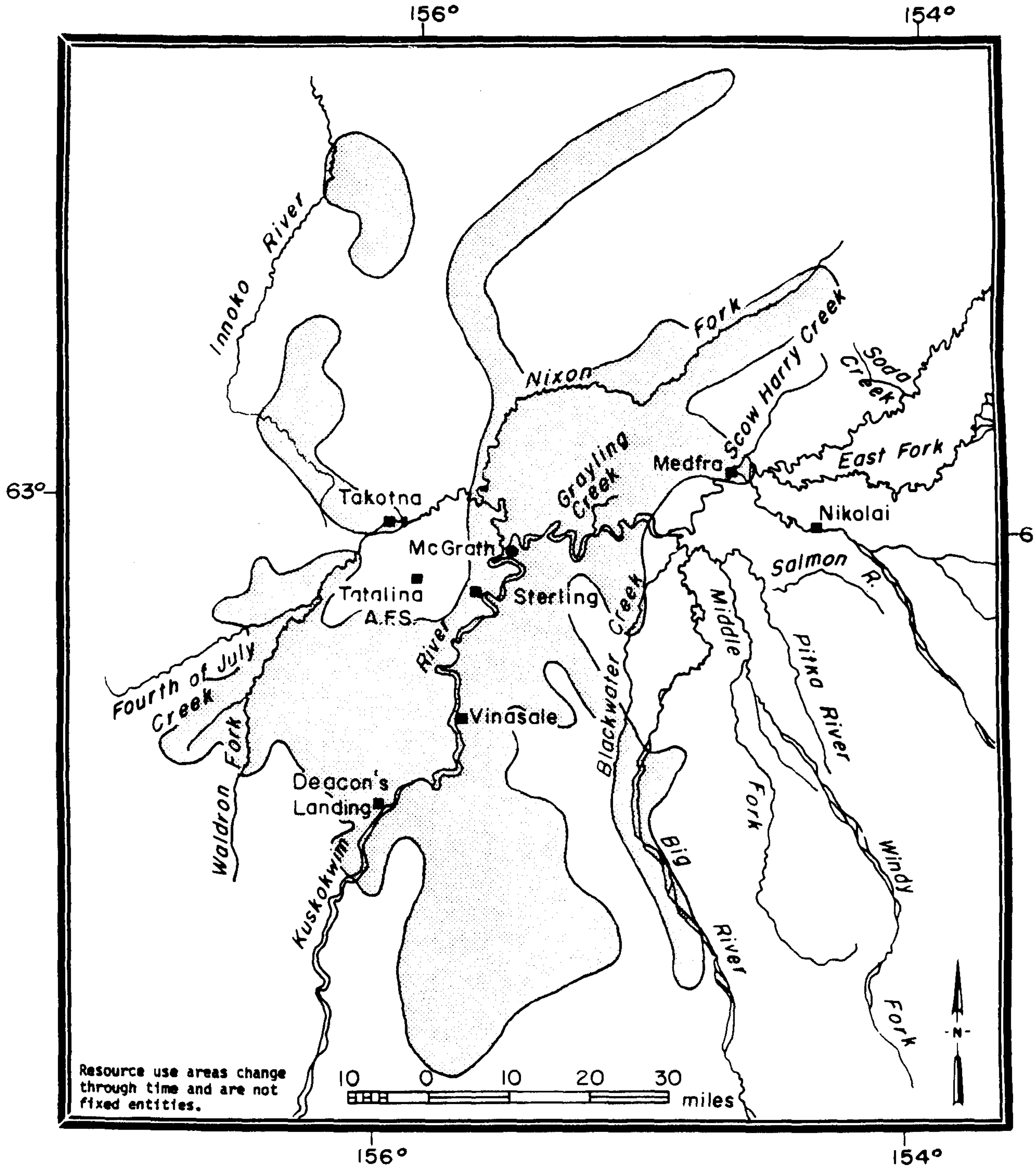

Fig. 24. Trapping areas of McGrath residents, 1967-1983.

from the lesser tributaries of the upper Takotna River northeastward to the upper Nixon Fork. Additionally, trappers utilizing aircraft for access regularly trap around White Mountain, Lone Mountain, and the Folger and Cripple area.

Most Takotna-based trapping occurs to the west of the community. Trappers utilize the Fourth of July Creek and upper Takotna River drainages northward to and including several upper Innoko River tributaries north of Ophir (Figs. 2, 25). Because many of the areas utilized by Takotna trappers feature rolling hills, most trapping activities are confined to the river and creek valleys characteristic of the area.

Like their Nikolai and Telida counterparts, the majority of McGrath and Takotna trappers pursue various furbearer species using surface transportation methods (primarily snowmobiles), although Takotna trappers appear to more regularly use dog teams to trap. While the species targeted by McGrath trappers include, in comparable proportions, those sought by Nikolai and Telida trappers, discussions with Takotna residents indicate a greater emphasis on beaver. According to respondents, beaver are quite abundant in the Takotna trapping area.

In some instances, there exists fierce competition for trapping areas contiguous to the community area among McGrath residents. As stated in Chapter 3, McGrath is a growing community, with much of the population increase coming from outside the area. Newcomers interested in trapping are, in some situations competing with longer-term residents in some areas. This is particularly acute because, based on reports of

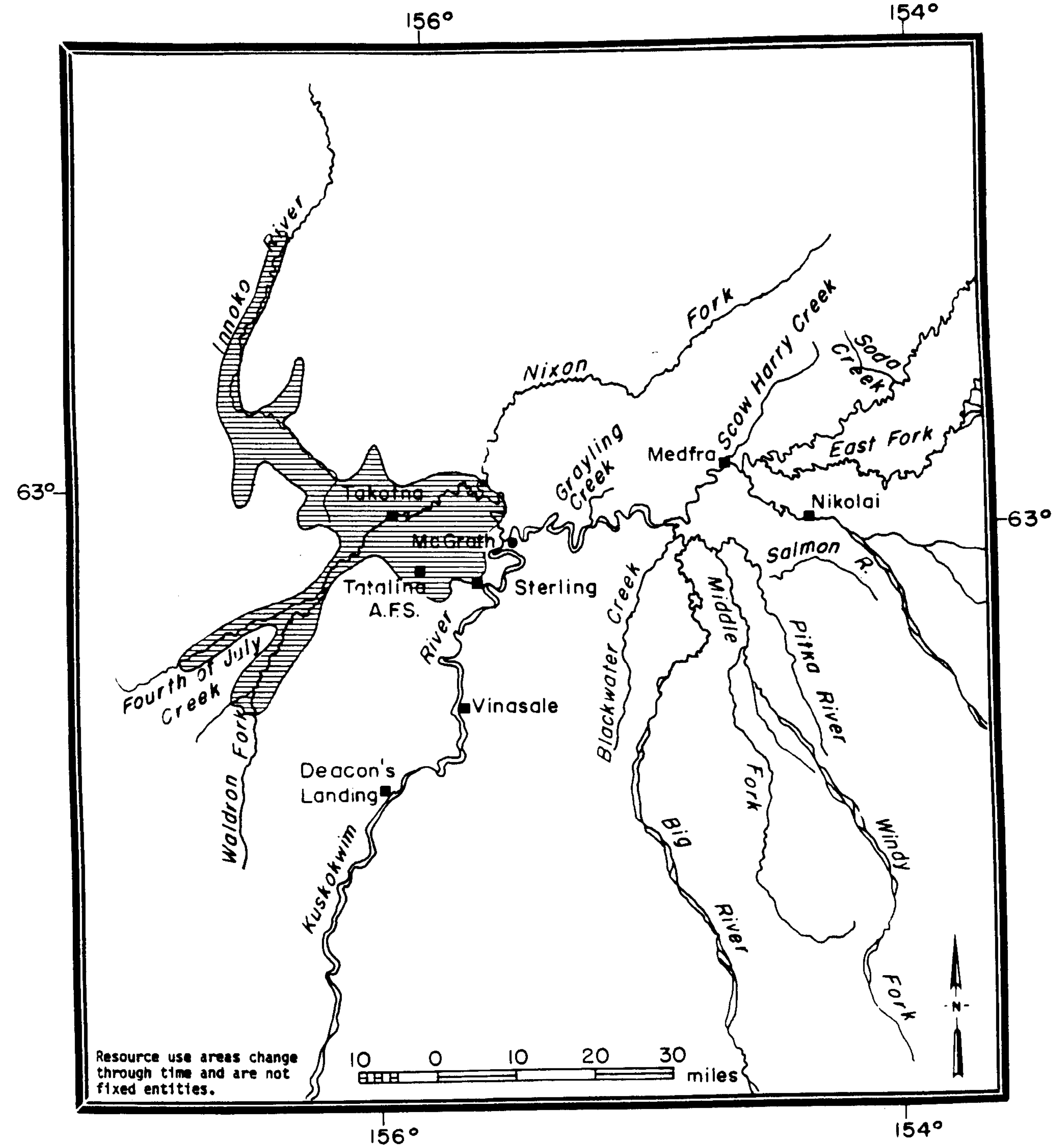

Fig. 25. Trapping areas of Takotna residents, 1967-1983.

declining harvest, many areas contiguous to the community cannot sustain increased trapping pressure.

Some serious McGrath-based trappers having a fairly recent or new history of use, now fly or travel appreciable distances to areas well away from the community in order to trap. These "fly-in" activities can take several courses. Those owning aircraft periodically fly to a remote trapline where area segments are checked on foot from various landing locations. Some of these aerial trappers maintain a snowmobile for use in running their line. In many instances, these remote lines feature a cabin or other form of permanent shelter. Beaver trappers utilizing aircraft periodically fly from lake to lake checking their sets.

Trapping techniques using pole sets and traps resemble those described earlier for Nikolai and Telida trappers. However, commercially made lure is reportedly used on occasion by some McGrath trappers.

Many McGrath and Takotna trappers prefer to consign all or a portion of their catch to the large auction houses outside. While this often brings the best possible prices, the major disadvantage associated with this method of sale is the wait of up to two months for receipt of payment.

USE RIGHTS

One of the biggest concerns evident in discussions with area trappers today is the competition for both new and long established trapping areas. There are a number of dimensions or aspects associated with this issue.

While Upper Kuskokwim trappers appear to generally recognize and respect the use areas of other area trappers, trapping disputes have long been known in the region. In a broad sense, local conflicts over trapping areas are three-tiered in nature. Intra-community conflicts occur when residents of the same community compete for concurrent trapping areas. Inter-community conflicts occur when residents of two or more area communities claim the same trapping areas. The third, and in many instances, most serious disputes occur between area inhabitants and those residing outside the region.

Trapping practices and patterns are greatly impacted by these types of disputes. Trappers long accustomed to managing their trapping areas in a manner conducive to maximum long-term yield find they must, for fear of "losing" an area, trap every season regardless of the condition of the furbearer population. Trappers utilizing multiple use areas feel pressured to operate all of them concurrently, reducing the frequency of trips to each. In addition to using areas of low furbearer yields, trappers in conflict situations are likely to operate their lines longer each season, further contributing to furbearer overharvest conditions.

While this problem is characteristic for trapping all the furbearer species, it appears to be most critical in beaver trapping where competition is particularly acute between trappers using surface transportation and those employing aircraft. Aircraft-equipped trappers have a high degree of mobility, providing them with an advantage over those using only surface means. Although many of these airborne trappers minimize conflict situations by utilizing highly productive areas distant from established use areas, others trap in direct conflict with longer-established ground trappers. Areas and lines which remain "fallow" for several seasons are sometimes incorrectly interpreted by some trappers as having been abandoned.

Nearly all trappers express frustration over the lack of legal protection and recognition of trapping areas. Registration efforts undertaken by the regional Native non-profit organization have not been widely accepted. Other voluntary registration programs and organizations are only effective if all trappers agree to be bound by arbitration in conflict situations. Consequently, legislative relief is one alternative being discussed among a number of Upper Kuskokwim inhabitants.

Many area trappers are sensitive about revealing exact locations of existing lines for fear of this information leading to an infringement by non-community members. Others, particularly those residing in Nikolai and Telida, believe the publication of this information will provide a data base for settlement of subsequent disputes with non-local trappers, particularly if legislative action brings about formal state recognition and direct involvement in some disputes.

Most trappers express satisfaction with the present bag limits and seasons. Sealing requirements sometimes reportedly pose problems for a few isolated trappers in remote locations near the end of the season as they are not able to get their furs to the sealing agent within the regulated time limit.

Beyond obvious economic hardships, wildfire causes major disruptions in trapping use areas. The most recent and graphic example of this is the Bear Creek Fire which, in 1977, burned around 500,000 acres southwest of Nikolai. In addition to loss of furbearer habitat, most traps left in place by at least seven Nikolai trappers were lost.

Fallen trees and the loss of wind protection has led to conditions that make travel difficult, and except for narrow "green" corridors along the rivers and creeks, marten are rarely encountered in the area. A joint Department of Fish and Game and Bureau of Land Management study to examine the effects of wildfire on furbearers is currently underway in the Bear Creek burn area (A. Magoun pers. comm., 1984).

SUMMARY

Furbearers have been harvested by residents of the area at least since contact times. Initially sought for their nutritional and clothing values, the pelts of furbearers including beaver, marten, lynx, fox, wolverine, wolf, mink, otter, and muskrat gained economic or trade value with the introduction of the fur trade to the area by Russian traders and their aboriginal intermediaries. Technologies for taking furs have changed over time, with various trapping devices ranging from deadfalls to firearms. Many Upper Kuskokwim households currently derive income annually through the sale of raw pelts or locally sewn products. Traplines range from 1 to 80 miles in length. While most trappers access area lines with snowmobiles, aircraft and dog teams also are important transportation methods. Bait choice and trap configuration vary between users, although virtually all employ variations of two basic techniques, the cubby and pole sets.

Contemporary trappers generally limit their trapping activities to mid- and late winter depending on the targeted species. Territorial disputes adversely affect trapping as trappers tend to "protect through use," their trapping areas that might otherwise benefit from a season or two of regenerative non-utilization.

CHAPTER 9

SALMON FISHING

Three species of salmon are currently available to and harvested by residents of Upper Kuskokwim communities. These are the chinook, "king," salmon (gas; *Oncorhynchus tschawytscha*), chum, "dog," salmon (srughat'aya; *O. keta*), and coho, "red" or "silver," salmon (nosdlaghe; *O. kisutch*). The terms in quotation marks refer to the locally-used English nomenclature. The Upper Kuskokwim Athabaskan name, followed by the scientific identification, is in parentheses.

This chapter presents information on salmon harvest, processing and preservation techniques, and fishing sites. It describes changes in fishing patterns and practices brought on by either regulatory revisions or changes in technology, and presents other information on both the historical and contemporary use of salmon in the Upper Kuskokwim.

SALMON FISHERIES IN THE UPPER KUSKOKWIM DRAINAGE

Upper Kuskokwim subsistence salmon fishing occurs in five distinct tributary systems (Fig. 26). The use of these areas varies by community and targeted species, and each system is distinguished by geographical and environmental characteristics that offset each from the other.

The "Salmon River" fishery includes the Big River, Middle Fork, Pitka Fork, Salmon River, Blackwater Creek, and numerous lesser tributaries (Fig. 27). Water within the Salmon River system is generally clear during the summer with the exception of the Big River and Middle

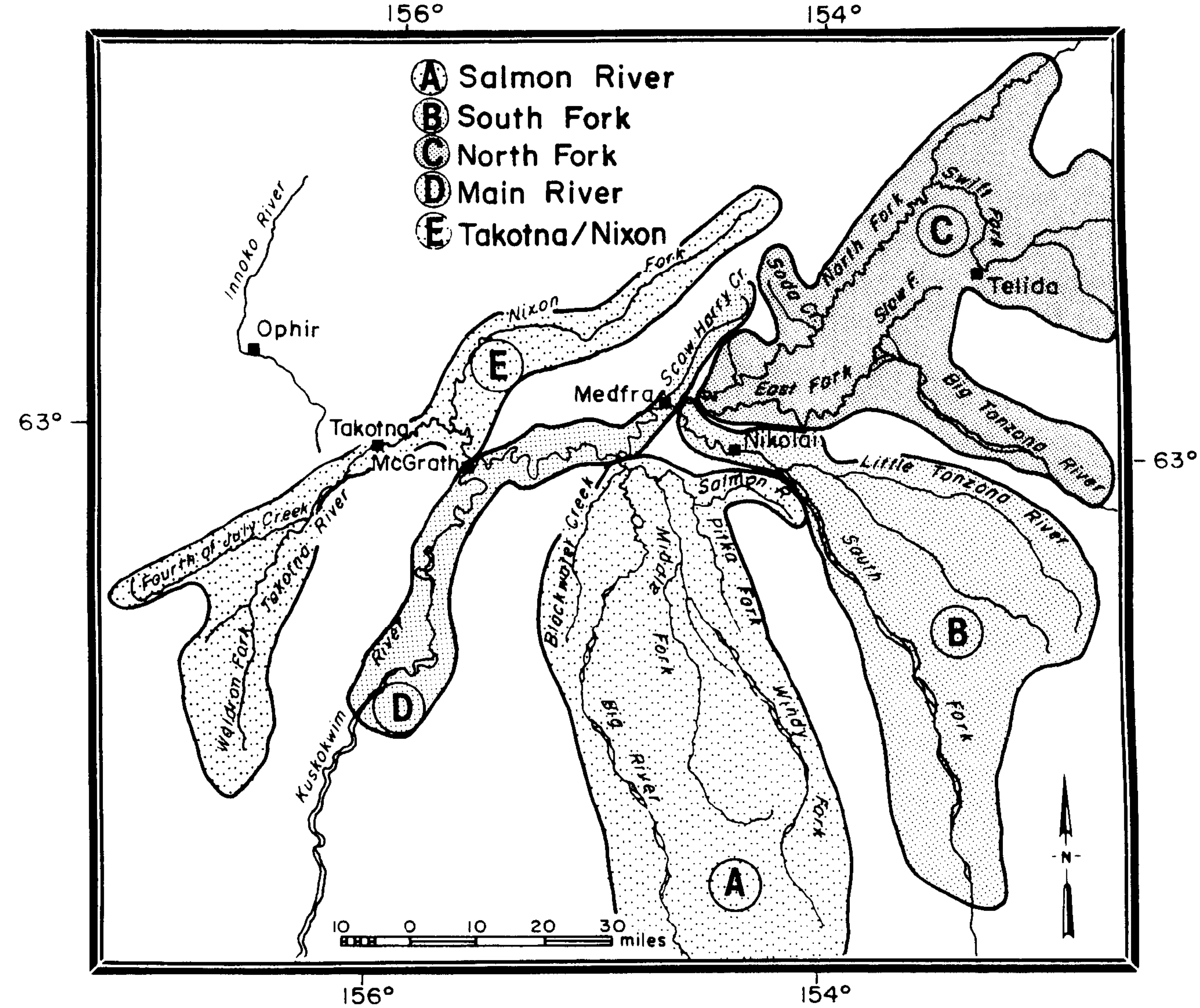

Fig. 26. Subsistence salmon fisheries of the Upper Kuskokwim.

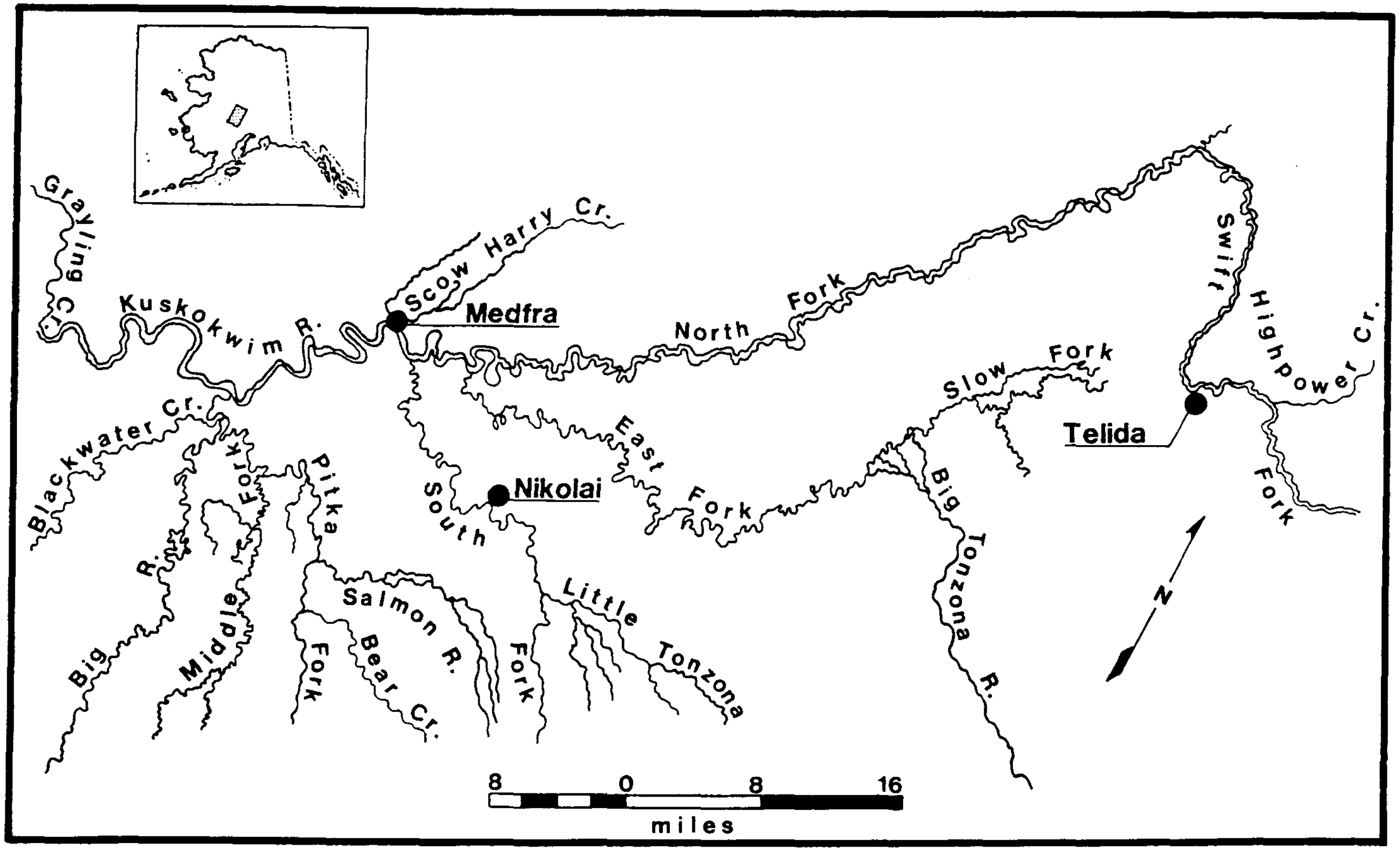

Fig. 27. The "Salmon River," "South Fork," and "North Fork" salmon fisheries.

Fork, which originate in glacial areas of the Alaska Range. King, chum, and coho salmon spawn in various tributaries of this river system. This fishery is primarily utilized by Nikolai residents, with occasional use by some McGrath inhabitants. In the historic past, portions of the fishery were seasonally occupied and principally used by the South Fork, Vinasale, and Tatlawiksuk aboriginal bands (Hosley, 1966).

The "South Fork" division includes the main Kuskokwim River upstream from the mouth of the Big River exclusive of the North Fork and its tributaries (Fig. 27). Major component tributaries include the silt-laden South Fork and the generally clear Little Tonzona River. The community of Nikolai is situated on the north bank of the South Fork, approximately 15 river miles downstream of the mouth of the Little Tonzona River. Traditionally utilized by both the South Fork and East Fork Upper Kuskokwim Athabaskan bands, both tributaries are fished by residents of present-day Nikolai for all three species of salmon common to the region.

The predominant river in the "North Fork" fishery is the North Fork itself, and featured secondary tributaries include the East Fork/Big Tonzona, Swift Fork, Highpower Creek, and Slow Fork (Fig. 27). Water turbidity varies, with the Swift and East Fork/Big Tonzona containing the highest concentrations of silt. The community of Telida is situated along the south bank of the Swift Fork, below the mouth of Highpower Creek. Residents of that community are generally the sole participants in this salmon fishery that was, at one time, occupied by the Telida-Minchumina and East Fork Athabaskan bands. While small numbers of chinook and chum salmon are seasonally present, coho is the major species present in this fishery.

The fourth fishery consists of the Takotna River and its tributaries (Fig. 26). Major collateral streams of this generally-clear water system include the Nixon Fork, Tatalina Creek, Fourth-of-July Creek, and Big Creek. Traditionally inhabited by the Takotna/Nixon Fork Athabaskan band, members of the Vinasale and Tatlawiksuk groups harvested salmon within this system. Because all three salmon species are reportedly present in comparatively small numbers, contemporary residents of Takotna, situated on the north bank of the Takotna River approximately 30 river miles above the mouth of the Nixon Fork, seldom fish within this fishery in favor of utilizing more productive sites along the main Kuskokwim.

The "McGrath" or "main river" fishery refers to the main Kuskokwim between Deacon's Landing upstream to the confluence of the North and South forks (Fig. 26). Important tributaries, exclusive of those previously described, include the Katlitna and Selatna rivers, Grayling Creek, and Scow Harry Creek. While these tributaries are generally clear, the main river itself is generally turbid, a characteristic largely attributable to the Big River and South Fork. Major settlements include McGrath, situated immediately across the Kuskokwim from the mouth of the Takotna River, and Medfra, a seasonally occupied site located on the north bank of the Kuskokwim approximately three miles below the confluence of the North and South Forks. While technological limitations traditionally precluded main river salmon harvest activities, the Takotna/Nixon, Tatlawiksuk, and Vinasale Athabaskan bands seasonally inhabited the area and likely harvested one or more of the salmon species common to this system in some or all of the lesser tributaries.

HISTORICAL USE OF SALMON

Salmon have historically been the most important source of fish protein for many, but not all, of the Upper Kuskokwim aboriginal bands described in Chapter 2. Physical evidence of fish storage pits at some locations combined with the oral accounts of lifelong residents indicate that salmon have been actively sought by area inhabitants at least since contact times (ca. the mid-1800s), with several gear types utilized both successively and in combination, ranging from spears and trap/fence configurations to gill nets and rods and reels.

Oral accounts indicate that, in the past, salmon were readily obtainable in or near the spawning areas of most salmon bearing waterways, with minimal investments of time, material, and effort. These earlier fishers used spears or even bare hands to take these salmon, often late in the fall. Information depicting various aspects of historical salmon use appears throughout this chapter and in Appendices 3 and 4.

SALMON HARVEST TECHNOLOGIES

Over time, Upper Kuskokwim inhabitants have employed a succession of harvest techniques. While there are slight variations or refinements in the techniques and strategies used for salmon fishing by community residents of the research area, five distinct salmon harvest techniques are or have been employed over the previous 20 years. Each of these has yielded significant numbers of salmon over the years and include set gill nets, drift gill nets, fishwheels, rods and reels, and the fish fence. Four of the five previously noted salmon harvest techniques are currently used in the region, while the fifth, the fence and trap, is no longer a legal method (Alaska Board of Fisheries 1984) and is not employed. Two additional and comparatively ancient salmon harvest techniques, dipnets and spears, have seldom been employed in the past 20 years, having been displaced largely by newer and more efficient technologies.

In the Upper Kuskokwim area, the type or quantity of gear used is not limited by regulation to a single harvest apparatus. Different types of gear are used in succession or concurrently, depending upon the fishing site, target species, water conditions, run strength, desired catch levels, and participant processing abilities. Nonetheless, fishermen generally prefer to employ one type of gear at a single location at a time. If fishing time is limited or catch levels are unsatisfactorily low, two types of gear will be used simultaneously to harvest a particular species. Alternately, multiple deployment, or use of a single gear type, is possible. This is illustrated by deployment of two or more nets by a single fisherman in the same or adjacent location. Fishermen may also fish in two different fisheries concurrently using similar or different gear types. For example, Nikolai king salmon fishermen, traveling to the Salmon River to fish for king salmon with rods and reels, may leave a net set overnight at a location enroute.

Water turbidity conditions associated with either the tributary source or seasonal influences, such as meltwater and rain, often dictate which gear types can be used most successfully. Salmon fishing with rods and reels is futile in silt-laden water, while the use of fishwheels and set nets is seldom productive in clear water. The characteristics of the site are important factors to consider when gear is selected. Set nets are usually placed in eddy or backwater areas, where fishwheels would fail to rotate in similar conditions. The use of drift nets is practical only in the deeper water and longer, straight stretches of the main Kuskokwim River below Big River.

Fish Fences

Fish fences (hwtsel) were stream or river blocking devices for taking large numbers of salmon in comparatively short periods of time, with king salmon being the main target species. The overall efficiency of this technique is probably unparalleled today. The use and construction of salmon fences are described in detail in Appendix 3. Fences worked best in shallow, clear upriver tributaries of the Kuskokwim. Area residents report fences were at one time located in the Nixon Fork and on the Little Tonzona, Takotna, and Salmon rivers.

Fishwheels

According to one knowledgeable Nikolai elder, fishwheels were first introduced to the Upper Kuskokwim in 1914 by an early-day trader near Wilson Slough, below present day McGrath, after he observed such devices in operation along the Yukon River near Anvik. This first wheel was built as a commercial venture, as the owner hoped to sell salmon to mine workers in the Candle Creek area. After initial profitability, interest in fresh fish waned and the wheel was given to a Vinasale inhabitant in the spring of 1915. This technique was quickly adopted by other upper river fishermen and, by the early 1920s, fishwheels were reportedly in operation near most Upper Kuskokwim settlements. For the first time, individual area inhabitants were able to harvest necessary quantities of salmon closer to winter settlements in less time. (The use and construction of fishwheels is described in Appendix 4). Fishwheels also facilitated expansion of "market fishing" away from fence sites.

"Market" or commercial fishing featured several dimensions. Fishing for cash initially was introduced at, and geographically limited to, the Salmon River fish fence site by early twentieth century American and European trappers and traders. Market fishing flourished with the access fishwheels provided for harvesting salmon in the main river near area roadhouses and trading posts. In simplest terms, market fishing entailed trading or selling raw or dried fish. One difference distinguishing this practice from the commercial fishing of the lower Kuskokwim River was that virtually all of the catch was sold for local non-human food. During the summer, freshly caught salmon were fed to the many dogs left behind by their owners during this season. Fresh salmon was also a staple in the diet of commercially-raised mink and fox. At the same time, by prior arrangement with the fur farm or dog team owners, thousands of pounds of salmon were dried for use throughout the winter. While "market fishing" declined in the 1930s, use of fishwheels peaked during the 1950s and 1960s when, according to several area residents, more than 25 were in operation in the region. Since their introduction, fishwheels were primarily utilized for harvesting chum salmon. After the deline of "market fishing", they were mainly utilized by families to harvest winter dog food. Some households reportedly used up to three wheels simultaneously to fulfill their salmon requirements in shorter periods of time, in an effort to facilitate seasonal employment opportunities. Today, there are no commercially regulated salmon fisheries in the Upper Kuskokwim.

Set Nets

Most older Nikolai residents agree that the use of gill nets pre-dated initial contact with the Russians. Verification may exist in the reported pre-contact presence of shuttles and measures generally used for net manufacture (Hosley 1966). However, these earlier set nets (tameɨ) constructed of caribou sinew and willow bark lacked sufficient strength and durability for the rigors of salmon fishing. Consequently, their use was generally limited to taking smaller fish, such as grayling and whitefish from area lakes and creeks. According to these same individuals noted above, the availability of spooled twine (tameɨilaye) at the Vinasale post, sometime before 1900, facilitated manufacture of larger and stronger nets. While these nets may have been suited for salmon, discussions with former residents of Vinasale indicate primary use continued to focus on non-salmonid species. Incorporating more ancient technologies with the newer twine, net weights (tameɨtsa') continued to be made from hollowed caribou or bear leg bones, while the floats (tameɨdilirs) still were fashioned from either cottonwood or white spruce. Respondents expressed no recollection of gill net twine being obtained from unraveled burlap bags, as was the practice among some of their Yukon River counterparts (Andrews pers. comm. 1984); interestingly, however, braided burlap twine was employed by some Upper Kuskokwim Athabaskans for clothing manufacture.

The time of introduction of pre-hung nets to the region is not known among area residents. Most believe their widespread use has occurred in the past 50 years.

Rods and Reels

Harvest of salmon with rods and reels was introduced to the Upper Kuskokwim subsistence salmon fisheries during the middle 1960s. Originally, this type of fishing was a source of good-natured diversion for adolescents and onlooking adults awaiting the arrival of salmon at fish fence sites in the Little Tonzona and Salmon rivers. Since then, with the regulatory elimination of the traditionally-utilized fences, the use of rods and reels has evolved to the point where it is now the predominant harvest method in both of these fisheries. Despite refinement of rod-and-reel fishing, and years of experience, this technique continues to fall far short of the customary fence and trap arrangement in terms of productivity (Appendix 3).

Drift Nets

The longevity of using drift nets near McGrath is unknown, although several respondents residing in that community believe this practice has occurred there for "quite a while." While salmon fishing using drift nets was an aboriginal harvest method along the lower Yukon River at historic contact (Wolfe 1979), there is no evidence of similar antiquity in the Upper Kuskokwim. Contemporary drift fishing is mostly confined to a 20-mile stretch of river contiguous to McGrath. People using drift nets generally employ modified set net gear, and often drift in parties of two boats. Drift gear is limited primarily to harvesting king salmon.

Dipnets

There is little information about the extent of historical use of dipnets (ts'otɨ'uɨ) for salmon harvest in the study area. Several Nikolai inhabitants recall hearing of their use in the shallow upper river spawning grounds "a long time ago." Historically, dipnets were made of sinew or willow bark and featured a single long handle. According to one anthropologist, Upper Kuskokwim dipnets were most commonly employed to remove salmon from an enclosure which resulted from the tandem placement of two fish fences (Hosley 1966) (Appendix 3). While this assertion may well have credibility, contemporary informants are unfamiliar with the double fence configuration.

Fish Spears

Salmon spears reportedly were last employed by Athabaskan fishermen in the middle 1960s. These spears featured a single-tined barbed point of bone or metal and were only effective in clear, shallow water. Most spearheads were designed to be detachable from the 8 or 9-foot-long shaft, which was fashioned from tamarack wood. A short length of stout line or beaver snare affixed the detachable point to the shaft and a second, longer length of line or babiche extended from the opposite end of the shaft to the fisherman's free arm, permitted retrieval of the spear shank, detached head, and impaled salmon. According to one former Nikolai participant, fishing was best undertaken from shore, although fishers sometimes stood in mid-stream, where the spear was thrust into the swimming salmon. The tamarack pole, while heavier than birch or spruce, was employed for its sinking characteristics, acting as a "toggle" against fighting salmon. Although salmon spears are no longer in use in the region, several Nikolai fishermen are still noted for their spear-making skills.

SALMON FISHING PATTERNS

The time of the annual arrival of salmon in the Upper Kuskokwim is a result of several factors. Extended periods of high water in the early summer or a late break-up tend to slow the arrival of the first salmon. These first salmon (kings) and usually arrive in the vicinity of McGrath in mid-June, with the run, at times, lasting well into July. Nikolai fishermen generally begin catching them in the lower stretches of the South Fork and Salmon River systems in late June, although it may be as late as the second week of July before kings reach the Little Tonzona River and the upper Pitka Fork (Fig. 27). The duration of the run usually extends two to four weeks.

Chum salmon reach McGrath around the first week of July and ascend to the upper fisheries by the third week of the month. While the chum run usually peaks a week to 10 days later, small numbers of this species continue to be present in area fisheries until early November.

Coho salmon are the last salmon species to arrive, reaching McGrath in early August. They are usually available in the upper river about two weeks later, with the exception of the upper North Fork fishery, utilized by Telida fishermen, where they may not arrive until near the end of August. The peak of the run at McGrath is near the end of August, in mid-September in the Nikolai area, and late September in the Telida area.

At times, the best fishing sites for some species are located considerable distances (up to 130 river miles) away from the permanent winter settlement. Decisions to relocate seasonally to these sites are apparently based on a number of factors. One of the more tangible aspects revolves around the inability of fishermen to attain satisfactory harvest levels of a particular species near the home settlement. Certainly this is linked to an efficiency factor, which could be measured by the amount of harvest during a specified period of time. Seasonal relocation also provides access to other subsistence activities such as berry picking and, in earlier times, seasonal employment. Yet, relocation for other salmon fishing families is simply expressed in terms of a desire to "just get away from town for awhile."

For many present-day individuals and families, salmon fishing is one of the high points of the seasonal round, reflected by the amount of time, effort, and money applied to the pursuit of this activity. One indication of the importance of salmon to area residents is evident through review of the amount of cash and other resources applied to salmon fishing activities. While expenditures can be appreciable for fishing contiguous to the winter settlements, these commitments are truly considerable for people who undertake salmon harvest activities away from established settlements at seasonally-occupied sites or fish camps. Cash commitments include fuel, food, and specialized gear such as nets. Some families voluntarily cease wage employment for periods up to a month in duration to obtain salmon. This "opportunity cost" in lost cash earnings serves as another measure of the importance attached to salmon fishing by some regional residents. Among contemporary area residents, only those from Nikolai continue to seasonally travel to and remain at distant fisheries in the region.

As noted in Chapter 2, until the 1960s Medfra was, for Nikolai and Telida residents, the closest settlement with an established year-round airfield. This transportation facility, combined with the existence of a permanent trading post, and Medfra's role as a supply hub for gold mining operations in the Nixon Fork area and as the uppermost terminus for barge service, created various short-term wage employment opportunities for Nikolai and Telida inhabitants. Employment opportunities included firefighting, woodcutting for the barge and various businesses and residents of the settlement, and temporary laborer and domestic positions at both Medfra and Nixon Fork mines.

Consequently, until the mid and late 1960s, virtually every Nikolai and Telida household spent a substantial portion of their summer in the Medfra area, often combining salmon fishing with the previously described employment opportunities. Because higher-paying seasonal positions were also available in McGrath, some families occasionally spent the summer fishing near that community. While many of the McGrath-based employment opportunities were more lucrative in terms of pay and duration, the "social isolation" associated with spending the summer near that community and obvious restraints to continued practice of other resource harvest activities made Medfra the preferred salmon fishing site. Even though families viewed the Medfra area as their summer "base," some households left their fish camps for other fisheries, such as Salmon River, to harvest specific species which occurred in greater abundance elsewhere. Those households that left Medfra in the early summer for king salmon fishing at other locations usually returned to Medfra for chum salmon fishing, the primary species harvested at that site. After the chum season, many households returned to their respective winter settlements for fall whitefish and coho salmon fishing, although others remained in the Medfra area until shortly before freeze-up.

Because fishing drew on the labor of a family group, once the fish camp was established, adult males were able to engage in seasonal employment opportunities, and leave other family members to catch and process salmon. In addition to seasonal employment and salmon fishing, families engaged in a wide range of activities including hunting, berry picking, clothing manufacture, and making equipment such as boats, snowshoes, canoes, sleds, baskets, and wooden spoons.

In the late 1960s and early 1970s, with the declining use of dog teams for transportation in favor of snowmobiles, the opening of a store and post office at Nikolai, and with the increasing availability of seasonal employment in the winter settlements, participation in salmon fishing away from the home community declined to the point that some earlier important fishing sites were not utilized for a number of fishing seasons. Other previously important fishing sites were used only minimally, often by just a single household. During this period, much of the salmon fishing occurred in immediate proximity to the winter community. The labor intensive and highly productive fishwheel was generally abandoned by fishers at the home community in favor of simpler set nets, primarily deployed to catch limited numbers of "eating" fish. The large-scale harvest that did continue was in the vicinity of McGrath and Sterling Landing, where several residents of McGrath and Takotna maintained large dog lots for professional racing purposes.

By the late 1970s, the trend away from remote salmon harvest sites began to reverse as Nikolai residents again started seasonally occupying some of the traditional sites such as Salmon River, Blackwater Creek, and Middle Fork, so that by the 1980s salmon fishing has grown to relatively high levels. This high level of participation continues to date. Interestingly, the Medfra area has not been reoccupied as a seasonal fishing site, possibly because interest in remote fisheries has focused on king salmon. Nonetheless, Nikolai residents have continued, since the mid-1970s, to periodically deploy set nets at the confluence of the North and South forks near Medfra while engaged in non-fishing activities in the area. "The Forks" continues to serve as a staging area for a number of subsistence activities during the spring, summer, and fall. Chum salmon fishing levels on the South Fork have also experienced similar increases since the late 1970s, and by 1984, four fishwheels were in operation along a two-mile stretch of river contiguous to the community.

Since abandoning the Medfra area, Telida residents have continued to focus much of their fishing activities on whitefish in Lower Telida Lake and on sheefish and coho salmon in the Highpower Creek area above the community. While fishing effort levels have increased among McGrath residents in the past five or six years, the pattern of dispersal evident among Nikolai salmon fishermen has not occurred. Residents are generally satisfied with salmon availability in the main Kuskokwim proximate to the settlement. Among Takotna inhabitants, there has been a decrease in salmon fishing activities in the region since the late 1970s.

REGULATORY HISTORY

Changes in fishing techniques and use patterns by Upper Kuskokwim residents have resulted in part from changes in salmon fishing regulations. As noted earlier and in Appendix 3, fences were the most efficient and preferred method of taking king salmon among residents of Nikolai. Sometime during the mid-1960s, individuals using a fence for king salmon harvest on the Little Tonzona River were informed that any device which blocked the full width of a stream had been illegal for several years. Consequently, during the course of a single summer, a time-proven salmon harvest technology, quite possibly in use since pre-historic times, was abandoned. For Nikolai inhabitants, this left a technological void that remained unfilled for more than ten years. In the absence of suitable harvest methods, use of those previously most productive sites diminished. Fishermen resorted to fishing for king salmon at less productive locations along the turbid main rivers with legal techniques more suited to those conditions. It was during this period that people began adopting and refining the use of rods and reels in clear water areas to the point that during the late 1970s, a suitable means of taking salmon in certain upper river tributaries emerged. This renewed the interest in and use of the freshwater fisheries and associated camps once again. On a statewide basis, the use of rods and reels is generally associated with sport or recreational fishing, but Nikolai users are adamant in their view that employment of such gear in the Little Tonzona and Salmon rivers is a subsistence activity. Rod and reel use occurs at sites customarily fished for king salmon where other techniques either are unproductive due to various stream characteristics or traditional techniques have been eliminated by regulatory action (see Stokes 1982). Imposition of a five-dollar king salmon stamp by the Alaska Department of Revenue in 1982 (later repealed), and the refusal of some area residents to recognize the legitimacy of rods and reels as a subsistence salmon harvest gear raised the issue of definition.

In the fall of 1982, one Nikolai resident submitted a regulatory proposal to the Alaska Board of Fisheries which would legalize the use of a fence and trap on the Little Tonzona River. Despite community and McGrath Fish and Game Advisory Committee support, the proponent withdrew the proposal early in 1983 after discussions between Division of Commercial Fisheries and Division of Subsistence staff indicated its adoption might necessitate restriction or outright curtailment of other South Fork king salmon fishing activities. The king salmon resource, its continued use, and current regulations restricting harvest methods and means continue to be of concern to Nikolai residents.

SALMON MANAGEMENT, STOCK STATUS, AND FISHING ISSUES

As shown in the previous historic section, the upper Kuskokwim salmon fishery can be characterized, in the simplest of terms, as being dynamic. User participation, catch levels, use sites, and harvest and preservation methods are undergoing constant change and refinement, making salmon fishing by area inhabitants a highly dynamic series of activities. From the minimal use levels of the mid- and late 1970s, fishing has increased once again to become one of the central facets of the contemporary seasonal round. This growth shows little sign of reversing, as many area residents continue to participate in harvesting one or more of the salmon species present in the area.

Little consistent region-wide biological information has been collected on salmon in the Upper Kuskokwim area. From direct observations spanning several decades, area fishermen note decreases in resource levels reflected in continued gradual but pronounced declines in the size of salmon runs in the upper river systems. This concern is most acute when discussing the condition of king salmon stocks, particularly in the Salmon River drainage (Figs. 27, 28). In response to concerns expressed by area inhabitants over the years to the Alaska Board of Fisheries, the Division of Commercial Fisheries in 1981 constructed a weir to study salmon escapement on the South Fork of the Salmon River, just upstream of the mouth (Fig. 28). This project continued in the summer of 1982. Much to the disappointment of area fishermen, reduced funding resulted in discontinuation after only two seasons. Except for the data derived from the two seasons of operation,

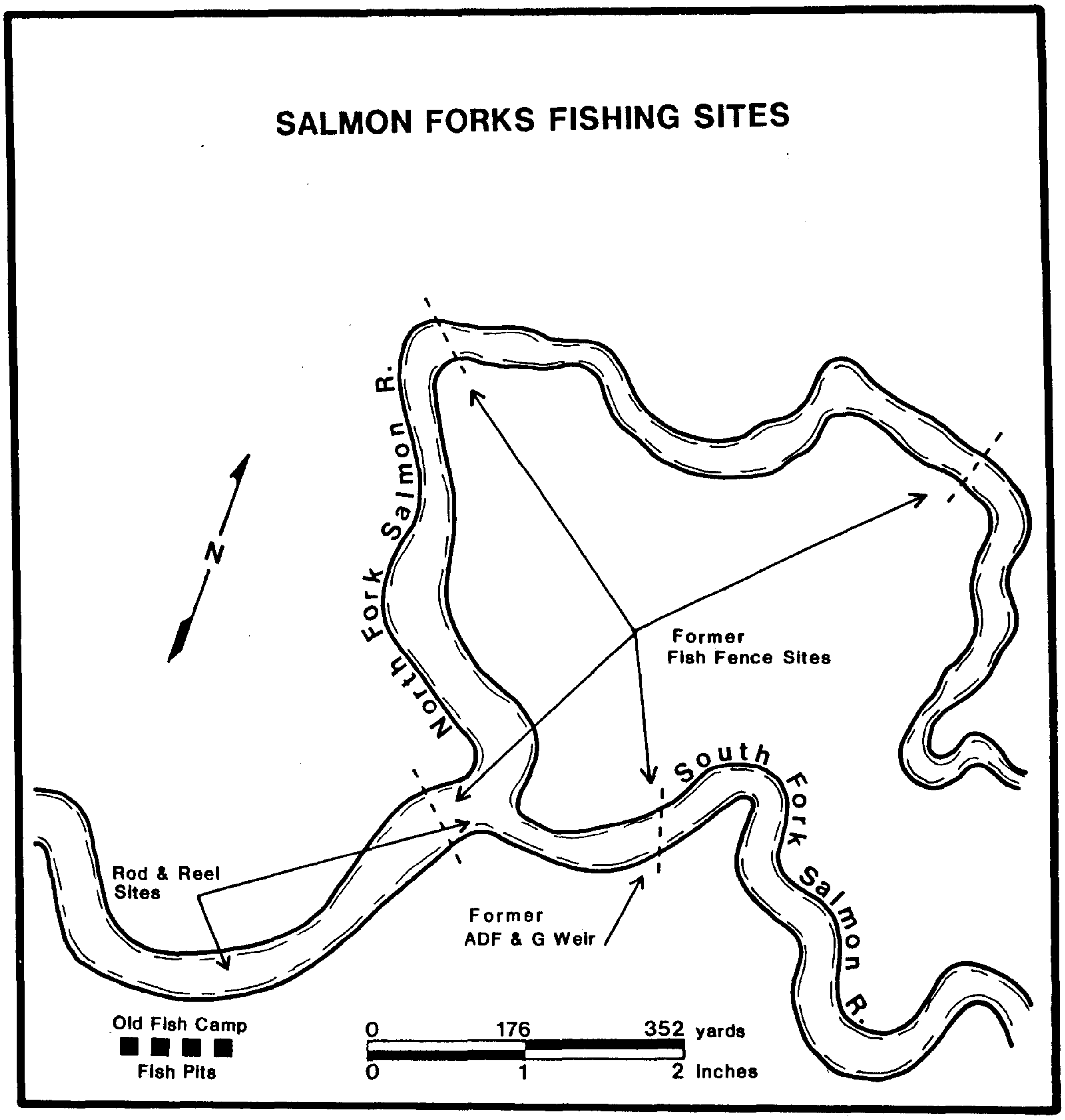

Fig. 28. Location of the former Division of Commercial Fisheries weir in relation to existing fishing sites and historically used fence sites.

little long-term information on the status of the largest and locally most important fishery was garnered.

According to long-time users and Division of Commercial Fisheries information, king salmon spawn in most Salmon River system tributaries in runs varying in size from less than 50 to over 2,000 fish. Table 19 depicts the estimated five-year escapement of king salmon in the Salmon River between 1979 and 1984, using both aerial surveys and weir counts (W. Avery pers. comm. 1984). From 1979 to 1981, Division of Subsistence data show increasing participation by Nikolai households in the Salmon River Fishery, leveling off between 1981-84 (Fig. 29). While this increased use (actually a resumption of a traditional use) is encouraging in the minds of many area residents, a number of concerns and issues are developing as well.

During the course of field research, many area fishermen noted declines in the king salmon run size in all area drainages over the previous 15 years. These discussions with long-time fishermen were consistent and definite. According to respondents, during the many years of fence operation on the Salmon River up until the mid-1960s (Appendix 3), consecutive annual harvests of 2,000 or more kings were not uncommon. These harvests occurred over a large number of seasons, and users perceived little decline in run size. Obviously, the customary harvest levels of 20 years ago would, in short order, decimate the runs of today (Table 19). The historically heavily-utilized Little Tonzona River has experienced similar pronounced king salmon population declines, even though the salmon run in that stream has always been smaller than that of the Salmon River. Nikolai fishermen and long-term observers tend to associate this decline or reduction in king salmon

TABLE 19. ESTIMATED KING SALMON ESCAPEMENT IN THE SALMON RIVER 1979-1984.

Year	1979	1980	1981*	1982*	1983	1984
Escapement	682	1450	1474	511	572	700**

Source: Division of Commercial Fisheries
* denotes use of ADF&G weir for estimating escapement; in other years aerial survey techniques were used
** preliminary estimate - D. Schneiderman pers. comm., 1985

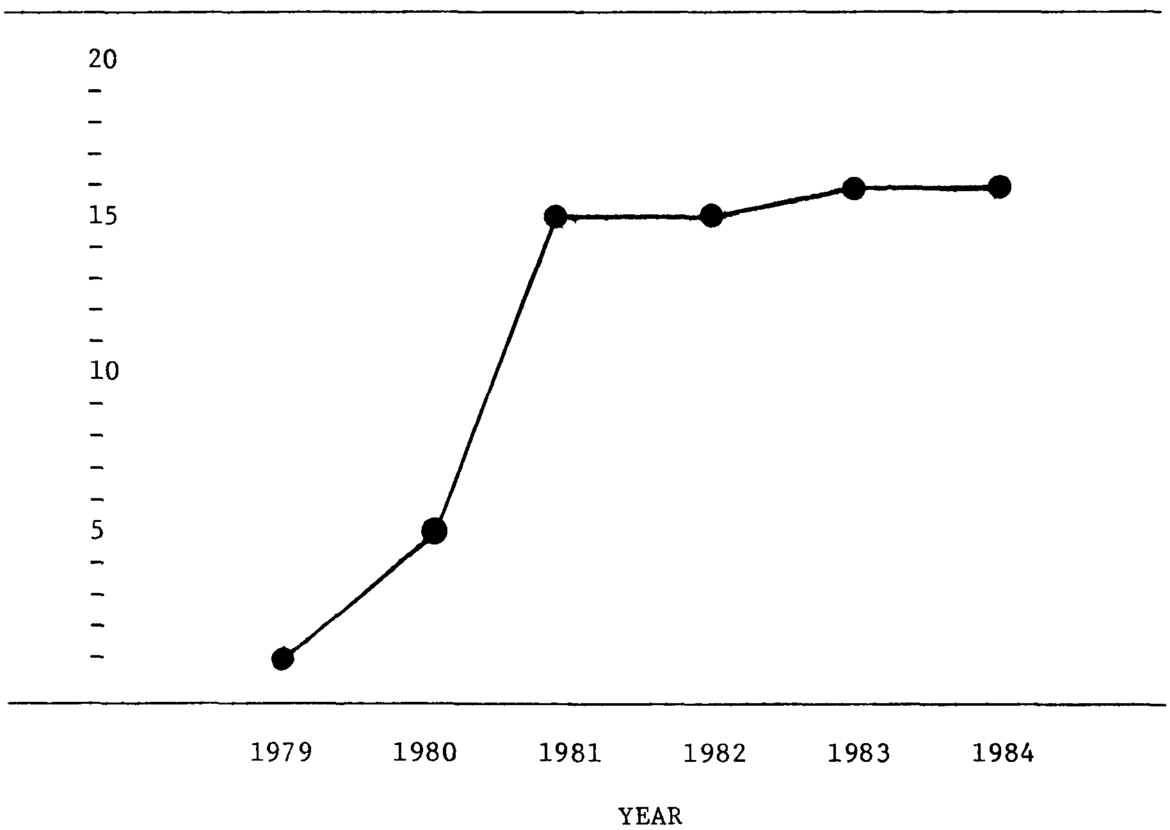

Fig. 29. Nikolai household participation levels in the Salmon River drainage, 1979-1984.

stocks, in both fisheries, to increased commercial fishing in both the lower Kuskokwim River and in the high seas.

In theory, the ten-year "hiatus" in Upper Kuskokwim salmon fishing, associated with the demise of an important traditional technology and the transition from dogs to snowmobiles and back, should have facilitated a replenishment of stocks in the upper river. In reality, however, most fishermen who resumed fishing in the late 1970s noted that marked declines in king salmon run size had occurred between the mid-1960s and mid-1970s when compared to the run strengths of the 1950s and 1960s. These concerns and perceptions as yet have not led to changes in management of the lower river and high seas commercial fisheries. The absence of long-term studies, along with the elimination of the Salmon River weir to monitor escapement, leaves the issue of declining salmon runs largely unsettled to the dismay of many area fishermen.

Concern over king salmon resource levels is amplified and complicated by the increased competition in the Salmon River by non-Nikolai fishermen who have recently "discovered" the fishery. This new user group has been attracted to this fishery in recent years by the relatively successful rod and reel harvest techniques employed by Nikolai fishermen. These recent participants, for the most part, lack or fail to appreciate the historical reasons for the subsistence rod and reel fishery at Salmon River. Like the state regulations, they tend to classify all rod and reel fishing activities as "sport" or "recreational" in nature. As stated before, this is not the case for Nikolai fishermen, who generally view use of this particular gear type as the best alternative to the traditionally utilized, but now illegal, fence and trap arrangement. Furthermore, most Nikolai residents using the Salmon River fishery, because of their involvement in the area prior to the introduction of rods and reels, consider it to be a customary and traditional use area for Nikolai.

Increasing competition for these limited resources has created tension on the part of some Nikolai participants, who believe the activities of many McGrath and even some Nikolai fishermen are detrimental to the fishery. Fear of "commercialization" or sport-oriented domination is a common concern to many of the people whose families have historically utilized the fishery. Long-time fishing families fear that a characterization of the fishery as sport or personal use in nature, based on the predominant gear type employed, could lead to inappropriate harvest restrictions being imposed on customary subsistence uses. Consequently, Nikolai residents are adamant in their view that the Salmon River is a subsistence fishery and, should allocation measures become a reality in the future, their continued use will be considered as such.

Increasing participation in the Salmon River fishery is exacerbated by the shortage of suitable campsites near the two locations which have historically yielded large numbers of kings. Both sites are fronted by Native allotments granted to Nikolai residents. To date, landowners have been reluctant to initiate selective trespass or eviction actions.

Interest in the health of area salmon stocks is not limited to Nikolai-utilized fisheries. Elderly Nikolai inhabitants recall the existence of fairly strong chinook and chum runs in the Takotna River until the early 1900s. Today, these runs are essentially non-existent. Review of literature provides little insight into the decline of the

Takotna River salmon stock. Contemporary speculation on what happened to these salmon runs is varied, depending on the individual. Among Nikolai elderly residents, the cause is most often attributed to changes in water quality and/or destruction of key spawning areas, associated with mining activities in the area. One respondent who helped operate a fence on the Takotna River recalls seeing large numbers of dead fish floating along the river above present-day Takotna, possibly poisoned by by-products associated with the gold extraction/separation process. On the other hand, individuals involved in mining point out that comparatively little placer activity occurred in the Takotna River in the early 1900s. Other long-time residents of the area believe systematic overharvest by early-day trappers, prospectors, and merchants may have been a contributing factor as well. As previously noted, fishing for local sale to miners and mink ranches occurred during and immediately following the gold boom period. Still other area residents having knowledge of the Takotna River believe disease may have been a factor in salmon stock decline. Finally, yet other area residents attribute the decline of Takotna River salmon stocks to overharvest in the high seas or lower river. Discussions about the decline of Takotna River salmon are by no means harmonious and, because each point of view appears to have merit, the probable cause may be a combination of some or all of these factors. In any event, there have been, for several years, ongoing discussions among Takotna residents about restocking this important tributary with one or more of the species of salmon once native to this river system.

Long-term residents of McGrath note declines in the health of the salmon stocks in the main Kuskokwim river over the previous 20 years.

Like their Nikolai counterparts, the greatest concern seems to center on decreases in the availability of king salmon in the main river. For the most part, residents of the community attribute much of the decline to commercial fishing, be it lower river or high seas in origin.

In Telida, fishermen are more philosophical about the absence of king and chum salmon from the upper North Fork system, recognizing that only coho salmon appear to thrive in the area. Most Telida fishermen deem the coho run to be satisfactory to meet their needs, in part because they utilize the excellent whitefish populations of the Swift Fork. However, Telida fishers, like other area residents, have noted comparative declines in run size in recent years for both coho salmon and whitefish in their area.

SALMON FISHING BY NIKOLAI RESIDENTS

Among area residents, Nikolai inhabitants demonstrate the greatest use of salmon. Nikolai fishermen travel further, spend more time afield, and harvest more salmon per household than inhabitants of the other area communities. Without a doubt, salmon fishing is an important element in their annual round.

Salmon Fishing Areas and Gear Types

Present-day Nikolai salmon fishermen primarily utilize the South Fork and Salmon River fisheries (Figs. 27, 30). While king, chum, and coho salmon are available in both drainage systems, Nikolai fishermen generally take all three only in the South Fork, and limit their harvest activities to kings in the Salmon River. Use of these fisheries is not exclusive and, often over the course of the summer, inhabitants of this community participate in both fisheries. Infrequently, Nikolai residents also participate in the "main river" fishery at selected points between the confluence of the North and South forks downstream to the mouth of Grayling Creek (Figs. 27, 30).

Nikolai fishermen employ various methods for harvesting salmon, depending on the target species, site, and desired catch levels. These contemporary methods include use of set nets, fishwheels, dipnets, and rods and reels.

King Salmon

While the relative value of a particular salmon species is largely dependent on interest or desires of each particular user, king salmon are most important to Nikolai inhabitants as a source of food for humans. The following section describes methods of harvest, processing, and use of kings.

Harvest Techniques

As previously noted, the use of rods and reels for king salmon fishing in clear water areas has become increasingly refined, out of necessity, in recent years. While a wide range of commercially made rods and reels is available, several characteristic commonalties have been identified in their selection and use by Nikolai subsistence fishermen. Most fishermen prefer to use moderate strength monofilament

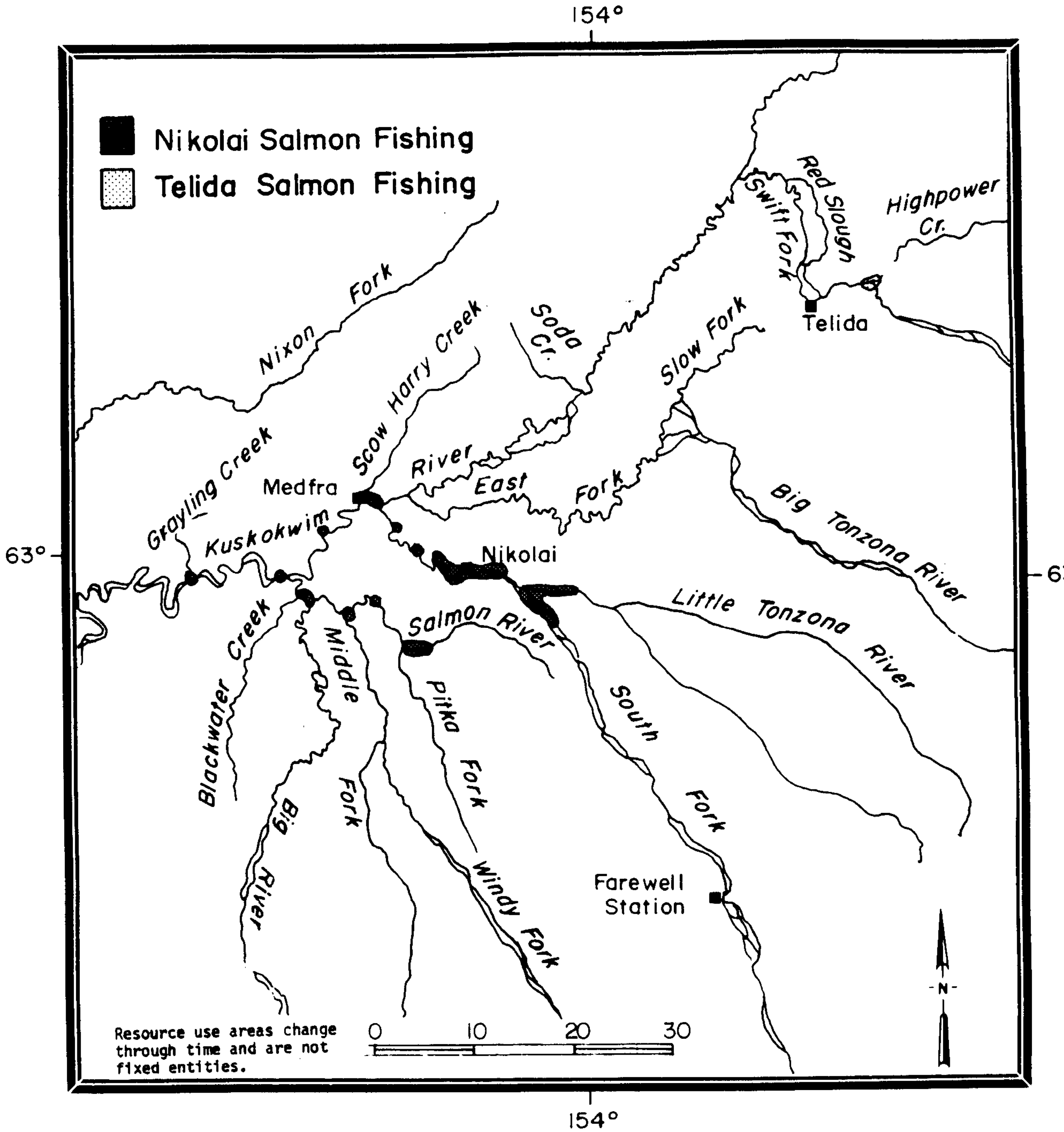

Fig. 30. Salmon fishing areas used by Nikolai residents, 1967-1984.

line ranging from 20 to 35 lb. test on a bail-type spinning reel. Medium duty poles that disassemble in the middle are preferred for their transportability. Steel leaders from 18 to 24 inches in length are employed at the line end. There is an element of subjectivity in lure choice, and most participants have on hand several dozen of varying weight, color, size, and movement. Many fishermen attach small lead sinkers to their leader to help compensate for the strength of the water current.

Most rod and reel salmon fishing occurs from the river bank or from boats tied to the shore, near sites traditionally identified as salmon "milling" locations. Occasionally, people rod-and-reel fish from drifting boats in both the Salmon and Little Tonzona rivers. The majority of the king salmon taken with rods and reels are hooked in the mouth, indicating the salmon's interest in the lures, although early in the summer some may be taken by snagging. Except for the smallest kings, captured salmon are drawn ashore with long handle gaffs or increasingly popular landing nets. In the absence of gaffs or nets, hooked salmon are sometimes shot through the head with a .22 caliber firearm as they near the surface.

Despite the cosmetic appeal of this harvest technique, most participants characterize rod and reel harvest of king salmon in satisfactory quantities as a physically tiring and tedious undertaking. For many households, catching enough fish for the year often necessitates every able-bodied household member, male and female alike, fishing several hours each day throughout the run.

King salmon are taken also through the use of strategically deployed set nets, a method most commonly used for chum and coho. This technology, discussed in greater detail later in the chapter, is most productive in the turbid lower portions of the Salmon River and South Fork fishery. Set net gear for king salmon ranges from 40 to 80 feet in length, with diagonal mesh measurement varying from 4-1/2 to 7-1/4 inches. King salmon are also taken by Nikolai fishermen in limited numbers with fishwheels, although like the set net, this harvest technique is primarily designed to target chum and coho salmon (Appendix 4).

Processing, Preservation, and Use

Most king salmon are preserved in the form of dried smoked "strips." Preparation of these strips is most often a two-stage process. The king salmon is usually split lengthwise and hung in this slab form to air dry for a day or two. Splitting entails removal of the head, backbone, and viscera, along with excessive inner meat. This "pre-drying" process apparently releases much of the moisture and makes strip preparation easier. According to several people who process king salmon in this manner, "pre-drying" minimizes the occurrence of spoilage associated with skin curling as strips begin to dry. Depending on individual preference and the size of the salmon, strips can be completely separated from the remainder of the fish or remain attached at the tail. The latter technique necessitates insertion of whittled spruce sticks to maintain separation for efficient drying. Some people soak the salmon in a brine of salt, or salt and brown sugar immediately prior to hanging the slabs of salmon.

Many of the byproducts of the splitting process, in excess of immediate dog food needs, are saved by Nikolai fishermen. The pectoral fins are sometimes strung together on string and dried for dog food, while the backbones are often preserved for use either as human or canine food (Fig. 31). Roe is often removed intact and dried atop horizontal surfaces of chicken wire (Fig. 32) for use as dog food, trap bait, and bait for non-salmonid fish targeted in late winter and early spring fishing. Smoke is not used to preserve salmon eggs, although the eggs are generally sheltered from the rain to inhibit spoilage. King salmon heads are often preserved through drying by removing the gills and tip of the lower jaw and splitting the top of the head lengthwise (Fig. 33).

Smaller king salmon are sometimes smoke dried as "flat fish" (Fig. 33). Instead of completely cutting the salmon in half, only the underside is cut lengthwise to remove the viscera. The meat of the flattened salmon is then horizontally and vertically scored, creating a pattern of small squares or rectangles one inch or less across. Whittled spruce sticks (Fig. 32) are placed across the skin side of the fish from outside to outside to maintain the flat dimension during the course of drying.

While not extensively practiced in recent years, king salmon are also preserved through continuous immersion in a stiff brine solution. Originally undertaken in wooden casks, "salmon bellies" are now most often prepared and stored in plastic 5-gallon buckets. Consisting of alternating layers of salmon sides or "bellies" and rock salt, a small amount of water is added to the top of each container prior to sealing. Winter use of salmon stored in this manner requires several days of soaking in changes of fresh water to wash out the saline flavor.

Fig. 31. Drying king salmon pectoral fins and backbones.

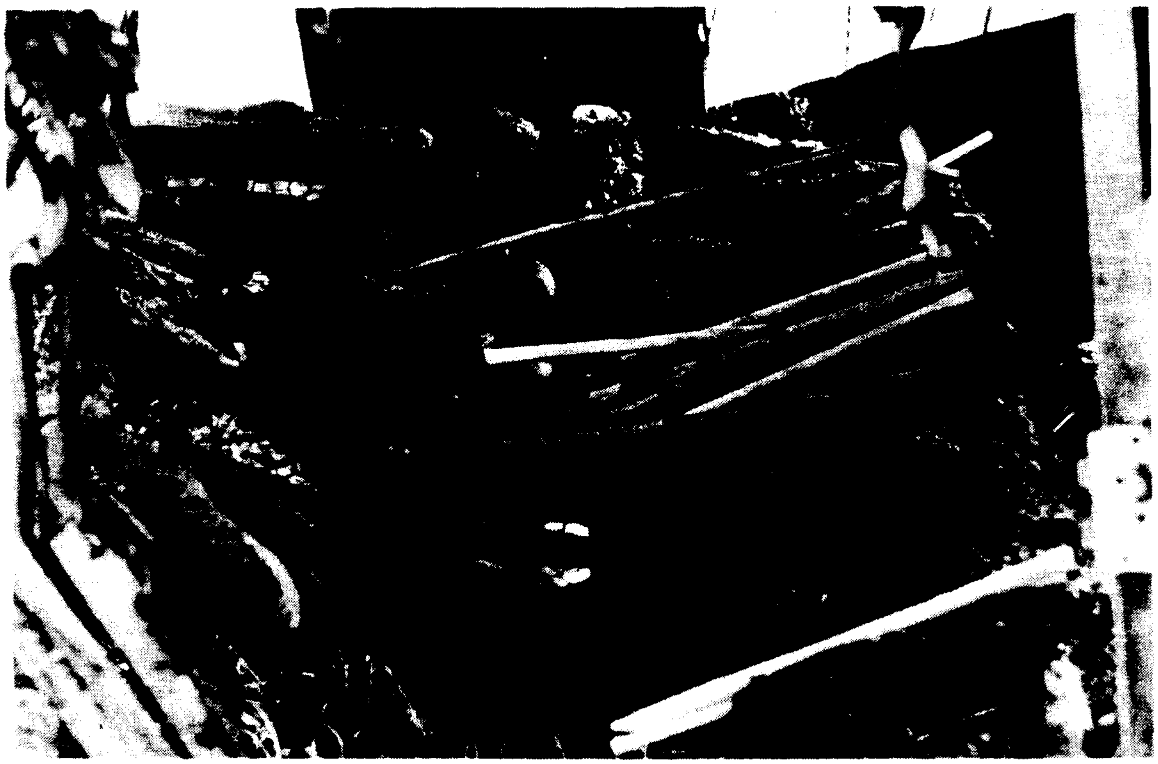

Fig. 32. Drying king salmon eggs.

Fig. 33. Drying king salmon as "flat fish" and king salmon heads.

The most recent preservation technique employed by Nikolai fishermen involves freezing king salmon. Frozen either whole, in chunks, or after a day or two of smoking, people in Nikolai are increasingly employing this method of storage for a portion of their annual catch.

Even if people intend to dry their salmon catch elsewhere, be it the home community or another fishcamp, many often undertake the initial drying stages afield, particularly if a large number of salmon have been taken. Removal of the viscera, and even a single night of drying, appreciably reduces the weight of individual fish, an important consideration when transporting a number of king salmon great distances. This is certainly the case when transporting salmon from most Salmon River fish camps to the village.

While the specific features and dimensions of each fish camp and fish rack vary, there are numerous commonalties associated with each. The central structures in each Nikolai-utilized fish camp are the fish racks designed to air dry harvested salmon. Overall dimensions range from 6 feet by 8 feet to more than 15 feet by 20 feet. Most fish camp frames are constructed from spruce poles and feature a central "ridge pole" for supporting a roof of wood, metal, spruce bark, canvas, or polyvinyl tarp. Often the elaborateness of a fish camp is a product of its permanency and, consequently, those featuring wooden or metal roofs have a long history of use. The sides are sometimes partially or completely covered with lumber, canvas or polyvinyl tarps, sheetmetal, or a combination of these materials. Beyond availability, the choice of material depends on weather conditions, anticipated length of stay, and the preferences of individual fishermen. In the most general terms, Nikolai and Upper Kuskokwim fish camps are designed to suspend varying quantities of cut salmon over or near cottonwood or alder smoke, away from inclement weather. The smoke aids drying, adds flavor, and inhibits insect infestation. Drying structures are designed to permit one, two, and at times, three tiers of fish to be dried. Figures 34 and 35 depict typical fish racks utilized by Nikolai inhabitants. Drying structures or fish racks are most effective when constructed in open areas away from timber, brush, and other vegetative ground cover, since this permits greater air circulation and reduces humidity, both important factors in the salmon drying process.

For the smoking process, cottonwood is the most common choice and can be either green or dry. One reported drawback to the use of green smoke wood is the greater amount of moisture or steam released as the wood burns, slowing the drying process. Partially dry alder is also occasionally used for smoking fish, although it is often difficult to obtain in necessary quanties. At the more established fishing locations, smoke wood is burned in metal containers, typically a 55-gallon drum which has been cut in half either horizontally or vertically. The smoldering wood is often partially or completely covered by a sheet of metal to control the rate of burning.

Another common feature of Nikolai fish camps is a cutting table. Constructed from spruce poles, scrap lumber, plywood, or other materials, most tables are between 30 and 40 inches in height with a surface area from 4 to 12 feet square. Larger cutting tables or platforms permit several persons to work simultaneously. Tables are often covered with sheets of white spruce bark or burlap bags to keep the fish from slipping. The cover material is generally washed at least once daily to remove slime, blood, and small bits of meat. Washing may take the form

Fig. 34. Typical Nikolai fish drying and smoking rack in use.

Fig. 35. Typical Nikolai fish drying and smoking rack in use.

of sluicing with fresh water or through prolonged submersion in the river. Because spruce bark requires moisture to retain pliability, this material is often stored between uses beneath the water along the river bank, held in place by rocks or other weights. Not only does the removal of blood and slime improve the ability of users to hold the salmon in place during the cutting process, but a clean work area also reduces the attraction of fish-infesting insects. Interestingly, the apparently widespread Yukon River practice of affixing salmon to the cutting table by impaling the tail on a nail is only practiced by a single individual.

Coho and Chum Salmon

Of the three salmon species common to the upper river areas, chum salmon are the most abundant and the annual harvest numerically far exceeds that of other species. To some Nikolai fishermen, the chum run is the most important of the season and, consequently, greater resources are applied to their harvest. The coho salmon run, also appreciable in numbers, is targeted by many Nikolai users. Primarily utilized for dog food, chum salmon are also an important source of human food to many people.

Harvest Techniques

Set nets are the most commonly used type of gear among Nikolai chum and coho fishermen. Virtually every fishing household owns at least one, and many families have several, often of different lengths and meshes. Compared to fishwheels, set nets afford fishermen a greater degree of freedom and mobility in determining fishing sites. They work well in the generally turbid rivers characteristic of much of the region. Their relatively low price ($90 to $150) and durability makes them attractive to fishermen who are unwilling or unable to construct fishwheels.

The length and mesh size of set nets varies between fishermen and is in part determined by the site where it is intended for use and the targeted species. Nikolai salmon fishermen generally use nets featuring 5-7/8 inch diagonally measured mesh for chum and coho salmon, although whitefish nets (4-1/2 inch) are also effectively employed, particularly when fishermen are simultaneously targeting both species. Prolonged use of the smaller mesh set nets for salmon harvest is usually avoided because the lighter twine characteristic of these nets tends to become damaged by the larger fish. Nets average 60 feet in length and are most commonly 28 meshes deep.

Set nets work best in areas of slack current, locally known as "eddies." Most often, these eddies are formed by shifts or changes in area river channels which create small backwater areas. Often these eddy sites only exist for a few seasons before filling with settling silt, although the dynamics of area rivers causes continual creation of new ones. While some of these natural backwater areas are evident throughout the summer, others exist only during periods of extremely high or low river stages. Probably the most predictable, and often most productive, sites occur at the inside confluence of two tributaries. Set net sites productive for king salmon harvest usually yield chum and coho salmon as well, although there are a few locations where only the latter species is caught.

Generally, a stout wooden pole is worked down or driven well into the ground several feet from the water's edge. Such poles or stakes are usually tall enough to accommodate rises in the river stages that, at times, leaves them extending from the water many feet away from shore. It is a common practice among Nikolai fishermen to drive additional "safety" stakes in the same area to doubly secure the net's shoreline (a line attached to the end of the floatline) in the event the primary pole works loose. After the shoreline is secured, the net is then deployed over the bow of the boat, working outwards from the post at an angle perpendicular to the bank. Boat propulsion for net deployment is often provided with paddles or a slowly running outboard engine. Frequently, once the net is set in the desired place, an anchor consisting of scrap metal or cans or burlap sacks filled with rocks or gravel is attached to the leadline with a short length of rope and is dropped overboard to maintain the net's position. A float, consisting of an empty fuel can or large plastic bottle, is then affixed to the outer end of the floatline to serve as both a marker and to provide additional flotation. Commercially-manufactured net buoys are not utilized by Nikolai fishermen.

Care is taken when setting a net to insure the river bottom is free of sunken logs as, in periods of high water, these waterlogged trees travel along the bottom, sometimes coming to rest in areas of slack current. High water also presents problems with surface flotsam and consequently, most Nikolai fishermen remove their fish nets from the water during high river stages.

Set nets are checked at least once daily, and when the run is heavy, salmon are removed in the mornings and evenings. Most Nikolai fishermen check their nets from the anchor end, working towards the shore. Because of the comparatively short length of upper river nets (40 to 80 feet), most people check their nets by lifting them from the water parallel to the side of the boat. The net is generally drawn up in a "roll," wrapped in such a way that the side of the net the salmon approaches from is folded inward to prevent minimally tangled fish from escaping. Live salmon are generally dispatched by several blows to the top of the head with a short wooden club or stick prior to removal from the net. Because of the favored smaller mesh nets, most salmon are entangled about the jaw or head and are, consequently, removed from the front, although smaller fish caught around their middle are often pulled through the mesh. As the run progresses and the salmon age, the large teeth, characteristic of spawning males, complicate easy removal from the net; several Nikolai users report cutting off the lower jaw with a knife or wire cutters to expedite this process. As fish are removed from the net, they are most commonly placed in metal tubs, barrels, or buckets to both reduce contamination by bilge water and to keep the boat clean.

While the net is being checked, sticks and other debris are removed, often placed in the bottom of the boat for later disposal away from the eddy. Because of the high moss content of area rivers, nets are periodically taken from the water and dried for a few hours so this accumulation can be simply removed by shaking the net. At the same time, major holes or tears in the net or lines may also be repaired.

Set nets are often stored for the winter in burlap bags or are otherwise protected from the elements. Among Nikolai fishermen, stored nets are usually placed off the ground to prevent loose dogs from urinating on them, something believed to cause a decrease in their catch.

Fishwheels yield appreciable quantities of chum and coho salmon for Nikolai fishermen, and as the run peaks, wheels are the most productive gear type for coho salmon. However, they are less popular than set nets, based on the limited number that are built. Fishwheels are most productive during periods of low or moderate river stages. When such conditions are concurrent with the peak of the chum run, harvests in excess of 200 salmon per day are possible, although their effectiveness diminishes as the season progresses and the water begins to clear. All Nikolai-based fishwheels are located in the South Fork along a 1-1/2 mile stretch of river immediately contiguous to the community. Appendix 4 discusses fishwheel construction and use in detail.

In recent years, the rod and reel techniques perfected in pursuit of king salmon have been applied to chum and coho salmon at selected locations. Because of the preference for and availability of both chum and coho salmon in the lower or turbid portions of the river, as well as the efficiency of set nets and fishwheels, the rod and reel harvest is quite low and most often is supplemental to these other gear types.

Nikolai fishermen generally harvest chum salmon with rods and reels near the mouth of small clear water South Fork tributaries (creeks), upstream of the mouth of the Little Tonzona River, late in the fall. As turbidity decreases late in the fall, chum salmon are also occasionally taken with rods and reels in the South Fork itself, often near the community. Coho salmon are taken also in limited numbers with rods and reels late in the fall, often in the main river concurrent to chum harvest efforts with the same gear. The harvest of both species with rods and reels is miniscule compared to the yield from fishwheels and set nets.

Dipnets are also occasionally utilized by a few Nikolai residents for coho and chum harvest during periods of low water. Recently introduced, these dipnets are generally commercially-made salmon landing nets, modified through the addition of an extended spruce or birch handle. They are most often employed in shallow water near the edge of bars and the harvest is quite low. Generally, people using dipnets sweep the device through the water near "fish waves" or ripples created by salmon swimming near the surface. Turbidity does not appear to be a factor in success, as individuals are seen using them in both clear and silty conditions.

Another form of chum salmon harvest bears noting. Some fishermen, particularly those with dog teams, occasionally travel by boat to the upper South Fork and gather spawned-out salmon for dog food. This occurs most often when the participant was not able to fish during the lower river run. These spawned out salmon are often preserved whole through open air freezing as, generally, this type of harvest occurs late in the fall.

Processing, Preservation, and Use

Most of the chum and coho salmon taken by Nikolai fisherman are preserved through a drying process resembling that employed for king salmon. While much of this dried harvest is used in winter for dog food, an appreciable amount is also preserved for human consumption.

Despite similarities between the king and chum/coho drying processes, there are also differences. Further, there are numerous slight variations between fishermen in how chums and cohos are cut, although there are only two general forms the finished product takes. One form consists of leaving the head and backbone attached, while the other entails removal of these two components.

To obtain the former product, the fish in split in half from tail to nose. This lengthwise cut is made along one side of the backbone and, consequently one half of the split salmon tends to be thicker. The thicker side is cross-hatched from the outer or skin side, while the thinner side is cross-cut from the inside. Advantages to this cutting style includes the preservation of a greater amount of meat and a decrease in processing time. On the other hand, the thicker portions of meat require longer drying periods and are somewhat more susceptible to rot and insect infestation.

Alternately, some fisherman remove the backbone and head as part of the splitting process, leaving a thinner but quicker-drying fish. Salmon processed in this manner are cross-hatched on the inside. Extra time is required to cut fish in this manner and less meat remains. Some of the meat loss can be offset by separately drying the backbones and heads, although most fishermen employing this technique cook both by-products for their dogs.

Because of the smaller size of these two species, cutting is a relatively faster process compared to the processing time of king salmon. Individual skilled fishcutters can process upwards of 250 fish per day if necessary. Each fish is generally rinsed in one or two stages to remove much of the blood and slime. Placed over a spruce pole, chum and coho salmon are hung initially with the skin side out for at least several hours. Most are turned over once the slime has dried. To facilitate air circulation, spaces of an inch or more are left between each freshly hung salmon. As they dry, the space between each is reduced, creating additional room for more fish. Once nearly dry, the salmon can be piled atop each other on the racks or hung vertically by "the ears" (small holes immediately behind the pectoral fins) to create even more space. As the drying process continues, spots infested with maggots are cut or burned out. Badly infested fish may be cooked for dogs or otherwise disposed of.

The drying structures employed are generally the same ones used for king salmon, although as noted earlier, some of the chinook harvest locations are utilized exclusively for that species. At times, the large volume of the chum catch necessitates hanging the salmon on uncovered fish racks. This practice is most common during periods of warm and dry weather and, like salmon hung under a roofed area, smoke is employed to reduce insect infestation. Generally, as space permits, these fish are later transferred to the permanent drying structure.

Nikolai fishermen generally remove dried chum and coho salmon from the fish racks, and place them in a cache for winter use. Most fishermen pile the dried salmon in the cache, although some make bundles of the fish or store them in burlap bags.

While drying is the most common processing technique employed among Nikolai fishermen, some preserve a portion of their catch in freezers for winter use as dog food. Once outdoor temperatures approach 32°

Fahrenheit, the frozen fish often are removed from the freezer and stored in the open. Additionally, salmon taken during the late fall and early winter are sometimes stacked in the open air "like cord wood."

A few fishermen store chums and cohos taken late in the fall in storage pits excavated adjacent to or atop permafrost locations. A recent variation of this technique consists of first freezing the fish in a freezer prior to placing in the pit. The major drawback associated with this method is the possibility of rot setting in should extended periods of warm weather occur.

A few chum and coho salmon are freshly eaten by fishermen, their families, and other Nikolai residents. Likewise, some of the richer dried fish taken early in the season are consumed later in the year. Nikolai residents also utilize a portion of the dried fish for trap bait later in the winter.

Harvest Levels

Over a four-year period, all salmon fishing families in Nikolai were surveyed to determine their harvest of king, chum, and coho salmon. The numbers of salmon taken in each year varied by household and species. Harvest levels were influenced by a number of factors including water conditions, individual participant efforts, run strength, and desired level of harvest. In 1981, Nikolai fishermen harvested 500 kings, 3,700 chums, and 50 coho salmon; in 1982, 778 kings, 4,360 chums, and 978 coho; in 1983, 750 kings, 2,600 chums, and 300 coho; and in 1984, 795 kings, 5,100 chums, and 200 coho (Fig. 36, Table 20). During this four-year period, 1984 provided the best king

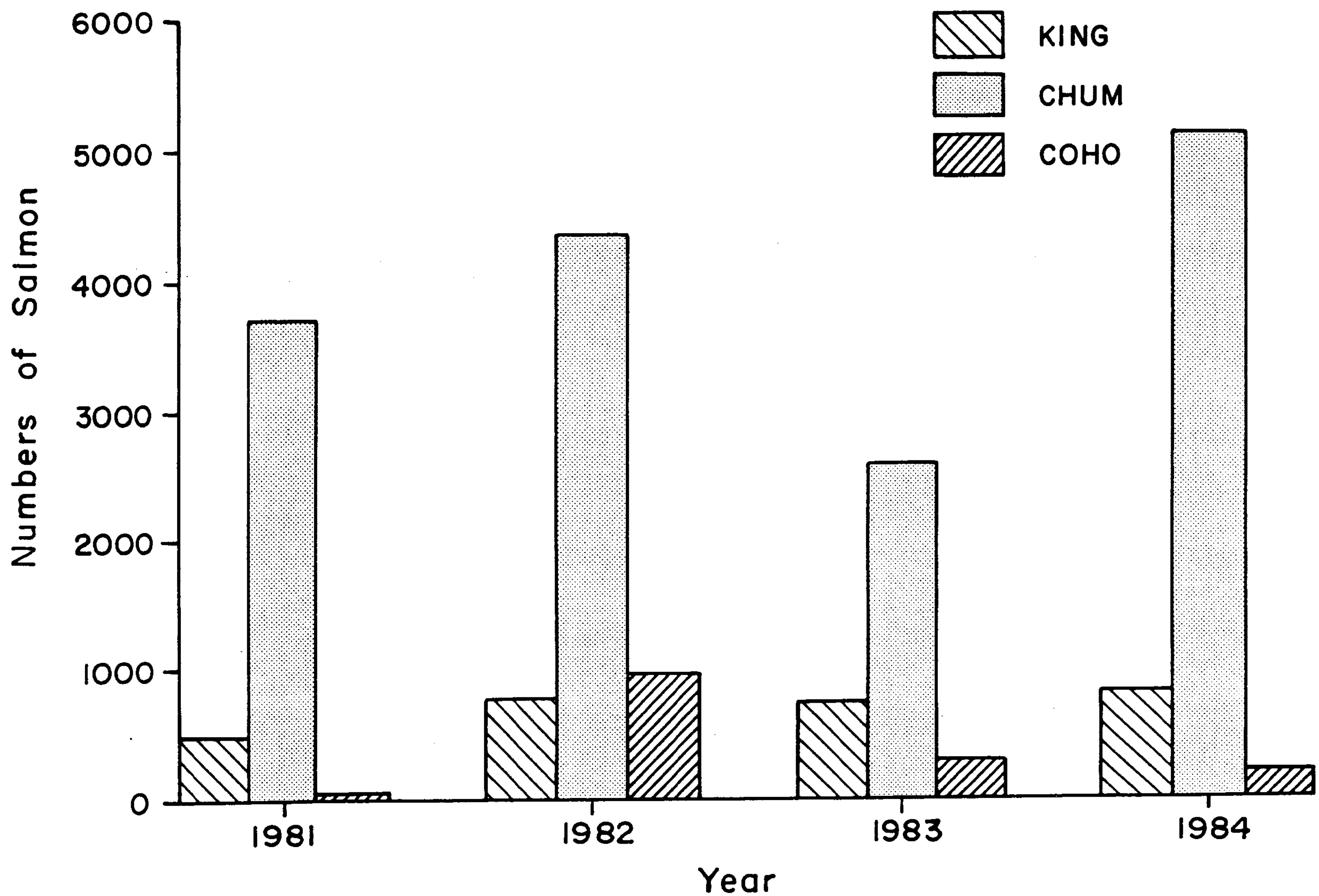

Fig. 36. Salmon harvests for Nikolai fishermen, 1981-1984.

TABLE 20. NIKOLAI HOUSEHOLDS FISHING FOR SALMON AND HARVESTS, 1981-1984.

	KING SALMON			CHUM SALMON			COHO SALMON		
Year	No. of Hhlds. Fishing	No. Hvstd.	Avg. per Hhld.	No. of Hhlds. Fishing	No. Hvstd.	Avg. per Hhld.	No. of Hhlds. Fishing	No. Hvstd.	Avg. per Hhld.
1981	18	500	27.7	16	3700	231.2	11	50	4.5
1982	22	778	35.4	19	4360	229.5	14	978	69.8
1983	22	750	34.1	16	2600	162.5	14	300	21.4
1984	23	795	34.5	26	5100	196.2	26	200	7.7

and chum harvest for Nikolai fishermen, while 1982 yielded the most coho salmon. During this same period, the number of fishing households increased, but varied by species. However, harvest per fishing household has remained the same for kings and declined for chum and coho in the past three seasons (Table 20). As was noted earlier, the harvest of coho and chum is limited to the South Fork since they rarely occur in the North Fork system. King salmon are taken in both the South Fork and Salmon River, although more are harvested from the Salmon River where household participation has increased (Fig. 29). The ratio of king salmon harvest in the two drainages has remained nearly constant for the past four years, although an increasing south fork harvest has reduced the margin between the two fisheries (Table 21).

For all three species of salmon common to the area, the highest participation levels among Nikolai fishermen occurred in 1984. This increase in participation is most pronounced in the level of chum fishing, where a 63 percent increase in fishing households was noted between 1981 and 1984.

SALMON FISHING BY MCGRATH AND TAKOTNA RESIDENTS

Since few salmon currently return up the generally clear Takotna River, residents of Takotna must travel to the main Kuskokwim to participate in an adequate salmon fishery. Because the main Kuskokwim fishery is also utilized by McGrath fishermen, the salmon fishing practices of both Takotna and McGrath are discussed in this section.

McGrath residents target king, chum, and coho salmon at various locations for human food and dog food requirements. Takotna fishermen

TABLE 21. KING SALMON HARVESTS BY NIKOLAI RESIDENTS IN TWO DRAINAGES, 1981-1984.

	Drainage				
	Salmon River		South Fork		
Year	Number Harvested	% of Total	Number Harvested	% of Total	Total Harvested
1981	350	70	150	30	500
1982	497	64	281	36	778
1983	490	65	260	35	750
1984	475	60	320	40	795

utilize many of the same sites as do McGrath residents when they fish for salmon. In comparison to other upstream areas in the study area, salmon taken in the main river tend to be of better quality and are often more abundant.

Salmon Fishing Areas and Gear Types

McGrath and Takotna residents have, over the years, concentrated their salmon fishing efforts along the main Kuskokwim near McGrath ranging as far downstream as Wilson Slough and upriver as far as Grayling Creek, utilizing fishwheels, set nets, and, among McGrath fishermen, drift nets. McGrath salmon fishing efforts has been concentrated near the mouth of the Takotna River, where up to eight set nets and two fishwheels have been in use simultaneously (Fig. 37). Takotna residents have focused their salmon harvest effort around the Sterling Landing area, approximately 25 miles downstream (Fig. 37). Additionally, in recent years, increasing numbers of McGrath-based fishermen have traveled to the Salmon River during July to harvest king salmon with

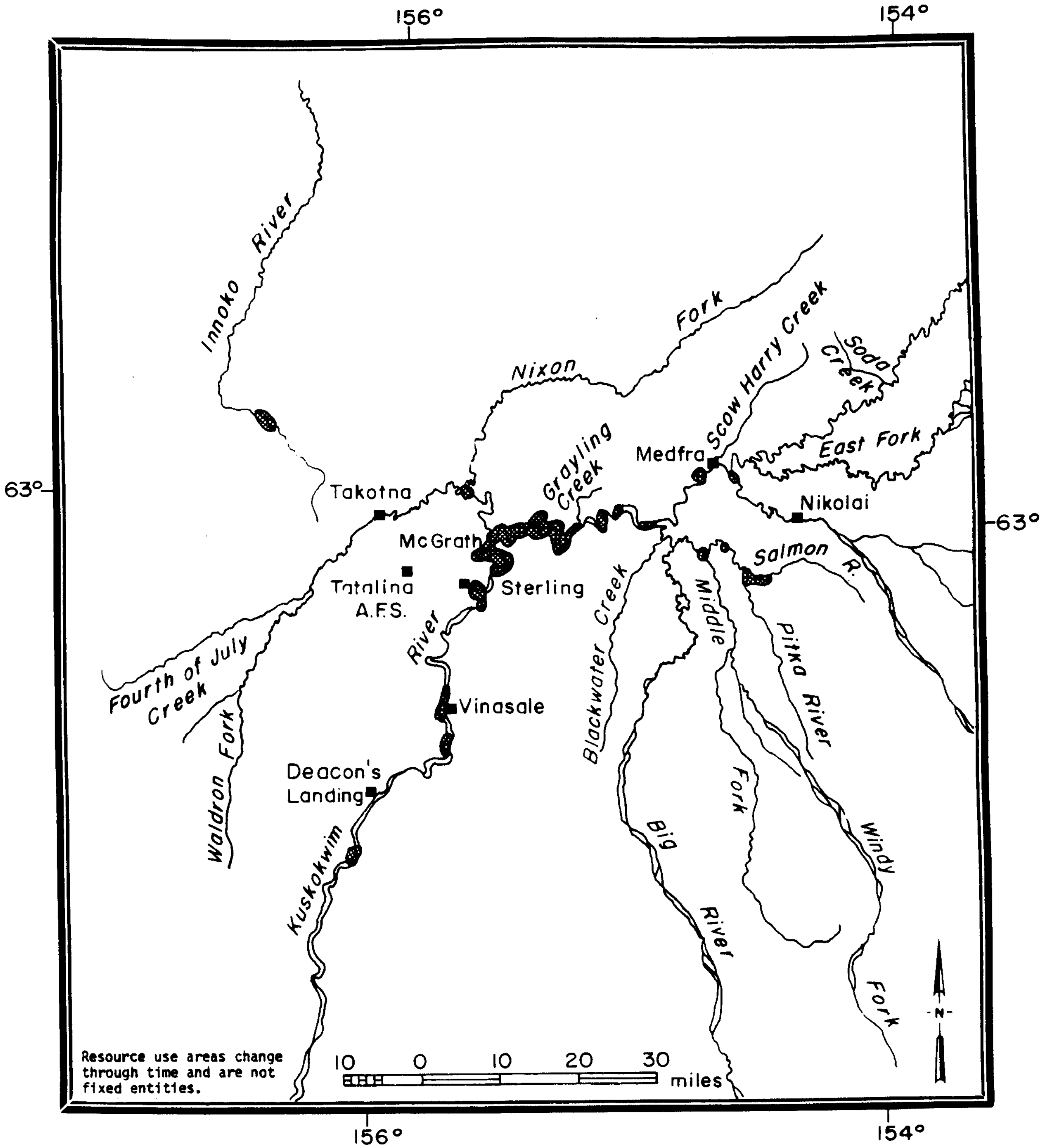

Fig. 37. Salmon fishing areas used by McGrath and Takotna residents, 1967-1984.

rods and reels (Fig. 38). For some, this harvest is primary in terms of a household's annual king take, while for others, salmon taken in the Salmon River with rods and reels are supplemental to main river catches. Issues associated with the Salmon River fishery were discussed earlier in this chapter.

King Salmon

Among residents of both communities, king salmon are highly prized for their human food value. Arriving in the vicinity of McGrath by the middle of June, the run generally lasts well into July.

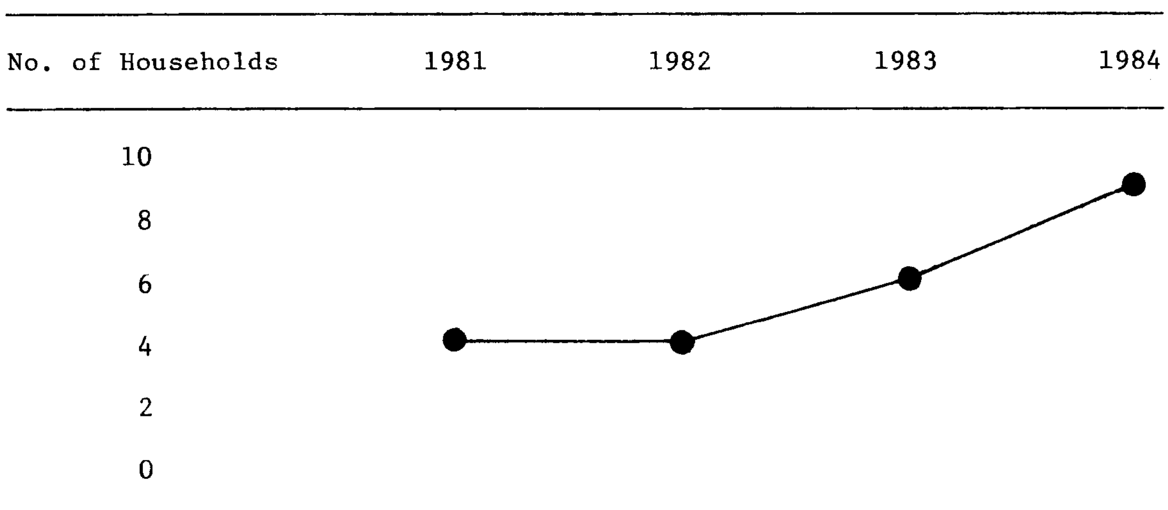

Fig. 38. McGrath household participation levels in the Salmon River king salmon fishery, 1981-1984.

Harvest Techniques

The most common gear type employed is the set net. For Takotna inhabitants, there are reportedly enough eddies near Sterling Landing to facilitate deployment of nets in a manner similar to that described for Nikolai fishermen. Because of the comparatively few eddies near McGrath, some McGrath fishermen successfully harvest king salmon with stationary nets deployed in areas of moderate water current. Employing large anchors to maintain net position perpendicular to the bank and sinking the floatline beneath the water surface to avoid flotsam, McGrath fishermen are able to take king salmon in the main river away from conventional places of slack water.

Set nets at eddy sites are generally deployed in a manner similar to that described for Nikolai fishermen. While many McGrath and Takotna fishermen take kings using nets with a mesh size designed for taking chums, a few inhabitants of McGrath use the larger mesh nets designed primarily for kings. Net length varies between 40 and 100 feet, with most being 60 or 80 feet long. Probably the most notable difference between nets set by Nikolai and McGrath fishermen is the occasional use of commercial buoys affixed to the end of the floatline by the latter.

Drift nets are employed by some McGrath king salmon fishermen. Almost all drifting occurs with nets designed for stationary use and, consequently, residents using this method sometimes tie several set nets together to obtain the desired length. While some fishermen use a single boat for drifting, others combine resources and drift together with one boat at each end of the net. Fishermen having experience with drifting in this manner indicate that the engine of the second boat is most often used to pull the net taut as it is fed over the side of the main boat. In addition, both boats may alternately employ their engines to maintain desired position in the river. As the drift is completed, the net is pulled back into the primary boat where salmon are removed.

In addition to quicker deployment and maintenance of position, use of two boats makes freeing a snagged net easier. Because of the comparatively shorter length of river bends, gear time in the water is limited and the yield from a single drift pass is low; consequently, most people make at least several drifts during a fishing excursion. Party size varies although each boat generally contains at least two individuals. Takotna fishermen are not known to drift. However, kinship or friendship ties between the two communities may enable some Takotna residents to travel with McGrath fishermen when using drift nets.

Fishwheels are also occasionally used to take king salmon. However, this gear type is primarily used for harvesting chum and coho salmon.

Processing, Preservation, and Use

In comparison to Nikolai, a larger proportion of the annual McGrath king salmon catch is preserved by freezing for future human consumption. Some McGrath fishermen also process a portion of their king catch in the form of "strips" in a manner similar to that described earlier in this chapter. For Takotna residents where the king harvest is lower per household, most kings are frozen. Residents of this community may obtain dried salmon strips as gifts or through outright purchase from other areas of western and interior Alaska. Unlike Nikolai fishermen, who process their salmon at fish camps or at temporary stations along the river, many McGrath residents process salmon closer to their houses; often a fair distance from the river. The fish racks and processing are similar. Some people use commercially manufactured "smokers" to produce kippered salmon. Sizes vary, and most are about three feet high and 16 inches wide and deep. Most are made of lightweight metal and burn commercially-available hickory "flavored" chips.

Coho and Chum Salmon

For reasons similar to those described for Nikolai salmon fishing, chum and coho harvest efforts by McGrath and Takotna residents appear to have decreased in the late 1960s and early 1970s. Several households, however, retained large teams of dogs even after snowmobiles became widely used for transportation. Some chum fishing continued, but for the most part, dried chum salmon were obtained through purchase or barter from residents of surrounding communities. Chum are the only salmon species which occur in the Takotna River, and the small numbers taken with rods and reels are insignificant when compared to the amount taken with nets and wheels in the main river fishery.

Harvest Techniques

In the middle 1970s, fishwheels again came into use in the McGrath area, although according to one long-time resident, at least one periodically was operated near Sterling Landing throughout the late 1960s and early 1970s. Between two and four fishwheels were used near McGrath each season between 1979 and 1984. These were built by individuals in McGrath or purchased from Nikolai residents. Their construction and use is similar to those described in Appendix 4, although McGrath fishwheels tend to be proportionately larger because of the greater water depth characteristic of the main river. This gear type yields the greatest amount of chum and coho salmon, and most "serious" fishermen favor fishwheels over other gear types. As in Nikolai, many households obtain fish from fishwheels which are jointly operated or shared with others. Productive wheel sites occur along most cut banks in the McGrath area. The most popular location appears to be immediately below the mouth of the Takotna River. Water expelled from the Takotna River tends to push out flotsam in the Kuskokwim River around this location, making the use of fishwheels in this area ideal in periods of high water.

Set nets deployed at many of the same sites utilized for king salmon harvest activities also yield chum and coho salmon. Set nets are generally less productive than fishwheels for chum and coho. While some McGrath-based fishermen reportedly do drift for chum or coho, the intensity of this activity is less than that applied to king salmon.

Processing, Preservation, and Use

McGrath and Takotna fishermen use chum and "silver" salmon as food for both themselves and, when applicable, as a mainstay or dietary supplement for their dogs. In comparison with Nikolai, McGrath and Takotna fishermen tend to freeze a larger proportion of their chum and coho catch for winter use as both human and dog food. Nonetheless, discussions with participant fishermen indicate the largest single preservation practice continues to be drying. With little variation, the cutting processes described for Nikolai are also applicable to McGrath and Takotna fishermen.

The number of dogs owned by McGrath and Takotna fishermen varies from 6 to 60, with the average sized dog lot being substantially larger than those maintained by Nikolai residents. Consequently, a large part of the daily catch is often cooked fresh as dog food. At times an appreciable incidental catch of whitefish is often fresh cooked for dog food. Likewise, the by-products of the cutting process including viscera, eggs, heads, and, when removed, backbones, also are sometimes cooked for dogs. Although some McGrath fishermen preserve the eggs, heads, and backbones for future dog or human use, others discard these parts with the viscera.

Harvest Levels

Harvests by McGrath and Takotna residents were not closely monitored during the study period like Nikolai harvest activities, with the exception of the king salmon catch by McGrath residents occurring in the Salmon River discussed earlier. In 1983, interviews with 25 McGrath households containing one or more members known to have fished for king salmon indicated 830 kings were taken from area fisheries, including approximately 700 from the main Kuskokwim and 130 from the Salmon River, for an average catch of approximately 33 kings per fishing household. These 25 households are believed to represent more than 70 percent of the total number of fishing households, according to knowledgeable community residents. In 1984, the main river harvest was reportedly similar in terms of participation and catch, and the Salmon River take by McGrath residents was approximately 30 kings for a total harvest of approximately 730 kings. In 1983, 14 McGrath households reported harvesting 2,900 chums, while in 1984, the catch by the same number of households totalled 2,450 fish. Seven McGrath households reported taking 300 coho salmon in 1983, the only year harvest data for this species were obtained.

According to the comments of several Upper Kuskokwim residents, interest in the area salmon fisheries among McGrath and Takotna residents is growing. An increasing level of participation and harvest is anticipated to occur over the next few seasons.

SALMON FISHING BY TELIDA RESIDENTS

In Telida, the contemporary salmon catch is dwarfed in comparison to the annual whitefish harvest. Coho salmon is the only salmon species consistently taken by Telida residents. This Upper Kuskokwim salmon fishing is described below. An occasional chum or king is also harvested.

Salmon Fishing Areas and Gear Types

In the past, Telida fishermen conducted most of their salmon harvest near Medfra (Fig. 26). As noted previously, the pattern of spending much of the summer at distant fish camps declined in the mid and late 1960s and ceased altogether by the early 1970s. Contemporary salmon fishing by Telida fishermen now occurs almost exclusively near the confluence of Highpower Creek with the Swift Fork, approximately 15 river miles upstream of the community, from late August through the end of September (see Fig. 30). Harvest activities are generally confined to coho salmon, the only species which runs in significant numbers up the Swift Fork of the Kuskokwim.

Set nets are the predominant gear type employed by Telida residents for the harvest of coho salmon (locally termed "red" salmon). A small portion of the annual catch is taken with rods and reels concurrent with and adjacent to set netting activities. While these nets are deployed in a manner nearly identical to that of Nikolai fishermen, there appears to be a greater tendency toward use of nets designed for harvesting whitefish (4-1/2 inch mesh), the most abundant fish species in the Telida area. The Highpower Creek sites also feature a full run of sheefish.

Fishwheels, common in other portions of the region, are not employed by Telida residents in the Swift Fork because, according to one, "nets work just as good." One Telida area resident operated a fishwheel along the North Fork near the mouth of the Swift Fork in the early 1970s, although it reportedly yielded far more whitefish than coho salmon.

Processing, Preservation, and Use

During the early part of the coho run, the general pattern among Telida fishermen using the Highpower Creek site is to commute to nets daily by boat and return the catch to Telida for processing. As the run intensifies, fishermen sometimes spend longer periods, varying from a single night to nearly one week encamped at the site, harvesting coho salmon, sheefish, and whitefish, sometimes processing all or a portion of the take on-site. Because the coho run occurs in the fall, Telida fishermen often engage in berry picking, moose hunting, and wood cutting in the same area concurrent to fishing activities.

The absence of a community-wide electrical system essentially eliminates the option of freezing harvested coho, although fish taken late in the fall are sometimes stacked out-of-doors as winter approaches. Consequently, salmon in excess of immediate food needs are almost exclusively preserved by the air/smoke drying method described earlier. Additionally, Telida fishermen, on occasion, reportedly preserve the "salmon bellies" using a salting technique like that described earlier for Nikolai. Telida residents occasionally receive small quantities of king and chum salmon, either dried, fresh, or frozen, from friends and relatives in Nikolai and McGrath.

Like other upper Kuskokwim communities, salmon is valued as food for humans and dogs. The local availability of appreciable quantities of whitefish, however, lessens the importance of coho salmon for the latter purpose. Similar to nearly all area fishermen, dried salmon seldom serves as the central component of a meal. Instead, dried salmon is most commonly consumed as a food complementing others in the daily fare. Telida (and Nikolai) residents often make a soup from partially dried fish. Dried salmon also has value to Telida and area residents as trap bait for marten, fox, and other species of furbearers.

Harvest Levels

During the four year study period (1981 through 1984), the annual coho catch among Telida fishermen ranged from approximately 100 to 200 salmon per season. In 1981 and 1982, 200 coho salmon were reportedly taken. In 1983, 120 were harvested and in 1984, the coho catch was about 100 fish.

While only one or two households engage in the actual fishing activity, extensive intra-community distribution takes place among the seven Telida households, who often pool their resources including nets, boats, engines, and fuel, to participate in this fishery. Consequently, the average household harvest during the four-year period was slightly more than 22 coho per household per year. The annual combined incidental king and chum catch for the same period by all Telida residents was less than 30 fish.

SUMMARY

King, chum, and coho salmon are harvested by subsistence fishermen throughout the region. Salmon are taken with a number of gear types including set nets, rods and reels, fishwheels, drift nets, and dipnets, and are actively sought by residents of all four Upper Kuskokwim communities as food for humans and dogs. Salmon preserved by drying, salting, and freezing are consumed throughout the remainder of the year.

After a 10-year lull in fishing efforts, possibly associated with the transition from dog teams to snowmobiles as primary means of winter surface transportation, and with shifts to summer residences closer to the winter settlements, areawide harvest efforts increased in the late 1970s. This growth shows little sign of reversing itself. Users are increasingly concerned about the health of Upper Kuskokwim salmon stocks, whose populations are at substantially lower levels in comparison to the mid-1960s. Conflicts in gear types and competition also are issues at particular locations.

CHAPTER 10

OTHER FISHING IN THE UPPER KUSKOKWIM

While salmon is the primary subsistence fish for Upper Kuskokwim residents, a great deal of time, effort, and equipment is dedicated to the harvest of non-salmonid fish species as well. Freshwater fishing activities involve a greater numbers of people, and participation levels among the young, appear to be higher than for salmon fishing activities. Differences in time of harvest and the nearly year-round availability of some species make freshwater fishing an ongoing activity with the possible exception of the mid-winter months (Fig. 39). Fishing occurs at numerous sites around the study area, some of which are shown in Figures 40 and 41. Non-salmonid species harvested today throughout the area include whitefish, grayling, pike, sheefish, and Dolly Varden. Lesser species harvested include burbot, sucker, blackfish, and "candle fish" (round whitefish).

The customary importance of non-salmonid fish species is evident in conversations with older Nikolai inhabitants. Without question, harvest activities predate contact with non-Natives, and the historical use of freshwater fish is evident in the oral accounts of fishing techniques and through consideration of the likely activities associated with early-day winter encampments. For example, abundant whitefish runs were noted earlier (Chapter 3) as being a key factor in pre-contact establishment of Telida as a seasonal site.

Around the Upper Kuskokwim, non-salmonid species are harvested with fishwheels, set nets, dipnets, fish traps, rods and reels, hand-lines

SPECIES HARVESTED	HARVEST MONTHS											
	J	J	A	S	O	N	D	J	F	M	A	M
Whitefish	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX					X	XXXX
Pike	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX				XXXX	XXXX	XXXX
Grayling	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX					XXXX	XXXX
Sheefish	XXXX	XXXX	XXXX	XXXX	XXXX	XX						XXXX
Suckers	XXXX	XXXX	XXXX	XXXX	XXX						X	XXX
Burbot ("lush")	X			XX	XXXX	XXXX	X				X	XXX
Clams	XXXX	XXXX	XXXX	X								
Other	XXXX	XXXX	XXXX	XXXX	XXXX	X				XXXX	XXXX	XXX
	J	J	A	S	O	N	D	J	F	M	A	M

Fig. 39. Seasonal use of freshwater fish in the Upper Kuskokwim, 1983.

and hooks, and spears. Different techniques are used with each type of gear and not all contemporary techniques are applied to the harvest of all species. While nets, traps, and fishwheels are operated passively, rods and reels, hand-lines, and spears require active ongoing participation.

WHITEFISH

Around the Upper Kuskokwim, whitefish (sajila) species of several varieties are harvested by area inhabitants. Sub-species identification and differentiation is difficult to the inexperienced because of subtle

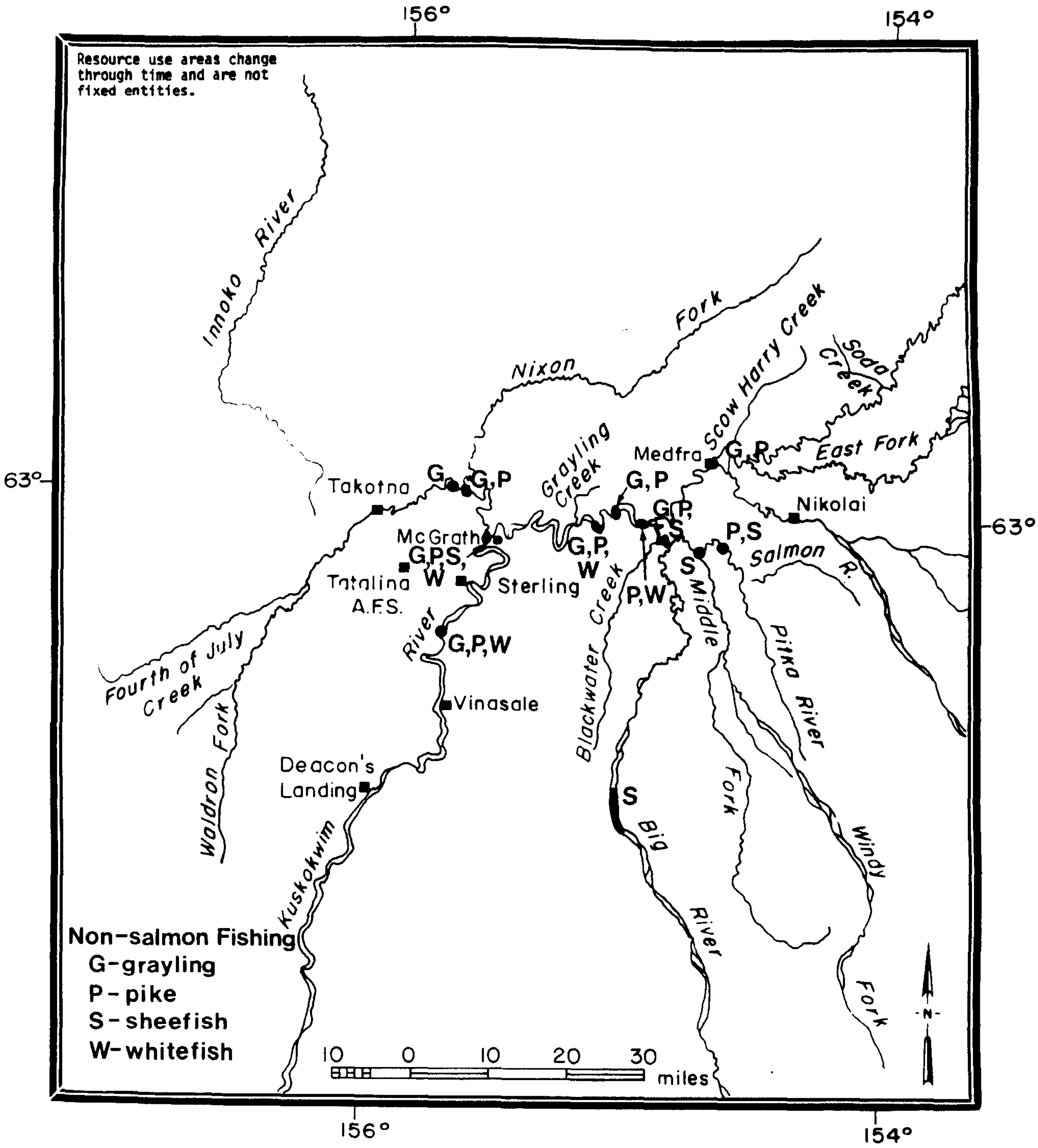

Fig. 40. Non-salmonid fishing areas used by Nikolai, Takotna, and McGrath residents, 1967-1983.

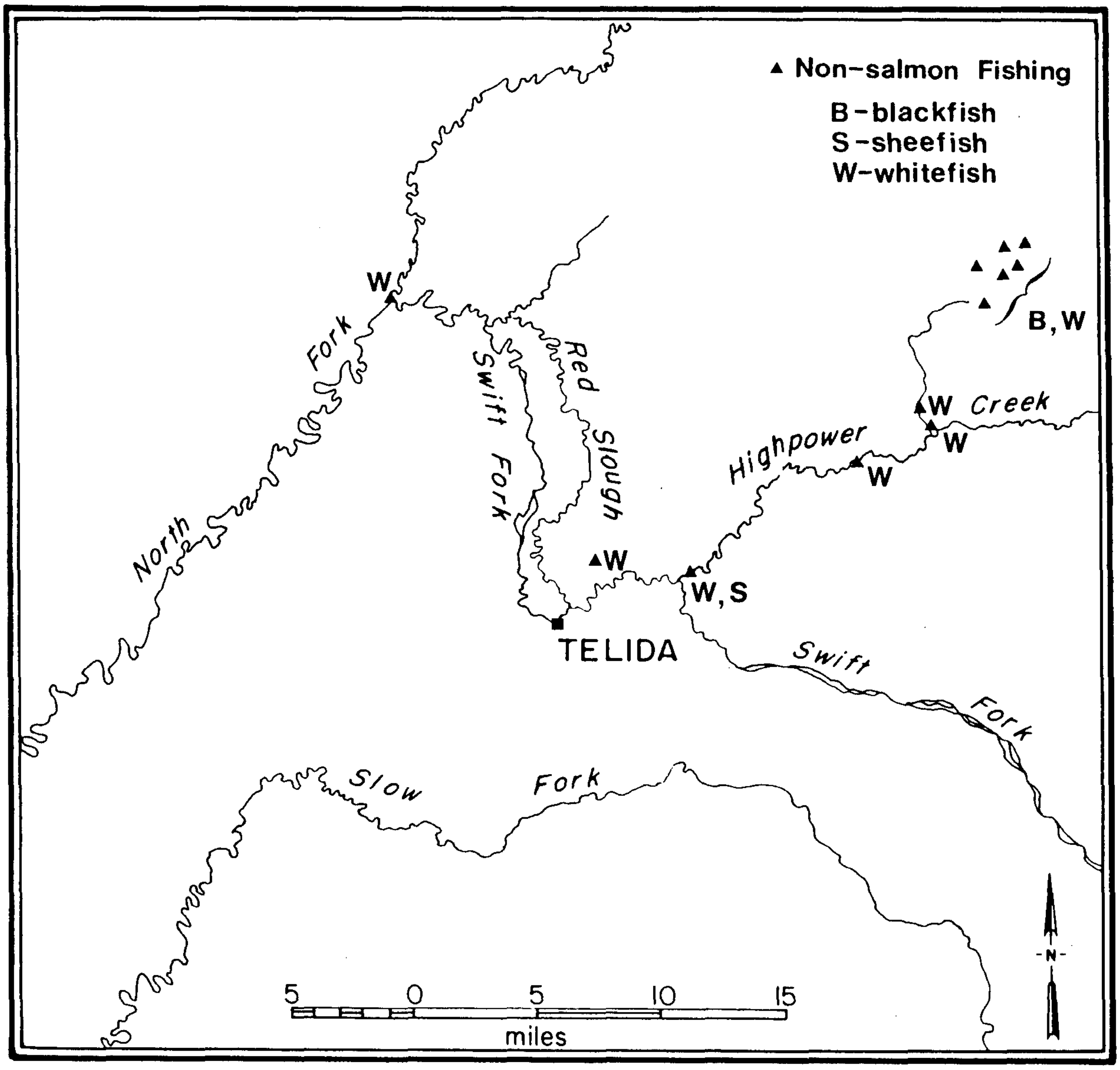

Fig. 41. Non-salmonid fishing areas used by Telida residents, 1967-1983.

differences. For example, a seldom harvested sub-species closely resembling "lake"whitefish, common name unknown, is known to Nikolai fishermen as taghye. Of the whitefish varieties, three general types are discussed in this section. These include a "small" whitefish (dilmije), humpback whitefish (tsendude), and "lake" whitefish (tilaya).

In recent years, whitefish have been taken with various gear types, including fishwheels, set nets, fence and trap arrangements, and to a lesser degree, rods and reels and dipnets. While whitefish harvest concurrent to salmon fishing activities is often considered incidental, in many instances the number of whitefish taken far exceeds that of the targeted species.

Submersible fish traps set for whitefish are generally considered a technology pre-dating contact, as are small nets constructed from moose or caribou sinew with legbone weights. Older inhabitants recall whitefish being taken with both single and multiple-tined fishing spears featuring points made of caribou antler. Some of these spear heads were reportedly detachable. Others have mentioned the use of fish hooks fashioned from beaver leg bones. One elder Nikolai resident also reported early-day use of handmade dipnets constructed of thin sinew or willow bark.

For purposes of descriptive presentation here, whitefish fishing has been divided into three categories according to the period of harvest. Spring includes that period from breakup in late April through about the first of June. The summer fishing period covers early June through mid-September. Fall whitefish activities are those occurring between the middle of September and late November, and include ice fishing.

During the spring period and immediately after breakup, "lake" (broad) whitefish are moving from several area rivers to outlet accessible lakes. Fishermen are able to catch large quantities with set nets at certain time-proven locations, both near these lake outlets and along the river. Fishermen most often utilize whitefish nets featuring 3-inch to 4-1/2 inch diagonally measured mesh. Most whitefish nets are fitted with the smaller and less buoyant under-the-ice floats, thereby increasing their versatility for use during other seasons. If necessary, additional buoyancy is created by adding surface floats for summer fishing activities. Most whitefish nets range between 30 and 60 feet in length. At times, nets designed for chum salmon are also used; these catch only the largest lake or humpback whitefish. In the river, whitefish nets are deployed in a manner similar to that described for salmon in the previous chapter.

Shortly after the ice moves out of the Kuskokwim in the Medfra area, Nikolai fishermen deploy set nets for whitefish near the confluence of the North and South forks (Fig. 27). This run slacks off after a few weeks. Telida fishermen likewise commence fishing shortly after break-up near the outlet of Lower Telida Lake, in the lake itself, at the confluence of the Swift and North forks, and near the mouth of Highpower Creek. McGrath fishermen participate in the spring whitefish fishery, but to a lesser extent, possibly because breakup occurs later in the season. Most set net fishing for whitefish by McGrath residents occurs near the mouth of the Takotna River. The absence of a pronounced whitefish run precludes Takotna residents from fishing near that settlement.

Mid-summer whitefish fishing occurs at many locations throughout the area and is largely incidental to salmon fishing with fishwheels and set nets. However, some sites are used specifically for harvesting whitefish with set gear until late June. Harvested species vary between fishery and site. The humpback and "lake" whitefish often taken during the summer along the main Kuskokwim near McGrath, are rarely caught by Nikolai fishwheel operators along the South Fork. Instead, the small "common" (cisco) whitefish are frequently caught by Nikolai fishwheel operators throughout the summer. Telida residents are able to fish for "lake" whitefish with set nets during the summer in Lower Telida Lake. The absence of current in lakes makes net setting somewhat easier. Through years of experience, some sites in targeted lakes are recogognizedly more productive than others.

Whitefish are sought during the fall and early winter by many area inhabitants. During September, set nets are deployed at selected sites around the Upper Kuskokwim, often in conjunction with other seasonal activities such as moose hunting. Many of these sites are the same ones identified as being productive during the spring fishing periods. These open water set net activities continue intermittently until ice begins running in the river during October. The value of fall whitefish to some Nikolai residents is great enough that some people set their nets up to 40 miles away and commute on alternate days by boat to check the net. Once the ice begins running, most nets are removed.

After freeze-up, some fishermen resume fishing with set nets under the river ice at many of the same sites. Nets beneath the ice are usually set at sites also used during the summer where the current is slack, the river bottom lacks obstructions, and where fish are known to pass. Overland travel with snowmachines makes many sites, fairly distant in terms of river miles during the summer, more easily accessible in terms of time and monetary costs. People are able to commute with relative ease between the home settlement and fishing area on a daily basis. While post freeze-up whitefish fishing involves the same gear types employed during the summer, there are pronounced differences in the manner these set nets are deployed and checked.

Fishermen utilize either whitefish or chum salmon nets for fishing beneath the ice. People who prefer the larger "eating fish" often use salmon nets for this activity, while those who seek fish for dogs often utilize whitefish nets to harvest smaller fish.

To set a whitefish net beneath the ice, two end holes are made through the ice. The distance between these holes corresponds with the length of the net (Fig. 42). Smaller holes also may be made in between to facilitate setting the net and for the optional placement of small anti-flotation sticks (Fig. 43). Several techniques for deploying the net have been observed. A length of rope at least as long as the net is attached to the net and fed beneath the ice with a pole and moved from hole to hole. After the end hole is reached, the net is pulled through the entry hole and set into place. In the absence of a second person, a long length of rope is attached to the opposite end of the net while being pulled through to maintain control. Once in place, long poles that extend several feet above the ice surface are pushed into the river bottom at both ends to hold the float line in position. The float line is tied to this pole several feet down to minimize contact with the underside of the ice. Some people utilize a second pole on each end

Fig. 42. Setting a whitefish net under the ice.

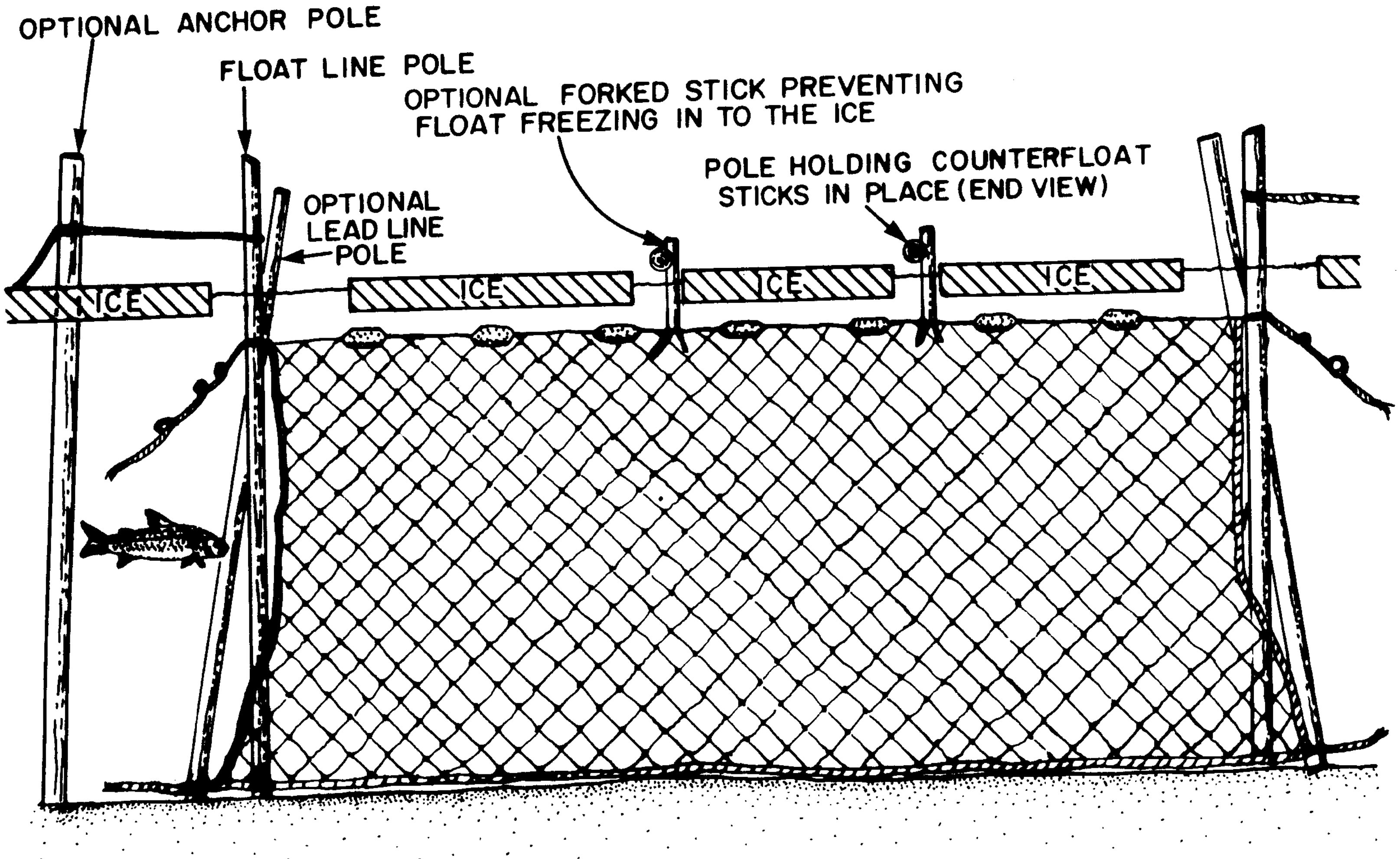

Fig. 43. Side view showing typical placement of a net set under the ice in the Upper Kuskokwim (not to scale).

affixed to the lead line to hold the bottom of the net in place as well, particularly when river current is evident.

Unmodified, the more buoyant salmon nets tend to freeze into the ice. Because a net frozen into the ice often necessitates the time-consuming task of opening the ice for the entire length of the net, short, forked sticks affixed at a 90-degree angle to a larger pole or log are used to hold the float line several inches below the underside of the ice at the "midway" holes (Fig. 43). Some people also utilize at least one such prop for whitefish nets as well. To counteract the upward pressure from the floats, this pole is sometimes weighted down with chunks of ice, drift logs, or other heavy objects.

Most nets set under the ice are checked at least once each day. In periods of moderate temperatures and slow-developing ice, an axe is sufficient for reopening these holes. Colder weather and the corresponding thick ice necessitates the use of an ice pick. After all the holes are opened, one end of the net is generally untied from the setpole(s) and completely removed from under the ice through the other hole (Fig. 44). The long rope previously described is attached and trailed. Care is taken to ensure that enough rope remains on the ice surface at the opposite end to facilitate easy redeployment of the net. The net is usually spread out on top of the ice as it is removed to minimize tangles and freezing that complicates redeployment. In cold weather, the end holes are sometimes refilled with snow or straw to reduce the amount of freezing between each checking.

Ice fishing sometimes continues until early December, depending on the run strength as well as weather conditions which affect ice

Fig. 44. Checking a whitefish net set under the ice.

thickness. While whitefish are generally targeted during post freeze-up fishing activities in area rivers, late running coho and chum salmon are sometimes also caught in appreciable numbers. Depending on the site, sheefish, "lush" (burbot), and pike are also caught during this period. When low numbers are caught, the fish are often cooked the same day either for the family or dog food. Fish taken in excess to immediate requirements are preserved for future use by simply stacking the frozen fish "like cordwood" outdoors.

During the open-water portions of the late fall, some area residents build small fence and trap arrangements in lake outlets to catch outward-bound whitefish. For the smallest outlets, the trap and fence are constructed entirely of wire with the exception of a few small poles or securing posts. In the larger whitefish outlets, straight-grained spruce is used to construct a scaled down version of the salmon fences described in Chapter 9 and in Appendix 3. These weir arrangements feature one significant difference from those traditionally employed for salmon. Often the trap is located on the downstream side of the fence and outward swimming whitefish enter the trap as they pass through the opening. One variation of this technique is the use of two fences a short distance apart. The upper fence permits whitefish to enter a corral or pen area between the two fences. The entrance is closed and fish are removed with dipnets. This latter arrangement has seldom been used in recent years. Commercially-manufactured dipnets, modified by attaching an extended wooden handle, first appeared in the Upper Kuskokwim whitefish fishery around 1979. Small quantities of whitefish can be caught along sand and gravel bars in the fall using these modified landing nets. Current use of this gear type in the main river and major tributaries appears to be somewhat of a novelty.

NORTHERN PIKE

Northern pike (ch'oghilduda') are taken nearly year-round in various lakes, rivers, and creeks around the Upper Kuskokwim, both incidentally and as a primary activity using hooks and lines, rods and reels, set nets, and fishwheels.

Early in the spring, usually in late February or early March, people begin fishing for pike by "jigging" through the ice in various area lakes. The approach and gear employed are nearly identical between communities. A small hole, ranging from 8 to 20 inches in diameter, is made through the ice with an ice pick and a lure affixed to a 4- to 6-foot length of monofilament line. This line is attached to a short stick and the lure in dangled in the water a short distance above the lake bottom. By laying face down on the ice or snow atop brush or tarp, fishermen are able to watch their lure and observe any nearby pike. As pike approach the hook, it is "jiggled" in an effort to entice the fish into biting. Once hooked, the pike is immediately drawn from the water. Success levels often vary widely between fishermen in the same lake, leading people to change fishing holes several times each day. While a few older adults participate in jigging for pike, this activity is undertaken primarily by high school-aged students and young adults of both sexes. Lake fishing for pike usually continues until ice and trail conditions deteriorate. Nikolai residents usually stop ice fishing for pike in mid-April, and switch to grayling fishing when they become available at other locations.

After break-up in May and June, and continuing throughout the summer and fall, fishermen from all four communities harvest pike using rods and reels. This type of fishing is often a recreational or diversionary activity undertaken primarily by younger community members around the mouth of numerous creeks throughout the area. Pike also are caught in some of the larger Kuskokwim tributaries when turbidity conditions permit fish to visually observe the lure. Because of the generally recreational nature of rod and reel pike fishing, many fishermen return smaller pike to the water after being taken.

As previously noted, some pike are harvested with gear primarily targeted towards salmon or whitefish. Pike are most frequently utilized as dog food, although larger fish are sometimes eaten by fishermen.

ARCTIC GRAYLING

Late in the spring, Arctic grayling (ts'idat'ana) are harvested both through the ice and at open water locations in area rivers. For these activities, handlines, fish spears, set nets, and rods and reels are employed, depending on the location, time of year, and individual preference. Upper Kuskokwim inhabitants historically have harvested grayling in various creeks around the area. Employing small traps or fine mesh nets, grayling were taken early in the spring. Grayling were also sometimes taken with bone hooks, multiple-tined spears, and dipnets. Grayling are prized primarily for their human food value, although fish taken in excess to immediate food requirements is sometimes cooked for dogs.

Among McGrath fishermen, fishing for grayling takes place through the ice on the Kuskokwim River near that community. McGrath fishermen employ hand lines in a manner similar to that described for pike fishing, although bait such as corn or fish eggs is sometimes substituted for lures.

In Nikolai, fishermen fish for grayling beginning in early April after the channel ice goes out along the South Fork near the mouth of the Little Tonzona River. Fishermen use light rod and reel gear and tackle for this activity and fish from the shore. Additional pre-breakup grayling fishing also occurs at selected eddies by fishing through the ice along the South Fork. These locations are accessed by snowmobile, dog team, or on foot. Fishing occurs until water turbidity increases or deteriorating ice and snow conditions prohibit surface travel.

After break-up, some younger fishermen use three- or four-tined spears with both fixed and detachable heads attached to a short length of light rope. Most spear handles range from 8 to 13 feet in length and are made of either birch or spruce. Spear fishing for grayling occurs in various shallow creeks at their lowest water levels early in the spring. Short, fine (1- to 2-1/2 inch) mesh set nets are also used for grayling in some locations during the early spring.

In Takotna, grayling are sought by fishing through the Takotna River ice late in the spring. After break-up, fishing activities are limited to the mouths of area creeks where the water is clearest. As turbidity conditions improve, fishing resumes in the main river and continues throughout the summer and fall. In addition to grayling, Dolly Varden are also present near the outlets of some area creeks. Fishermen primarily use rod and reel gear, including both conventional spinning reels and fly fishing arrangements.

For Telida fishermen, grayling are sometimes harvested in the spring through the ice in some area creeks, employing hand-lines in a manner similar to that described earlier in this section. Open-water rod and reel harvest also takes place at various sites around the study area.

SHEEFISH

Sheefish (zidlaghe) are taken throughout the summer and fall by Nikolai, Telida, McGrath, and Takotna residents. They are harvested both incidentally to other fishing activities and as a targeted species.

Oral accounts indicate past use of the upper Big River sheefish fishery by Nikolai and Vinasale residents. This activity was a particularly important aspect of the contact period seasonal round for the latter group. Fish were taken with spears and nets that were drifted along the gravel bars between one man moving on shore and another in a canoe. One older Nikolai resident speculated that a type of toss net also may have been employed, although little specific information about this gear type is available. Fishwheels in use after the early 1900s near the Big River Roadhouse on the Kuskokwim River yielded considerable quantities of sheefish each summer.

Today, harvest occurs incidentally throughout the summer and fall, often in conjunction with salmon fishing. This incidental harvest usually occurs with set nets and to a lesser extent using rod and reel gear. When targeted, sheefish are generally taken with rod and reel gear; this activity is nearly identical to that employed for king salmon harvests described earlier. Sheefish fishing takes place on the lower Salmon River and Big River during June and July and on the upper Big River and lower Highpower Creek (Figs. 27, 40, 41) from late August through late September, mainly near locations where these fish mill.

The sheefish run increases as the summer progresses, although for Nikolai residents most harvest activities cease with the end of the king salmon run. In recent years, several Nikolai fishermen have flown into the upper Big River during the fall with friends from McGrath and utilize rod and reel gear for taking sheefish. A few sheefish also are reportedly taken with rods and reels near the mouth of the Takotna River throughout the summer by McGrath fishermen.

In Telida, fishermen appear to target this species more frequently than do residents of the other study area communities. This may be due to less variety of fish species and the relative meager strength of salmon runs in the upper Swift Fork. Much of the Telida sheefish harvest occurs near the mouth of Highpower Creek (Fig. 41). Set nets yield the most sheefish at this location, although some are taken with rod and reel concurrent to set net fishing.

Among Nikolai and Telida residents, sheefish are a welcome variation in diet. The meat is also used to make "ice cream" (nemaje), and the eggs are sometimes used as an ingredient in preparing "smashed berries" (noɫnosditside) late in the summer. Other ingredients of this latter speciality include lowbush cranberries, grease, and sugar. The harder and more numerous bones of sheefish, its high grease content that retards drying, and problems with skin curling and tearing make sheefish somewhat more difficult to dry. Consequently, sheefish are favored as a source of fresh food for dogs by area fishermen. Those that are cut and dried are processed in a manner similar to that described for chum salmon. Sheefish are primarily used for dog food among McGrath fishermen who take this species during the summer along the main Kuskokwim incidental to salmon fishing activities.

OTHER FRESHWATER FISH

Blackfish (hozrighe) have seldom been harvested in recent years around the area. Historically, blackfish were utilized primarily by Athabaskan inhabitants during times of food shortage. Taken with small traps in selected creeks and lakes, blackfish were apparently a poor substitute for other protein sources. In the words of one Nikolai resident, blackfish "made the dogs get skinny."

"Candlefish" (hwstin'; round whitefish) are present in great numbers in various tributaries of the Upper Kuskokwim. While this species can be harvested using rod and reel gear, it is not a popular fish for human consumption. Historically, candlefish were taken in traps for people and dogs.

Burbot or "lush" (ts'onya), are taken occasionally by Nikolai fishermen in the spring incidental to whitefish and pike fishing using set nets and rods and reels near the mouth of selected creeks. Historically, appreciable quantities of "lush" were taken with trap and partial fence arrangements beneath the ice along the main Kuskokwim after freeze-up. Except for the incidental harvest noted above, Nikolai fishermen no longer target this species. Among McGrath inhabitants, lush are targeted in the early winter after freeze-up using traps near the mouth of the Takotna River. The traps employed near McGrath are of one piece construction and consist of a rectangular frame of peeled spruce timbers covered by wire (Fig. 45). A concave funnel permits the lush to enter the holding area. Bait is dangled on a string within the holding area immediately across from the trap opening. The trap is placed on the river bottom between two short fence sections consisting of small poles driven into the mud. To check the trap a hole is made through the ice of sufficient size to permit the trap to be drawn out of the river. This is undertaken at least once each day. These traps often yield incidental catches of whitefish and occasionally large suckers.

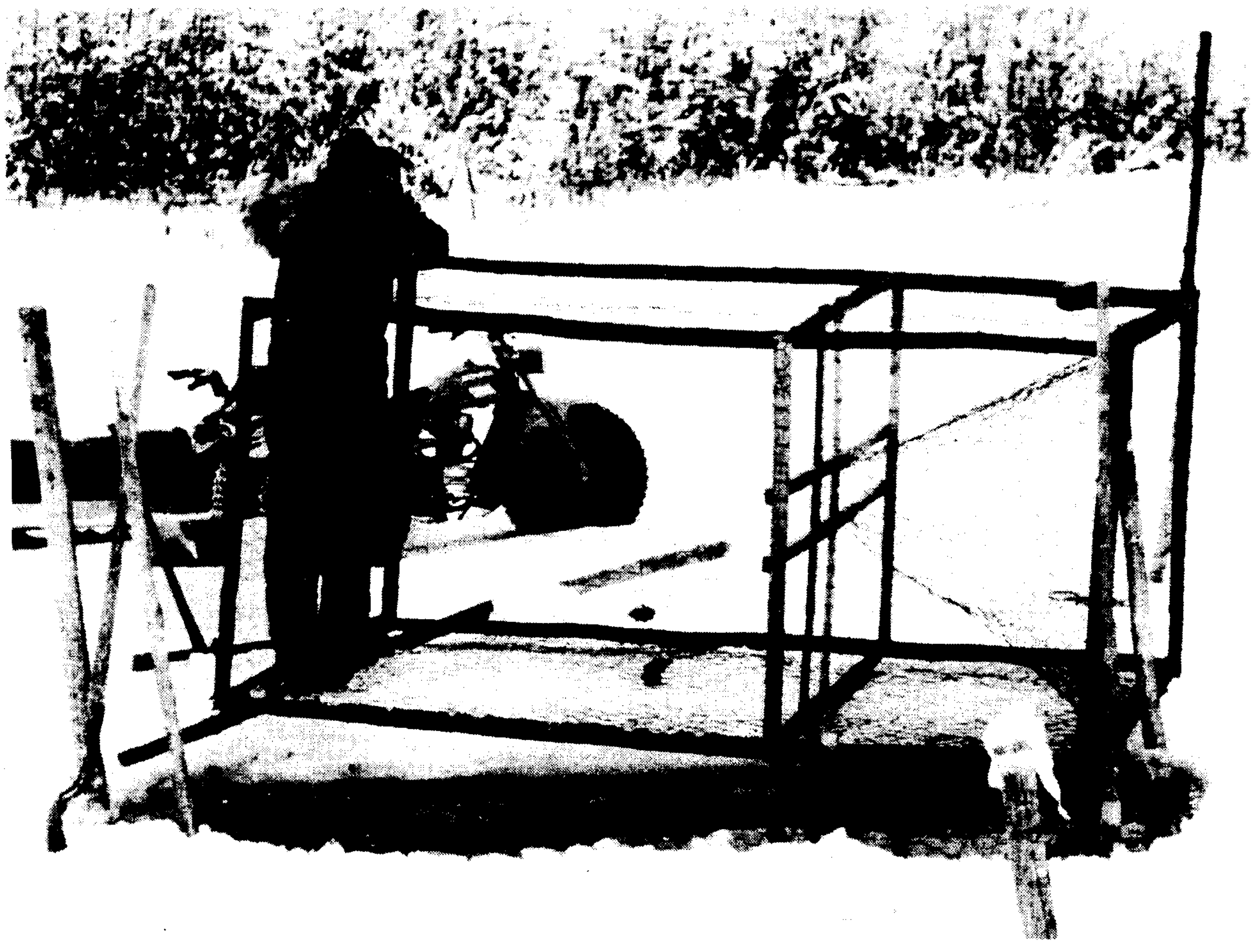

Fig. 45. Setting a "lush" (burbot) trap near McGrath.

Lush are enjoyed as both an "eating" fish and as dog food. Most lush utilized by Upper Kuskokwim residents are obtained through sale or barter arrangements with central Kuskokwim residents.

Freshwater clams (halts'oja) are taken during the summer in selected lakes along the East Fork and main Kuskokwim by a few Nikolai residents. Generally, a thin stick or fishing rod is lowered to the bottom of a lake. Reflex by the mussel when touched causes the shell to close around the irritant and the clam is pulled up. Historically, clams are believed to have been important to the area aboriginal population and were taken in a similar manner. No information is available about the contemporary clam harvest activities of other Upper Kuskokwim community residents outside of Nikolai.

Longnose suckers (donts'oda) generally are taken incidentally to other fishing activities throughout the summer with fishwheels and set nets. Valued as dog food, suckers have been targeted for this purpose by Nikolai fishermen using small mesh set nets and traps in creeks and lake outlets known to feature heavy sucker concentrations in the late spring and early summer.

Arctic lampreys or "eels" (tɨ'ighirs) are seldom targeted in the contemporary freshwater fishery. Information about fishing locations and seasonality is scarce, although several longtime residents of the region recall hearing of a run in earlier times. This species is sometimes obtained from central Kuskokwim or lower Yukon fishermen through barter or purchase arrangements. "Eels" are primarily used as dog food.

SUMMARY

Several species of non-salmonid fish are harvested by residents of all four Upper Kuskokwim communities on nearly a year-round basis. Traditionally, aboriginal inhabitants of the area took many of these species with traps, spears, small sinew and willow bark nets, and hooks fashioned from animal bones from early spring through the middle of winter. In many instances, selection criteria of winter encampment sites included proximity to places where non-salmonid species were readily available.

Employing set nets, spears, rods and reels, dip nets, traps, and fishwheels, contemporary fishermen capture grayling, pike, sheefish, suckers, whitefish, and other species in varying numbers. While most non-salmonid species provide area residents with a welcome dietary variation, whitefish are generally the most important to most fishermen as a source of protein for both humans and dogs.

CHAPTER 11

PLANT GATHERING IN THE UPPER KUSKOKWIM

Like other wildlife species, the occurrence and use of plants varies between the communities of the Upper Kuskokwim. A wide range of both domestic and wild plants and plant products are utilized by inhabitants of the region. These plant species are primarily used for food, construction materials, and for heating fuel. A few species or plant products also continue to have value among some residents for medicinal purposes. While difficult to quantify, many edible plants and plant products substantially contribute to or supplement the diet of many area inhabitants. This chapter describes the extent of the contemporary use of some of the plants and plant products characteristic of the region, season of harvest, gathering and preservation techniques, and, when possible, levels of use. Medicinal use of plants by Nikolai and Telida residents is believed to be fairly extensive, although little ethnobotanical data were gathered.

According to older residents berries, greens, and other naturally occurring plants historically rounded out the diet of area residents. Plant gathering was an important element in the seasonal round and selected sites featuring a particular plant species were visited annually. Among earlier inhabitants of the area, berries were important throughout the fall and winter and, according to several people, they were gathered in great quantities. One Nikolai resident indicated that berries excess to immediate food needs or transportation abilities were preserved by placing them beneath the moss in shallow pits from which they were later retrieved during the winter. Certain plants were sought for medicinal purposes that ranged from curing headaches to treating major wounds.

BERRIES

Among Upper Kuskokwim inhabitants, berries are the most important edible wild plant product. Their abundance fluctuates from year to year, in response to various natural factors including temperature, precipitation, and animal and bird consumption. Too little or too much precipitation in the spring adversely affects availability of berries. Similarly, late spring frosts or below-average temperatures also impact species abundance. Excessive consumption by black bears and birds also affects the seasonal availability of berries of limited distribution.

During the summer and fall, berry picking is an activity undertaken primarily by women and older girls. Men sometimes accompany berry picking groups and may pick some berries, although in most instances their primary role is to carry a firearm in the event a bear is encountered. Berry picking trips are usually one day in duration with most gathering trips lasting two to five hours. While most activity often occurs near the winter community or fishing sites, some households travel up to 30 miles by boat or several miles on foot to reach particularly productive sites for certain species. People at some Nikolai fish camps often delay their departure from king salmon fishing sites after the run has ended in order to await ripening of blueberries and lowbush cranberries, one indication of the importance of berries. Figures 46 and 47 depict berry picking areas utilized by Nikolai, Telida, Takotna, and McGrath residents.

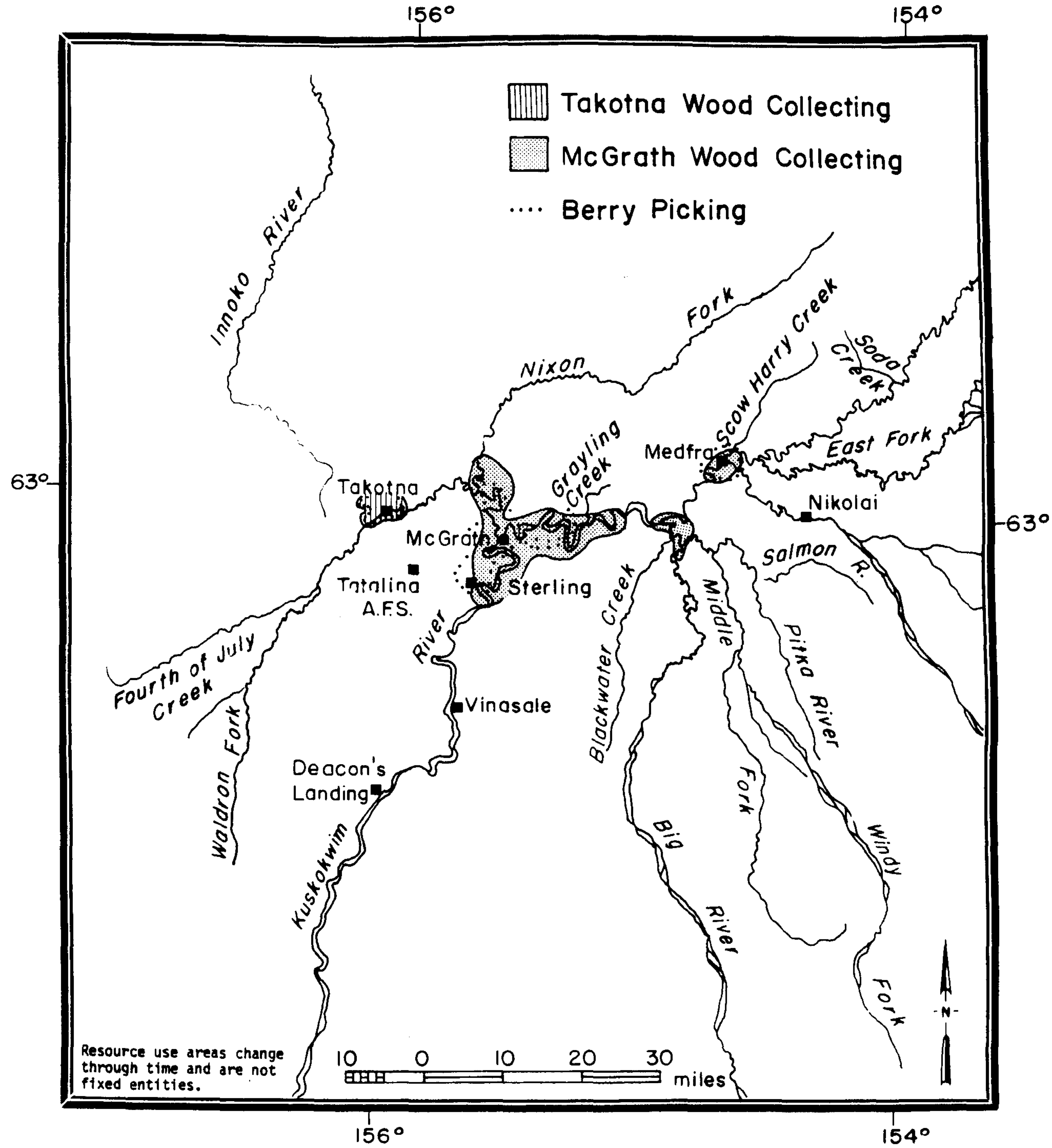

Fig. 46. Berry picking and wood collecting areas of Takotna and McGrath residents, 1967-1983.

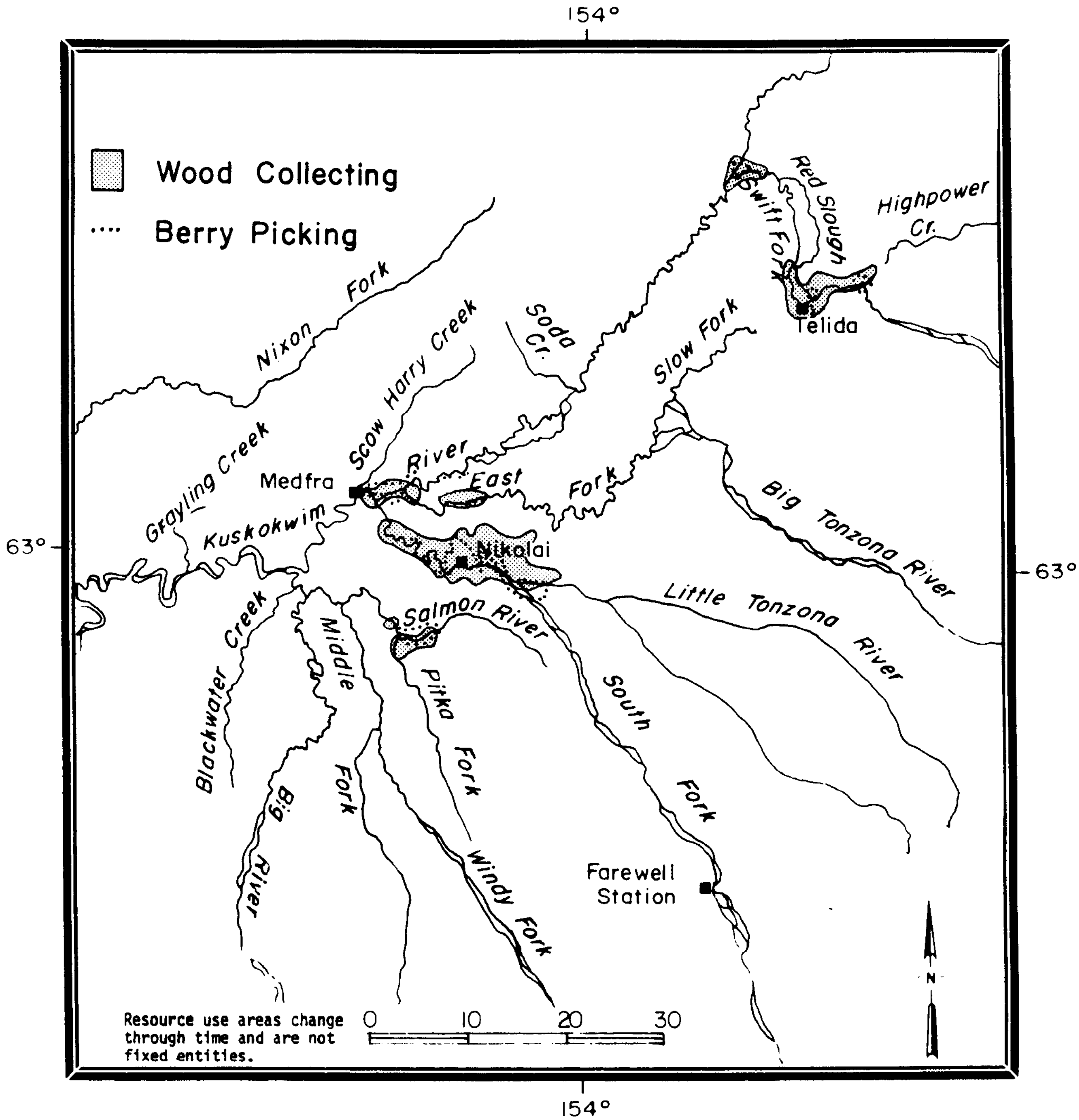

Fig. 47. Berry picking and wood collecting areas of Nikolai and Telida residents, 1967-1983.

Blueberries (*Vaccinium alaskaense*)

Blueberries (*jija*), the most commonly sought berry species, occur throughout the study area, primarily near high, dry, and semi-open areas. Gathering usually occurs between late July and late August in the lower areas of the valley, although harvest activities continue well into September near the Alaska Range. Gatherers generally are selective in their harvest activities, taking only the larger mature berries. Nonetheless, blueberry picking is systematic in nature as participants work on a single plant at a time. Care is taken to cleanly remove each berry to eliminate unnecessary secondary handling of the soft fruit. Along the Alaska Range foothills, plant leaves which fall after the first frosts make picking easier and, in the past, this was a favored time for gathering blueberries.

Blueberries are preserved through canning in the form of jam and whole freezing in sealed containers. The former technique is most prevalent in McGrath and Takotna. Among Nikolai and Telida residents, frozen berries are often consumed periodically throughout the winter in a cooked "pudding" (*nasdladre*) made by cooking them with flour and sugar as the primary additive ingredients. Blueberries are also an important ingredient when making "ice cream" (*nemaje*), a food dish consisting of a mixture of fish, lard, sugar, and berries.

Salmonberries (*Rubus chamaemorus*)

Salmonberries (*nikotł'*), also known in other parts of Alaska as cloudberries, are usually the first berry to ripen each summer. Picked between late June and the middle of July, salmonberries are not as widely distributed as blueberries. Often occurring in open wet areas, most patches are fairly small. Because of the selective occurrence of this species, known sites are visited from year to year. Salmonberries are best picked when not quite ripe. The berry and surrounding sepals are often removed from the plant in one piece, and separated later, the berries are often left to ripen in an open container for several days.

Ripe salmonberries usually are eaten unprocessed, although some Nikolai residents freeze excess berries for later use. While a few use salmonberries in "nemaje", other berries are more commonly used in preparing this dish.

Lowbush Cranberries (Vaccinium vitis idaea)

Lowbush cranberries (netɨ') are highly prized among area residents. Areawide, the annual harvest is probably second only to blueberries. Ripening late in the summer, most are picked during September, often in conjunction with moose hunting activities. The occurrence of this species is widespread throughout the region and appreciable quantities are often picked contiguous to area settlements. They are commonly preserved by freezing. Like blueberries, they are often cooked during the winter in a "pudding" made with flour and sugar. Lowbush cranberries are also an ingredient used in making certain sweetbreads. Additionally, "smashed berries" (a mixture of whitefish or sheefish eggs, cranberries, sugar, and grease) is a popular dessert among many Nikolai and Telida households during the late summer.

Blackberries (Empetrum nigrum)

These small low-growing berries are known locally as bearberries (jezramoyanagha') and occur sporadically throughout the Upper Kuskokwim. Consequently, harvest levels are comparatively small. As they ripen in September, blackberries are often picked in conjunction with gathering lowbush cranberries. These berries sweeten after the first frost and usually are preserved by freezing and served in "nemaje." Blackberries are also eaten fresh in the field.

Highbush Cranberries (Viburnum edule)

Highbush cranberries (tsaltsa) occur along area rivers among stands of cottonwood and alder and generally ripen in late August. Sometimes they are eaten in the field, but more often they are cooked or prepared as jams.

Raspberries (Rubus idaeus)

Raspberries (dwhnikotɨ') are fairly rare in the Upper Kuskokwim region and occur in widely scattered locations. Most often they are found at the edge of settlements, gardens, near old fishcamps, and in other areas characterized by disturbed soil. This species also is successfully grown "domestically" by a few area residents. Raspberries are generally eaten fresh, although some McGrath residents report making them into jam for later use.

TREES

Among Upper Kuskokwim inhabitants, trees comprise the most widely utilized plant group. Used for heating homes, meat preservation and flavoring, building construction, and manufacture of various wooden items, several tree species are procured throughout the year. Chainsaws are the most common tool used in harvesting.

While Nikolai, Telida, and Takotna residents generally harvest standing green or seasoned (dry) trees for firewood, some McGrath residents obtain driftwood from the main Kuskokwim near the community in a manner similar to that employed by middle and lower Kuskokwim inhabitants. McGrath and Takotna residents tend to gather firewood in advance, stockpiling it for the winter, while Nikolai and Telida inhabitants cut and haul firewood periodically throughout the winter. Pronounced peaks in the latter pattern occur late in the fall prior to freeze-up and again in the late spring just before break-up, periods when overland transportation is difficult during changing seasons.

White Spruce (*Picea glauca*)

White spruce is the most sought-after tree species (Figs. 47, 48). It is considered ideal for building log structures. White spruce are often felled, cut to length, and peeled in the late spring and early summer for later use in construction.

Often obtained during the winter as a source of firewood, green white spruce is commonly utilized by many area inhabitants, although seasoned wood is somewhat more desirable. Before a tree is felled, firewood cutters often chop into the tree with an axe to determine the depth of the green or "frozen" outer layer. Color and consistency indicate the depth of this outer portion. Spruce that contain more than an inch of wet or frozen wood burn poorly and are generally avoided for use as firewood. Likewise, Nikolai firewood cutters tend to avoid, when possible, felling exceptional trees which would be suitable for "house logs."

Seasoned wood is obtained in three ways. First, naturally dead or dry standing trees are the major source. Seasoned wood also can be "made" by removing the bark around the base of the standing tree in the early spring, causing the tree after several seasons, to eventually dry out. Finally, standing green trees can be felled and cut into firewood lengths (14 to 24 inches) during the summer and retrieved during the fall or winter. The second method of drying may take up to three years, while fairly dry wood is often obtained by the third method after a single summer, particularly if the blocks are split in the field. Splitting unseasoned white spruce in the summer usually necessitates use of a wedge and maul.

Spruce pitch or gum (<u>ts'imadzagha'</u>) obtained from standing white spruce trees continues to have medicinal value among some older Nikolai and Telida residents. Additionally, the green spruce boughs (<u>iɨ</u>) are sometimes used to line the bottom of dog houses during the winter and spring, for tent "flooring" in the summer, and for seasonal indoor decoration. Squares of white spruce bark (<u>ch'ilotr'esh</u>) are used for slip free fish-cutting surfaces and roofs of fish drying structures.

According to older residents, roots from white spruce trees historically were split along the grain and used for heavy-duty binding purposes such as canoes and birch bark baskets. The gum was utilized to seal canoes.

Black Spruce (Picea mariana)

Black spruce, locally termed "gee-pole" spruce, has limited use among Upper Kuskokwim residents. The small diameter and high density of mature black spruce stands makes it a poor source of firewood. The most common use of this species is as poles used in the construction of fishwheels, fish drying structures, and trap sets, although small white spruce is favored for these purposes when available.

Paper Birch (Betula papyrifera)

Birch (k'esh) is the hottest and longest burning type of firewood. It is used also for manufacturing many items including dog and snowmobile sleds, furniture, snowshoes, and tableware. While it occurs throughout the area in isolated stands, birch is not as abundant as white spruce.

Finished products made of birch wood in the past were treated with a compound consisting of a powdered red clay mixed with water and sometimes called "Alaska paint." The clay was obtained from widely scattered locations often known only to a single family.

The bark of birch trees is utilized by many as an all-season fire starter. Large pieces placed inside out are used in the field as temporary food preparation surfaces. Some area residents continue to manufacture small baskets from birch bark for both personal use and sale.

Cottonwood (Populus balsamifera; Populus tremuloides)

Green cottonwood (t'ighis) has little value as a source of household heat, although green and semi-dry cottonwood is often utilized in area fishcamps for drying fish. Dry cottonwood is a preferred fuel source for the small camp stoves used in canvas wall tents because of the relative absence of fabric-damaging sparks. It is also used for smoking fish as described earlier. Poplar trees, or quaking aspen, also called cottonwood by Nikolai residents, occur on low hills around the area, often in conjunction with birch. Occasionally used for winter home heating, this species burns poorly, produces little heat, and leaves more ashes than birch and white spruce.

Other Trees

Tamarack trees (lat'ighazya) occur throughout the area in low densities and usually are found near swamps and low-lying areas. They have little contemporary value except as an occasional source of firewood. One McGrath resident notes a few residents of that community may still favor this species as a high heat source of firewood.

OTHER PLANTS

Numerous other plants are utilized by area inhabitants for both edible and non-edible purposes. This use varies between communities and individuals. While some species are used throughout the area, others are utilized by only a few residents.

Willow (Salix sp.)

According to knowledgeable area residents, several species of willows are found in the area. Differentiation between each is difficult to the uninformed. During the summer, willows (k'wy') have a wide variety of structural uses around camps, ranging from use as tent pegs to hangers for teapots when cooking over a campfire. In the past, willow fibers from the inner bark were used as thread or binding twine for small fish nets, fish traps, and dipnets. Characterized as "pretty strong" by several older Nikolai residents, this inner bark often was intertwined or braided with strands of caribou sinew for added strength. While effective, the articles manufactured with the inner bark had to be kept wet between use in order to maintain pliability. Diamond willow is sometimes used by area craftsmen for furniture construction.

Alder (Alnus Crispa)

Green alder (k'irs) is used primarily to smoke fish and meat during the summer. Additionally, dry alder is a favored wood for open camp fires because of its relative abundance and the comparative small amount of smoke it gives off.

Birch Punk (Phellinus tremulae)

Birch punk (ch'imodzigha') is a fungus in conk form which grows on birch trees. It is sought by many Nikolai and Telida residents who usually render it into ashes within a can on a fire or in a stove. A small quantity of the birch punk ash is added to chewing tobacco, enhancing the strength or "bite." Smoke from smoldering birch punk is also reported to be an effective mosquito repellent much like "buhach" (a rat poison which is burned), although the scarcity of these fungi precludes widespread utilization as such.

Wild Grasses

"Grass" (ch'itsan') is abundant within and near settlements where the ground has been disturbed. It is often harvested late in the fall after it dries but before the first snow, and is primarily used by Nikolai and Telida residents for lining dog houses during the winter months. It is cut with a knife just above the roots and then bundled up with string and stored in a dry place.

In the past, grass was utilized as a lining or insole for moccasins and winter boots. Sometimes grass is used in this manner during emergency situations. Each spring after the snow melts, most Nikolai residents burn off the remaining unharvested grass around their houses to minimize fire danger later in the summer. Additionally, some wild grasses were important sources of food for horses used around early area mines.

Moss

Until recently, moss was widely used as insulation between logs in many homes in the region. It continues to be used for this purpose in remote cabins. The insulating qualities of moss also made it ideal for covering foods during periods of outdoor storage, when meat was kept cool by placing against the cold or frozen soil. According to many Nikolai residents, certain species of dry moss were widely used as "diaper liners" in earlier times.

DOMESTIC PLANT USE

Rich soil along area rivers lends itself to small-scale agriculture or gardening. These small gardens contribute greatly to the non-meat element of the diet of most area residents. While some gardens are cooperative ventures involving several families, most are single-household undertakings.

The concept of small-scale gardening probably was introduced shortly after 1900 with the arrival of the first permanent non-Native settlers to the area. According to older Nikolai residents, many settlement and roadhouse sites had large gardens, as did many single cabin sites occupied by trappers and miners throughout the Upper Kuskokwim.

Currently, potatoes, carrots, turnips, beans, peas, and onions are grown in family gardens. Other plants such as tomatoes, squash, cabbage and head lettuce, are commonly started or grown in small household greenhouses. Several home gardeners in McGrath note success with berry plants including raspberries and strawberries. Potatoes, by far, comprise the largest crop. Among Nikolai gardeners, potato supplies generally last into December.

Most gardens are planted by the middle of June. Harvest begins in the early fall, although root crops such as potatoes are often left in the ground just prior to ground freeze.

SUMMARY

Plants and plant products ranging from berries to birch trees are important to residents of the Upper Kuskokwim who utilize them in various ways. While little ethnobotanical research has occurred, some wild plant resources are known to have medicinal value among some Athabaskan residents of the area.

Spruce and birch trees provide important sources of firewood and yield materials for building and handicraft construction. Willow, alder, and cottonwood are used to generate smoke for fish and meat preservation. Various species of berries are gathered by area residents for direct family consumption and as an ingredient in some cooked dishes. In addition, domestically grown vegetables provide a welcome supplement to the diet throughout the late summer, fall, and early winter.

CHAPTER 12

CONTEMPORARY RESOURCE ISSUES IN THE UPPER KUSKOKWIM

In recent years, Upper Kuskokwim inhabitants have been confronted by a myriad of resource management plans, fish and wildlife regulations, development proposals, and changing land ownership patterns. While some of these proposals and actions were locally initiated with the advocacy and support of area inhabitants, others were introduced by agencies from outside the region. Public reaction to these issues varies between proposed activities and communities.

FISH AND GAME REGULATIONS

Over time, possibly the single greatest area of discussion and controversy has centered around fish and wildlife regulations. While many of these regulatory issues were discussed in earlier chapters of this report, there are a number of general concerns more appropriately discussed in this section.

While fish and game resources are constitutionally mandated to be managed under the principles of sustained yield, approaches to this end can vary. In the minds of area residents, many changes or regulatory adjustments have had both positive and negative effects. Examples of the former include implementation of regulations eliminating same day airborne moose and caribou hunting, creation of the Upper Kuskokwim Controlled Use Area in 1981, and subsequent season length increases. Less popular changes in these regulations include season and bag limit reductions for many large game species, elimination of the traditionally-utilized salmon fences (Appendix 3), restricted waterfowl harvest seasons, and increasing reluctance on the part of state agencies to control wolf populations.

Probably the greatest single frustration voiced about regulatory restrictions and revisions is the perceived lack of timely responsiveness to locally-identified concerns and problems. Users of a resource often are the first to observe changes in the availability, range, and population of the wildlife resource. Additionally, knowledgeable users are frequently able to predict resource trends based on firsthand observations of environmental conditions. In nearly every instance, user observations are timely and, more importantly, quite accurate. Unfortunately, these initial "user perceptions" are often dismissed by scientists as being unscientific. Consequently, many years sometimes lapse before a biologically-based assessment of the situation is developed. In instances of species decline, the problem inevitably worsens by that point, leading to implementation of far-reaching regulations that, in the view of many local users, unfairly restrict the very group that attempted to alert the regulators to the developing situation. This, in itself, is a second major area of frustration among many users.

Wolf control is an excellent example of both points. Many Upper Kuskokwim residents have consistently noted over a number of years that high wolf populations were contributing to declines in both the moose and caribou populations. Until recently, this perception was largely ignored by Department of Fish and Game personnel. At the local level, through the Fish and Game Advisory Committee structure, area inhabitants attempted to initiate control programs. The statewide political climate made implementation of a timely control program impractical (Collins pers. comm., 1984). As predators such as wolves continue to depress moose and caribou populations unchecked, users fear, based on past experience, that further harvest restrictions will eventually be unfairly imposed. Knowledgeable local residents fail to see the logic of these restrictions when they have repeatedly pointed to high predation levels. Long-range plans more fully utilizing the multiple management tools available would, in the view of many area inhabitants, go a long way towards flattening out the high and low peaks of cycles now evident in both game and fish species.

LAND CLASSIFICATION/USE PLANNING

Land ownership patterns continue to solidify in the Upper Kuskokwim region. State, federal, and private landowners have in recent years begun to plan for the use of their holdings. Sequential or systematic classification programs are often lacking, since some of these entities attempt to undertake development-related programs as rapidly as possible.

One positive step towards organized planning was the "Upper Kuskokwim Regional Strategy Project" (UKRSP) (Johnson and Snow 1985). This state-funded, area-wide endeavor gathered background information for presentation to a subregional oversight body which will subsequently decide whether to initiate a full-scale regional plan. The most significant component of this project to date has been the administration, compilation, and interpretation of a regional attitudes survey. This document identified public concerns and positions on various issues in the area. Covering a wide range of topics, nearly 52 percent of the adults in Nikolai, McGrath, Takotna, and Telida participated in this survey.

SETTLEMENT ENTRY

Additionally, the Alaska Department of Natural Resources (DNR), Division of Land and Water Management, has commenced work on the Kuskokwim Area Plan. The area encompassed in this plan includes the middle Kuskokwim and upper Innoko River areas, as well as the Upper Kuskokwim region. Altogether, 16 million acres of state lands will be covered by this two-year effort. The planning study is primarily intended as a state land use plan, although classification will possibly occur cooperatively in some areas with both the federal government and private land holders (M. Welbourn pers. comm., 1985). Eight steps will occur in the planning process:

1. Public meetings for issue identification (Fall 1985)
2. Data collection (throughout the planning process)
3. Land use alternatives are prepared and evaluated (Summer 1986)
4. Alternatives are reviewed by the public (Fall 1986)
5. Draft Kuskokwim Area plan is prepared (Fall 1986)
6. Draft plan is reviewed by the public (Fall 1986)
7. Final plan is prepared (Spring 1987)
8. Final plan is adopted and implemented (Summer 1987)

(from Department of Natural Resources brochure, August 1985).

Among area residents most familiar with planning processes, this DNR study will, in their opinion, complement the efforts of the UKRSP oversight committee almost certainly will eliminate much of the perceived "randomness" presently associated with land and resource development on state-owned lands.

Among development proposals, settlement entry programs appear to be the most controversial. Settlement entry programs in the Upper Kuskokwim occur or are proposed by three groups. These are the Federal Bureau of Land Management (BLM) (1981), Alaska Department of Natural Resources (1983), and corporate landowners (E. Holmberg pers. comm., 1984). Local proponents of settlement entry programs, mostly residing in McGrath, press the state and federal government to make more suitable land available for sale or lease (DNR Transcript 4/21/82; personal notes from public meeting 9/25/82 at McGrath). On the other hand, many inhabitants of the area, particularly from the smaller communities outside of McGrath, critically review each proposed opening for potential conflict with existing resource use activities (DNR transcript 4/21/82, Takotna; personal notes from BLM public meeting 4/18/85; DNR transcript public meeting spring 1980, Nikolai).

Two significant federal proposals in the settlement entry classification have occurred in recent years. In February 1982, more than 10,000 acres within the BLM's "Minchumina Block" were opened to public entry. Parcel size options ranged between 5 and 80 acres (BLM 1982). To date, entry activities have been reported as minimal (K. Meyers pers. comm., 1983, 1984).

Of greater concern to area residents and in closer physical proximity was the BLM's "Upper Kuskokwim/NYAC Planning Block" (BLM 1981), which underwent the review process in 1982 and 1983. This block, nearly rectangular in shape, is located south-southwest of Nikolai and totals approximately 2.8 million acres. In a process that included public comment and agency review, most of the block was identified as being open to settlement entry leasing under the Federal Lands Policy and Management Act (FLPMA) program. No filings have been reported to date (R. Conquergood pers. comm., 1984).

Between 1981 and 1984, not less than ten blocks of Upper Kuskokwim land managed by DNR were proposed for inclusion in the "Remote Parcel Program." Of these, areas in the upper Big River and Windy Fork were eventually opened to entry. Another parcel near Appel Mountain is tentatively scheduled for opening in 1986. In most proposals, public concern over potential conflict with subsistence-related activities and local infrastructures, the lack of region-wide planning, and poor quality or accessibility were key factors in postponing the other disposals.

Among private landowners, Native corporations created in 1971 with the Alaska Native Claims Settlement Act (ANCSA) are the largest. While Doyon Limited, the area Native regional corporation, has not discussed opening Upper Kuskokwim lands for settlement programs, the management and shareholders of MTNT Limited, the area consolidated village corporation, are currently examining several one-time-only distribution plans that will make small parcels of land available to shareholders (J. Vanderpool pers. comm., 1984). Parcel size will vary, depending on location and the number of shares participants own.

Draft findings from a comprehensive attitude survey administered to adults in the area in 1984 under the auspices of the Upper Kuskokwim Regional Strategy Project (UKRSP) indicate a mixed reaction to settlement entry programs. Area-wide, only 8 percent of the respondents were "very" familiar with state and federal land disposal programs, while 45 percent indicated they were not familiar with or did not know about such programs. Participants were also asked about two specific state proposals -- Appel Mountain and Big River disposals. For the former, 31 percent of the area respondents favored this proposal, 29 percent opposed, and 40 percent were undecided. For Big River, 30 percent favored, 25 percent opposed, and 45 percent were not sure. According to the draft narrative that accompanied the survey results, "...opinions were divided between those favoring and opposing. McGrath residents were most favorable of both plans while Nikolai respondents were most opposed" (Ender 1984).

Discussions with area residents indicate that settlement entry programs potentially present problems for area communities by placing additional pressure on certain natural resources which are already depressed. Residents of communities outside of McGrath also voice concern about the increasing possibilities of competition for trapping areas, fishing sites, and hunting areas that may result from settlement entry. Some communities also note concern over the additional pressure settlement entry may bring to bear on local municipal or traditional infrastructures. This latter point is reinforced in the UKRSP survey, where 59 percent of the respondents noted they favored their current community size. Interestingly, only 10 percent felt the community they lived in was too small, while 27 percent felt their population was already too large.

MINERAL LEASING

Like settlement entry, neither mineral leasing nor oil and gas development enjoy widespread support in the area. Public comments include concern over interference with natural resource use activities, diverse social impact within area communities, and development of market-related transportation networks.

In 1983, seismic exploration activities undertaken along a series of lines southeast of Nikolai within the BLM's Upper Kuskokwim Block was the focus of considerable public concern, particularly in Nikolai. A series of lines up to 25 miles in length was brushed out to conduct these tests and charges were detonated at regular intervals. Local trappers fear that these lines, clearly visible from the air, will be used by individuals from outside the area to establish competitive traplines in the area. Additionally, concerns over the potential disruptive effects of detonating charges in the vicinity of caribou hunting and trapping areas were noted.

The State of Alaska, under Minchumina Basin Sale 42, proposed to offer leases on more than 200 tracts of state land east of Nikolai and south of Telida in 1983. Despite the low marketable find potential and fierce public opposition from residents of these two communities, preliminary planning continued. Eventually the sale was indefinitely postponed after other State-sponsored sales produced lower than expected bid prices.

Going beyond seismic activities, concerns regarding some of the more long-term environmental, social, cultural, and economic impacts of mineral leasing have been noted. Environmental concerns include the obvious potential for damage to area ecosystems immediate to development sites and through spills or accidents that may have longer range impacts. Area residents fear economically feasible discoveries would also lead to the need of the development of transportation networks capable of moving products to market. As these overland transportation networks are likely to eventually provide access to the area by non-local individuals, concern over unwanted changes in lifestyle have been noted. Development activities based from local communities also concern many residents, particularly because of the potentially negative social implications often associated with this type of activity. Likewise, residents believe that local economic benefits will largely be limited to menial support jobs. Because oil and gas exploration is an inexact science, residents appear to be little assured by agency assessments of low potential.

MINERAL ENTRY

Mineral entry or mining activities also worry many inhabitants of the area, although the consensus among many residents seems to indicate that mining is probably the least objectionable of the three development categories. This attitude is possibly based on the long history of these activities in the region. While mining is not new to the area, concern over potential damage to already low salmon stocks, the possible influx of additional population, and associated increase in competition for certain renewable resources are some of the more common concerns voiced in various state and federal-sponsored public meetings in Nikolai, Takotna, and McGrath over the past few years, although supportive comments have been expressed as well.

SUMMARY

Contemporary resource issues in the Upper Kuskokwim fall into two broad categories: fish and game, and land use and development.

Over the years, fish and game management issues have generated increasing public interest, and at times, outcry. Some regulations, including those dealing with same-day-airborne hunting and establishment of controlled use areas have been well-received by area residents, while those reducing or eliminating harvest opportunities, bag limits, or restricting gear types are, for the most part, very unpopular. Many of the biologically confirmed crises now facing users of the area are, in part, precipitated by the unwillingness of some resource managers to recognize the contribution of long-term observations and perceptions of area inhabitants.

Issues associated with land use and development by federal, state, and private owners continue to surface as ownership patterns solidify. Development proposals advanced by these entities generally fall into three classifications: settlement, mineral leasing, and mineral entry. With the planning efforts currently underway, area residents are hopeful that an ordered approach to development proposals for the region will be forthcoming.

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APPENDIX 1

PLACE NAMES IN THE UPPER KUSKOKWIM

Many of the geographical attributes that separate the Upper Kuskokwim from other regions of Alaska feature names. Place names tend to reflect some of the significance associated with a particular location by the users. The antiquity of many names serves as an important indicator of continued use and offers information about the geographical extent and intensity of such activities. Place names also provide readers with insight into historical transportation, harvest, and preservation methods, as well as clues to the identity of these early-day inhabitants. While some of these place names have been included on U. S. Geological Survey (USGS) maps, many others are unknown outside of the area.

Without a doubt, the oldest place names are those of Upper Kuskokwim Athabaskan origin. According to older Nikolai inhabitants, many of these pre-date European entry to the area. According to the same individuals, at one time "every place had a name." While many of these names have been "lost," as descendants of the pre-contact population have forgotten them, others continue to be widely known among Upper Kuskokwim Athabaskan speakers. Shifts in geographic use areas, the passing on of those individuals most knowledgeable about place names, and a general decline in Upper Kuskokwim Athabaskan language usage are all factors in the loss of Athabaskan place names. It is from those still in usage that the Athabaskan component of the following list is drawn.

One of the first explorers of non-Native origin in the Upper Kuskokwim noted the existence and significance of these "original" names:

> "...their geographical knowledge is very considerable, they travel extensively and they have names for every topographical feature of the country. These names have always certain attributes to recommend them; they have been spoken by untold generations of men and handed down in the native tongues of the land from untold antiquity. ...These place names have, moreover, in each instance, a most appropriate significance; they carry with them local associations of special meanings and they hand down long traditions of man's relation with nature. (Gordon 1917:77).

English place names are also an important element in the Upper Kuskokwim and there appears to be a greater degree of contemporary dynamism in their creation and use.

Comparison of the two types of place names indicates differences transcending the obvious linguistic characteristics of two different languages. Translated Upper Kuskokwim Athabaskan place names tend to describe an activity, the physical characteristics, or animals or plants known to be seasonally available at a location. More specifically, Upper Kuskokwim Athabaskan names appear to fall into at least one of eight of the ten semantic classifications advanced by John T. Ritter in 1976 (Caulfield, Peter, and Alexander 1983). While this categorization was originally appplied to Dene-speakers in northwestern Canada, there is some applicability to the Upper Kuskokwim. These include place names which describe fauna (Tomo Mina': Swan Lake); or are associated with flora (K'isr Hidighelo': Alder Hill), material culture (Iska Mina': Fish Trap Lake), historical events (Dinatseya Ts'ina' Hwzdlodi: Our Grandfather's Bones Are Lying There), and mythological events (Dzɨyehwt'ana Kayih: Mountain People's House). There are examples also of metaphorical names (Chi'dotɨ'uɨno': "Braided String River"), names for which the meaning has been lost (Edzeno': ? River), and purely descriptive names (Tsat'ohghelindi: current flows beneath the rock place). Review of the Upper Kuskokwim Athabaskan place names presented later in this section reveals the inapplicability of two additional classifications: names borrowed from other languages and places associated with particular individuals. Interestingly, a majority of the English names presented fall into one of these two latter classifications and, while a number of the English place names have basis in some of the other categories (Salmon River; Cranberry Ridge; Lost Knife Lake), many others contain the name of a person who inhabited or otherwise used an area or location ("Stewart's Bend;" "Wilson's Slough;" Berry's Lake). Still other English names can be considered "borrowed" as Anglicized versions of Athabaskan names ("Nixon Fork" from "Nets'inhido"; "Telida" from "Telayadi").

Among present-day inhabitants of the region, those locations which feature both English and Athabaskan names, are increasingly referred to by the English name, even if the meanings are completely unrelated. For example, Hwghnotohdaneɨni Mina' ("channel cuts off portage") is not familiar to younger Athabaskan speakers, and consequently, is now more commonly known as Morrison Lake. Many older speakers of the language speculate that this decline in use of the original names parallels the continued general decline in native language usage among Upper Kuskokwim speakers.

An undeterminable number of Athabaskan place names still are known to one or more residents of the area; even as the following list and accompanying maps are finalized, additional names continue to surface.

Consequently, while the following list is the most exhaustive compiliation to date, readers should not assume that such a listing is by any means complete. Many of the Athabaskan place names presented below were compiled from various unpublished sources, including lists recorded by Collins (1970), Kari (1979), and Andrews (1982). A number of additional Athabaskan place names were revealed to and noted by the author during the course of baseline subsistence research in Nikolai and Telida.

Sources for English place names not previously published on USGS maps included residents of all four communities. These were gathered with a methodology similar to that described for Athabaskan names (Collins and Collins 1966)--a review of word lists during the course of discussion with area inhabitants.

During the mid-1960s, linguist Raymond L. Collins approached the U.S. Geological Survey seeking a correction in the published location of the community of Nikolai on the then current series of maps. At the same time, Collins presented a list of Upper Kuskokwim Athabaskan place names for inclusion in revised versions of area topographical maps. While a few of these names were added, many others were rejected as "unpronounceable." In some instances, the translation was used in place of the original title ("spruce-lined creek;" "salmonberry lake"), while for others, Anglicized versions of the Upper Kuskokwim Athabaskan name appear to have been used (Tonlhona: Toneł'ono'; Trimokish: Ts'emo K'esh). Overall, this sporadic or inconsistent approach to labeling has created a series of maps featuring a blend of accurate, misspelled, mislocated, and unnamed places that are viewed as unacceptable to many long-time residents of the area. Two examples of longstanding errors are described below.

The Herron expedition (1909) correctly identified the Tonzona River as a tributary of the South Fork in 1898. Subsequent explorers and early-day travelers in the same area mistakenly labeled the East Fork above the confluence of the Slow Fork as the Tonzona River. This error has projected itself forward to contemporary USGS maps. Rather than rectifying the error, the original Tonzona River was, at some point in time, renamed the "Little Tonzona." While this may have solved an apparent duplication on paper, area inhabitants continue to make no distinction between the upper and lower stretches of the East Fork, likewise calling the aforementioned tributary of the South Fork the "Tonzona River." The continuity of the East Fork to its headwaters is reinforced among area residents through the existence of a single Upper Kuskokwim Athabaskan word Chida'tl'uɨno' (no. 86 in the accompanying place name list).

Another noteworthy error exists in the Telida area. Area residents and early-day travelers (Dice 1912; Gordon 1917) who used the Minchumina portage referred to the "McKinley Fork," as a tributary of the Kuskokwim. Currently, USGS maps incorrectly label this river along which present-day Telida is situated as the "Swift Fork." While the origin of this error is obscure, most area residents continue to utilize the customary name - "McKinley Fork."

Collins provided assistance in transcribing and translating Upper Kuskokwim Athabaskan names collected by the writer. Likewise, orthographical review of the entire list was undertaken by Collins in consultation with both local and university-associated experts.

Additionally, Collins prepared the introduction to the Upper Kuskokwim Athabaskan orthography that follows.

While great care was taken in reviewing the following place names list and accompanying maps, the probability of some errors remains. The researcher accepts responsibility for all errors. Nonetheless, it is hoped that this Appendix will be of some value to future investigators as they continue to document and preserve Upper Kuskokwim Athabaskan place names for future generations of area inhabitants.

The English names without quotation marks are those which appear on U.S. Geological Survey maps (scale 1:63,360) and are spelled as they are on those maps. Other English names commonly used by area residents, as noted above, are indicated in quotation marks. When possible, the translation of the Upper Kuskokwim Athabaskan name appears in quotation marks directly below the Athabaskan name. In some cases, no corresponding English translation was available. Athabaskan and English place names are listed with a number keyed to the map (Figs. 49-66). Figure 48 depicts the area within which the recorded names (numbers 1-267) occur.

UPPER KUSKOKWIM ATHABASKAN ORTHOGRAPHY

by Raymond L. Collins, Linguist

Upper Kuskokwim Athabaskan is one of the eleven Athabaskan languages that have been identified in Alaska. Currently most of the speakers of this language reside in the communities of Nikolai and Telida; previously they occupied numerous small communities throughout the upper Kuskokwim area. Earlier ethnographic maps grouped these people with surrounding Athabaskan people since it was not known that their language was unique.

Edward Hosley conducted anthropological studies in the area in the early 1960s. He first called this group the "McGrath Ingalik" (Hosley 1961), then proposed the name "Kolchan" in 1968. Meanwhile, in 1966, Ray and Sally Jo

Collins adopted the geographic name "Upper Kuskokwim Athabaskan" to describe the language.

We began a linguistic study of the language in 1963 under the auspices of the Summer Institute of Linguistics, Inc. In 1964, an orthography was adopted. At that time there was little interest in the language except by the speakers themselves so an orthography was developed for their benefit that was as close to English as possible and yet used a separate symbol for each sound in the language. It was also desirable to have an orthography that could be typed on a standard typewriter and this was accomplished, although some backspacing is required to complete some non-English symbols. The first publication was a dictionary of nouns in 1966, and literacy materials soon followed.

In 1972, when the bilingual education movement reached Alaska, several local speakers of Upper Kuskokwim were trained as instructors. Subsequently numerous short books were published in the language including a dictionary of verbs in 1979. A bilingual program began in the Nikolai School in the fall of 1972 and has continued since that date. A similar program for students exists in Telida as well. As a result, a number of speakers of Upper Kuskokwim have learned to read and write their language.

The Upper Kuskokwim orthography can be charted as follows:

<u>Consonants</u>

voiceless stops	t	ts	tl	tr	ch	k
voiced stops	d	dz	dl	dr	ch	g
glottalized stops	t'	ts'	dl'	tr'	ch'	k'
glottal stop						'
voiceless fricatives		s	ł	sr	sh	h
voiced fricatives		z	l	zr	y	gh
glottalized fricative					y'	
voiceless nasals		n̲				
voiced nasal	m	n				
glottalized nasal		n'				

<u>Vowels</u>

e			u
	i	w	
a			o

One familiar with linguistics can see in the chart above that most of the symbols are conventional. The largest group of non-English sounds is that of glottalized consonants which are marked by the apostrophe ('). There are two voiceless sounds in Upper Kuskokwim that need to be mentioned, the "l" and "n̲". The "l" is produced by striking a hyphen (-) over an "l" (symbolized in some other orthographies by "lh") and the "n" by underlining ("nh" in some other orthographies).

The greatest difference between the Upper Kuskokwim orthography and those of the neighboring Athabaskan languages is the way the vowels are written. Upper Kuskokwim has six vowels but there are only five vowel characters in the English alphabet. The choice was to either use double letters for some vowels or to introduce another symbol for the sixth vowel. The "W" was chosen to represent a vowel since there is no "W" sound in Upper Kuskokwim and the vowel it represents shares the lip rounding used in pronouncing "W" in English. The vowels can be compared to English as follows:

"e"	as in the English words "me" and "he"
"a"	as in the English words "hat" and "cat"
"i"	as in the English words "bit" and "hit"
"o"	as in the English words "hot" and "pot"
"u"	as in the English words "flu" and "blue"
"w"	as the "u" in the English word "put" or as the "oo" in the English word "soot"

As was mentioned previously, in other Athabaskan languages different choices were made. For instance, the Upper Kuskokwim "e" sound is written in neighboring Koyukon as "ee" and in Tanaina as "i".

As previously noted, a number of the place names on the following list were first recorded during this period using the Upper Kuskokwim orthography. A few names were recorded earlier and some have even been placed on the USGS maps, but these were recorded by non-speakers of the language who were influenced by their own language--either Russian or English.

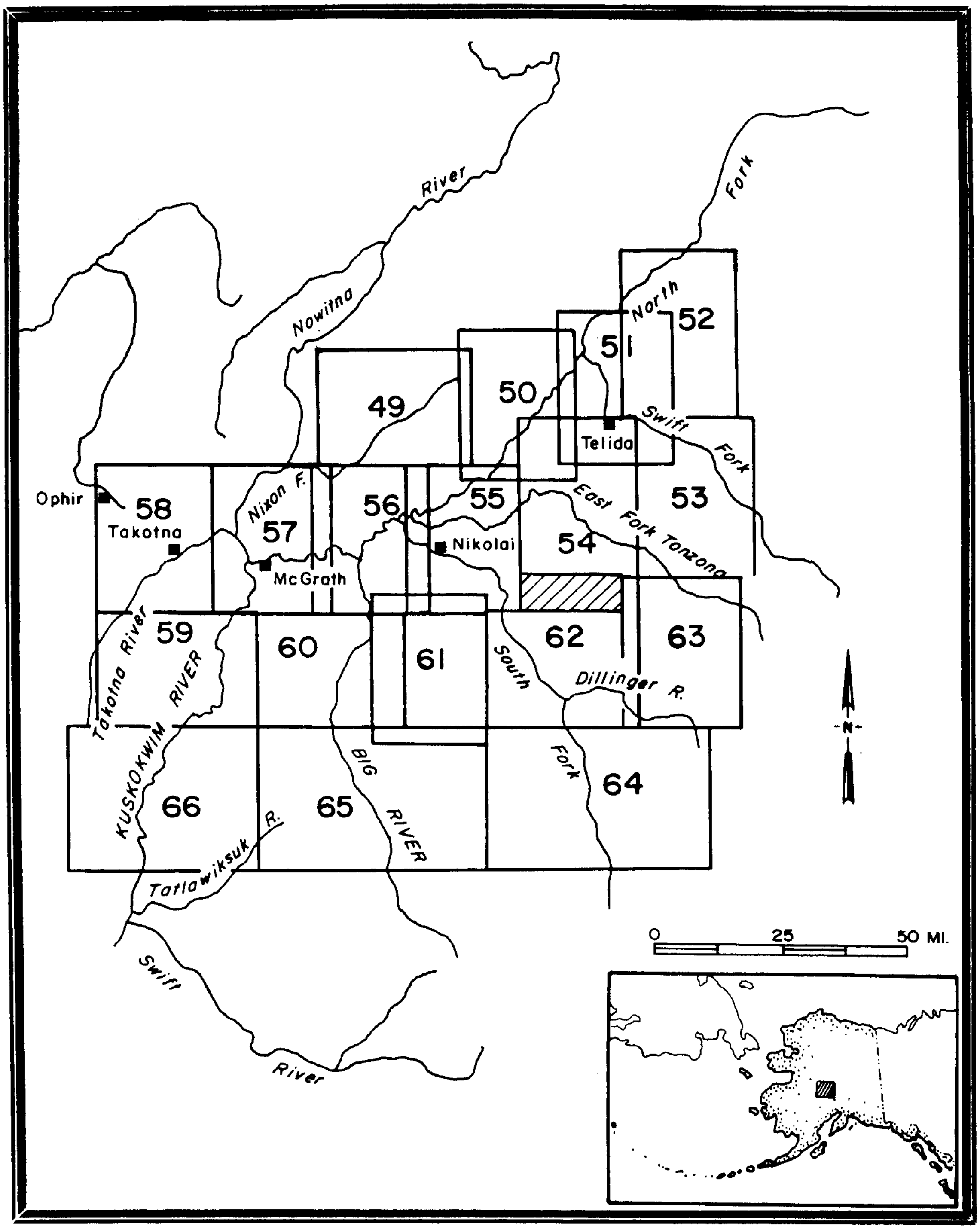

Fig. 48. Orientation of figures showing locations of places with native or commonly-used English names in the area.

PLACE NAMES--FIGURE 49

	Upper Kuskokwim Athabaskan	English Name or Description
1.	Ch'itsan' Nelane "the one with grass on it"	meadows near Sunshine Mountain
2.	Mimonoch'isdoje	hill 25 miles northeast of Medfra
3.	Tsat'asrno' "black/charcoal rock creek"	Soda Creek
4.		Von Frank Mountain

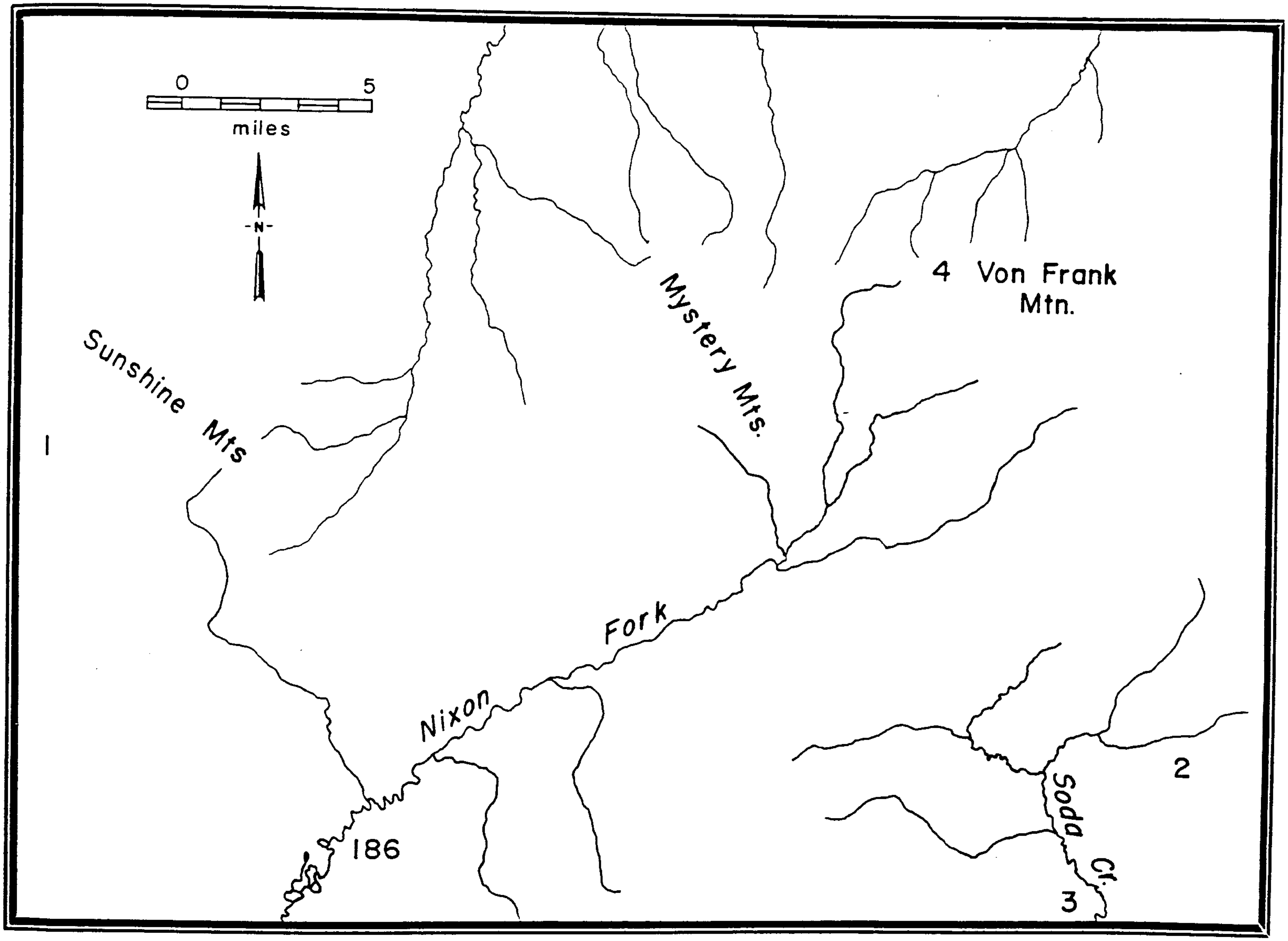

Fig. 49. Locations for places with Athabaskan or local English names, numbers 1-4.

PLACE NAMES--FIGURE 50.

	Upper Kuskokwim Athabaskan	English Name or Description
5.		"Arthur Berry Lake"
6.		"Charlie Wood" (North Fork)
7.		"High Cache Lake"
8.		"Birch Lake"
9.		"Ray Collins Lake"
10.	Shisr Nughchak' "black bear river mouth"	mouth of Slow Fork
11.	Shisr Nughno' "black bear river"	Slow Fork of Kuskokwim
12.	Shisr Nughchak' Mina' "black bear river mouth lake"	lake near mouth of Slow Fork
13.	Shisr Nughoye "black bear river hill"	"Fred King's Hill"
14.	Shisr Nughoye Mina' "black bear river hill lake"	King's Lake; "Fred King's Lake"
15.	Miɫits'anezile	Wilson's Hill
16.		"Sammy John's Lake"
17.	Shisr Nughoye "black bear river hill"	"Deaphon's Camp/Cabin"
18.	Tomo Mina' "swan lake"	Swan Lake
19.	Toneɫ'ono' "where water extends creek"	Tonclonukna Creek
20.	Hwsr Notoz'one "goes into thorns"	8 mi. southwest of Telida
21.	Tomo Mina'/Tomo Mik'idinets'ech "swan lake"	lake 6 miles west-northwest of Telida
22.		"Lost Knife Lake"
23.	Srihno'chi'a "gaff hook creek"	Baker Creek

24.	Nuchilo Mina' "point lake"	lake 13 miles northwest of Telida
25.	Ts'imayedazdlo' Mina' "among the spruce trees lake"	Spruce Lake
26.	Tontsuh Mina' "_______ lake"	lake 10 miles north of Telida
27.		"Lower Moose Lake"
28.		"Upper Moose Lake"

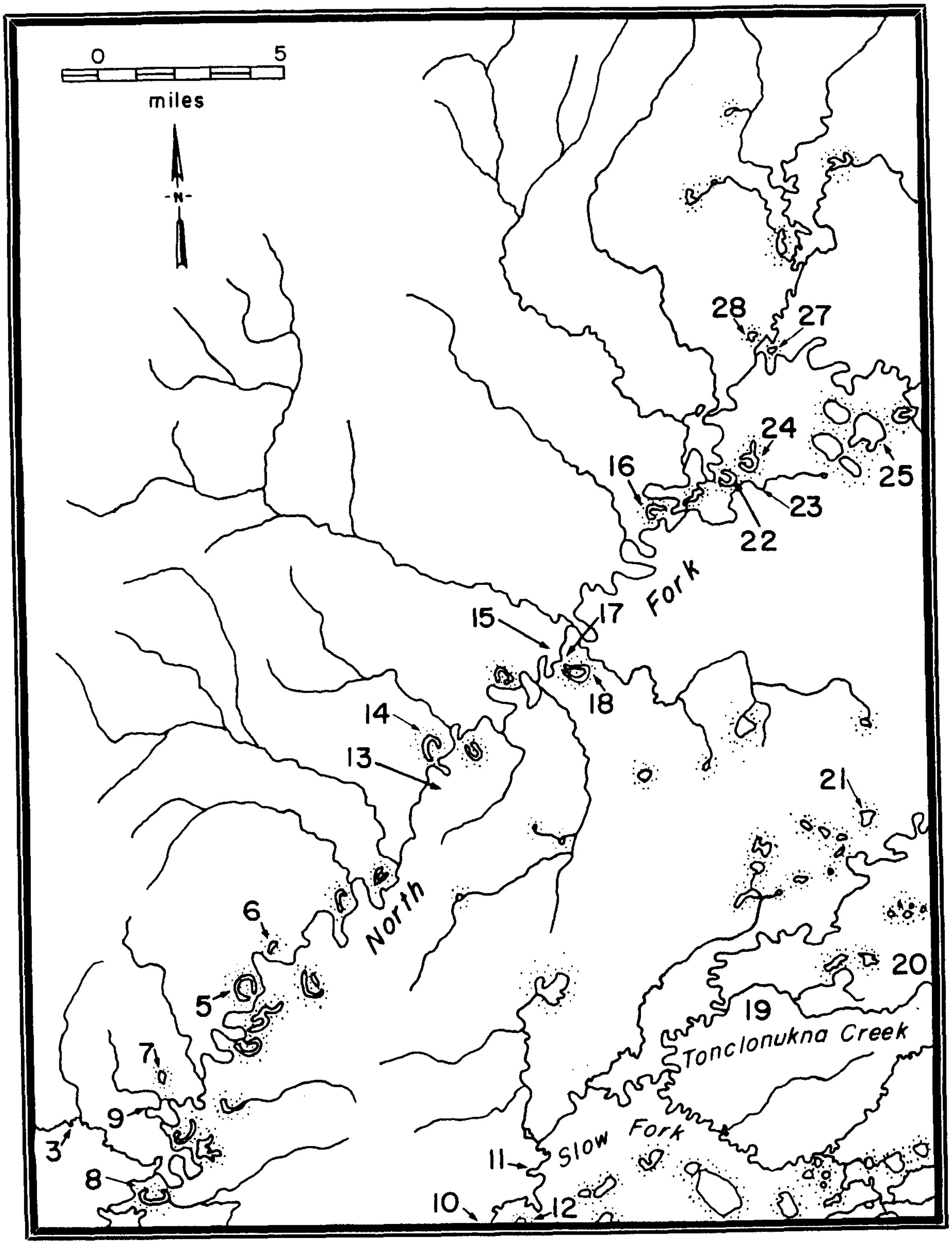

Fig. 50. Locations for places with Athabaskan or local English names, numbers 5-28.

PLACE NAMES--FIGURE 51

	Upper Kuskokwim Athabaskan	English Name or Description
29.	Ts'itontsuhdi	"Medicine Creek"
30.	Hoghtin "trail goes over"	portage 20 miles north of Telida
31.	Ts'itontsuhdi Mina'	Teliamina Lake
32.	Dwhtso Dighe'o "place where old cache stood"	13 miles north of Telida along Red Slough
33.		"Halfway Lake"
34.	Hwn Hwɨak'a' "old river/channel"	Red Slough; "Old Channel"
35.		"Grayling Hill"
36.	Todzoɨno'	Swift Fork of Kuskokwim; "McKinley Fork"
37.	Hidighidi Mina' "next to the next lake"	Upper Telida Lake
38.	Mintsatɨ'e Mina' "rock scraper mountain lake"	"Barbara's Camp"
39.	Mintsatɨe "rock scraper mountains"	Telida Mountains
40.	Ƚuk'a'unta' Mina "fish ______ lake"	Spirit Lake

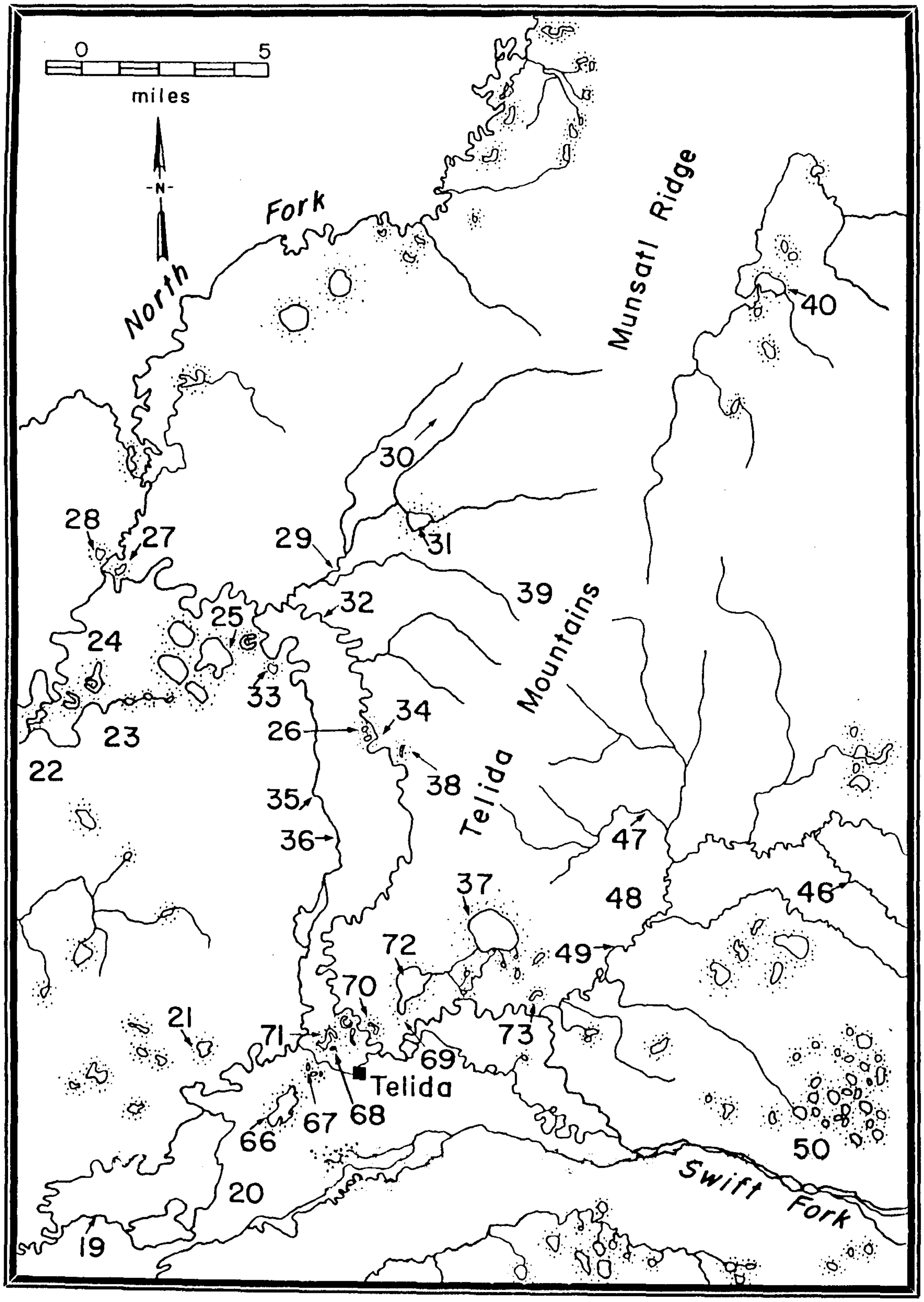

Fig. 51. Locations for places with Athabaskan or local English names, numbers 29-40.

PLACE NAMES--FIGURE 52

	Upper Kuskokwim Athabaskan	English Name or Description
41.	Shisrghoy Yisa' "black bear ridge"	Snohomish Hills
42.	Shisrghoy Yisa' Mina' "black bear ridge lake"	Thirty-Eight Mile Lake
43.	Hitsidagheɨ'oye	place near Blackfish Lake
44.	Ts'imaɨuk'a Mina' "sprucefish lake"	Sprucefish Lake
45.	Ts'imaɨuk'a Mina' K'isno "sprucefish lake outlet creek"	Lonestar Creek
46.	Hotoleno'	tributary of Highpower Creek
47.	Tsat'asrno' "black rock creek"	tributary of Highpower Creek
48.	Mitistinye "trail goes over"	hill 6 miles northeast of upper Telida Lake
49.	Tsat'asrnek' "black rock creek"	Highpower Creek

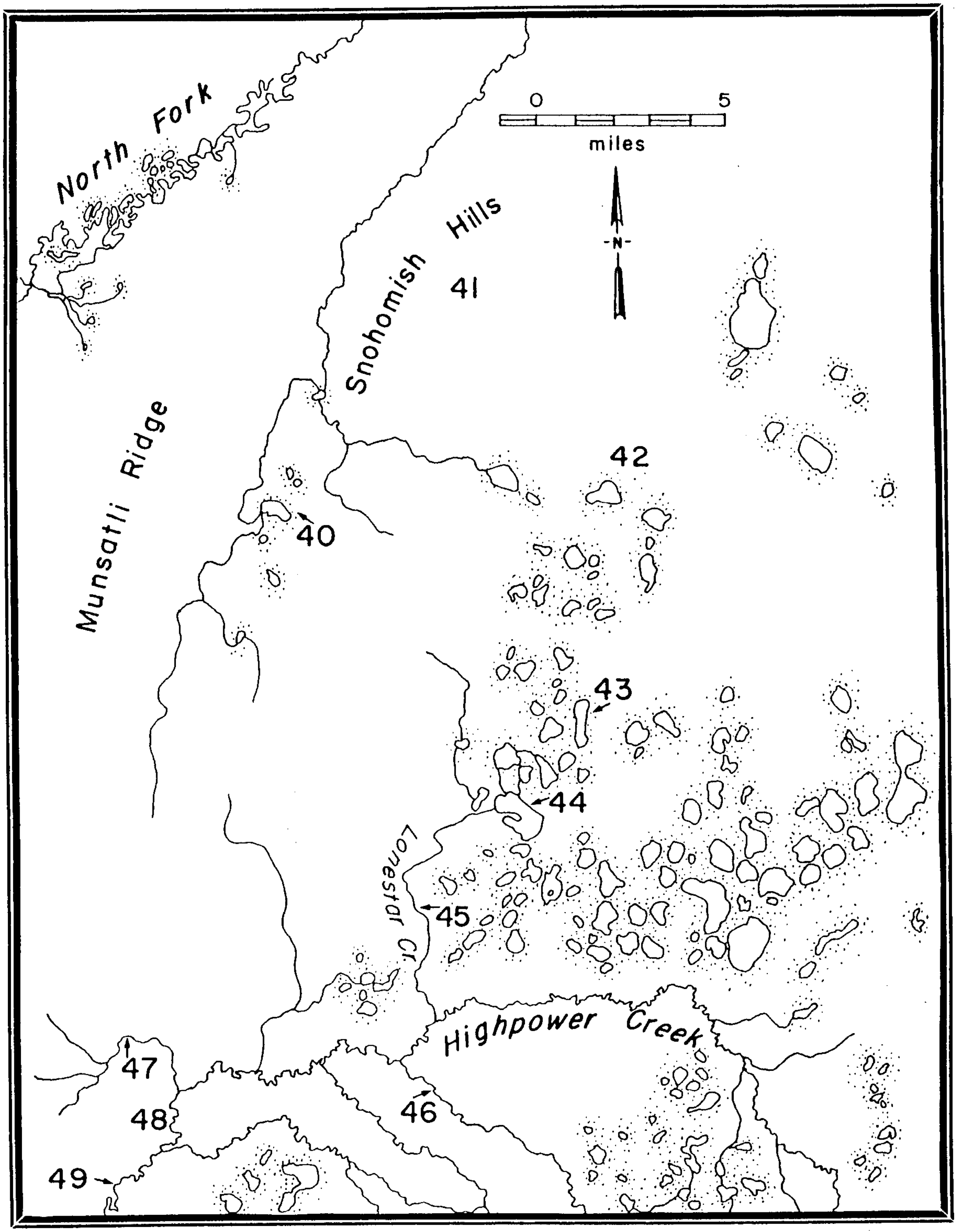

Fig. 52. Locations for places with Athabaskan or local English names, numbers 41-49.

PLACE NAMES--FIGURE 53.

	Upper Kuskokwim Athabaskan	English Name or Description
50.	Mintododigwt	camp 16 miles east of Telida
51.	Hotoletłot	4 miles west of Dull Ax Lake
52.	Hughwt "island _______"	6 miles south of Dull Ax Lake
53.	Ts'idat'ana Ch'ela Yisa' "grayling ridge"	Slow Fork Hills

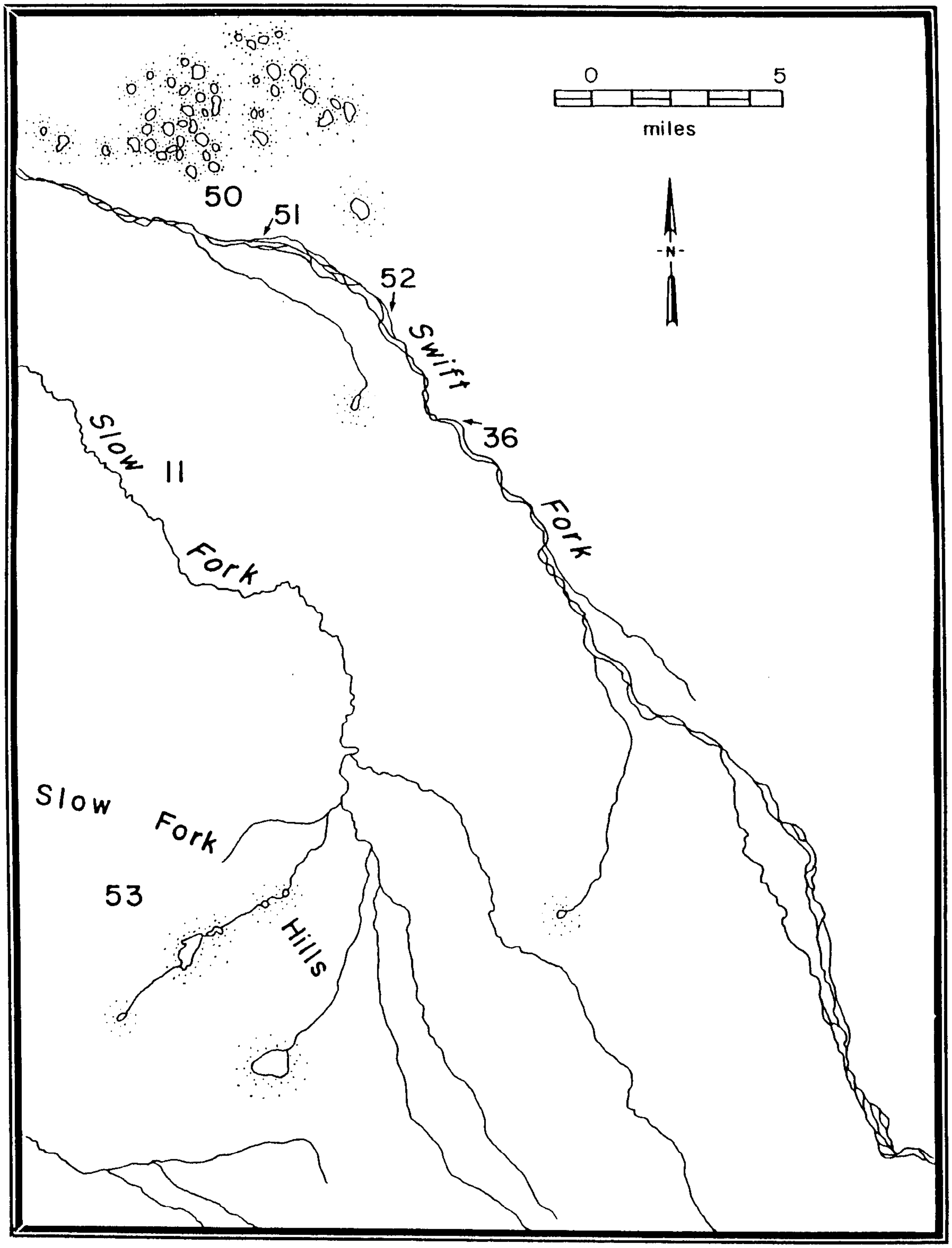

Fig. 53. Locations for places with Athabaskan or local English names, numbers 50-53.

PLACE NAMES--FIGURE 54

	Upper Kuskokwim Athabaskan	English Name or Description
54.	Toghaghe'odi "where the high ground extends to the water"	southwesternmost point of the Slow Fork Hills
55.	Hwnnoyano' "sparrow hawk creek"	Pingston Creek; "Dry Creek"
56.	Ch'udiljisdi'	Dennis Creek Village
57.	Ch'udiljisno'	Dennis Creek
58.	Tsat'usr Mina' "flat rock lake"	Dennis Lake
59.	Toghone'oye "where it goes into water"	hill east of Lake Hoyle
60.	Toghone'oye Mina' "where it goes into water lake"	Lake Hoyle
61.	Mik'itsotɨ'zitone Tɨ'wghw' "baby basket sitting on it meadow"	6 miles southwest of Lake Hoyle
62.	Mik'itsotɨ'zitone Lodhnodighelindi "baby basket sitting on it creek"	Ekolina Creek
63.	Ts'idat'ana Mina' "grayling lake"	Grayling Lake
64.	Hwldadzik	Grayling Hill
65.	Neɨk'iztazdlindi "streams flow together"	confluence of two Slow Fork tributaries 10 miles south-southweast of Telida
66.	Hwsrotoz'one mina' "goes into thorns lake"	Bear Island Lake "Two-Mile Lake"
67.		"Bob Stone's Lake"
68.	Nitoɨtroda Mina' "muskrat lake"	"Muskrat Lake"
69.	Tilaydi K'isno "lake whitefish outlet creek"	Lower Telida Lake outlet
70.	Tishdoghdaɨtone Mina' "hill ______ lake"	lake southwest of Lower Telida Lake

71.		"John's Lake"
72.	Tilaydi Mina' "lake whitefish lake"	Lower Telida Lake
73.	Dishyułk'a Mina' "spruce grouse lake"	"Chicken Lake"

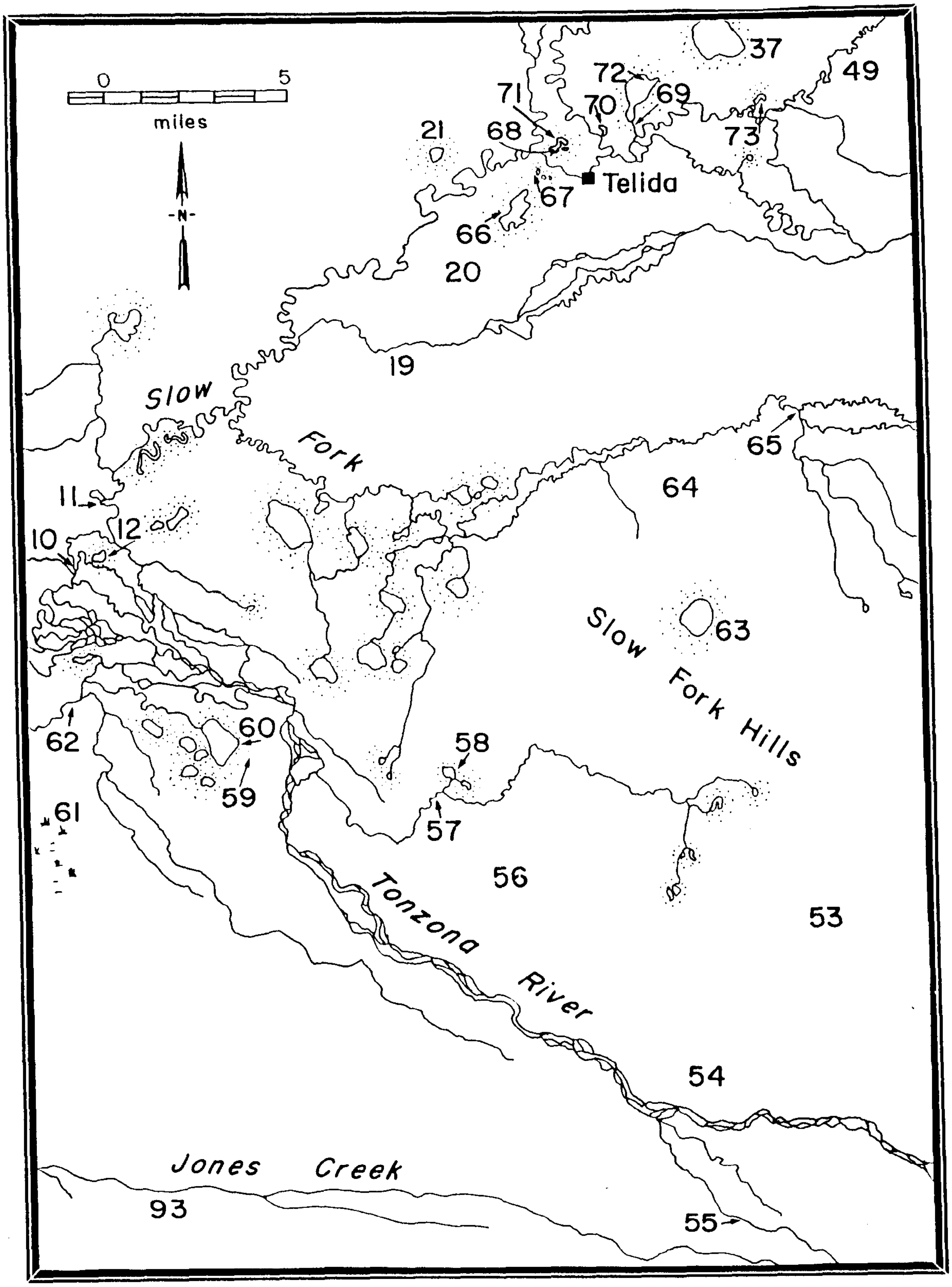

Fig. 54. Locations for places with Athabaskan or local English names, numbers 54-73.

PLACE NAMES--FIGURE 55

	Upper Kuskokwim Athabaskan	English Name or Description
74.	Dinatseya Ts'ina' Zidloda "our grandfather's bones are lying there"	ridge 20 miles southwest of Telida
75.	Toneɨ'ono' "where water extends creek"	"Fish Creek"
76.	Shisr Nugh "black bear hill"	East Fork Hills
77.	Nok'eshghiltr'ish Mina' "birch _______ lake"	18 miles northeast of Nikolai
78.	Dineje Mina' "moose lake"	"Moose Lake"
79.		"Fox Banks"
80.	Mimots'ek'eshdilene	
81.		"Pitka's Lake"
82.		"The Island"
83.	Ch'its'an'k'o' Hwchuh "big grass meadow"	13 miles northeast of Nikolai
84.	Dichinanek' "water in trees"	North Fork Kuskokwim River
85.	Dik'ats'ats'inladi	"Snag Slough"
86.	Dik'ats'ats'inla Mina'	"Dennis Tree Lake"
87.	Chi'dotɨ'uɨno' "crooked/braided string river"	East Fork of Kuskokwim and Big Tonzona River
88.	Mik'itsotɨ'zitone Nodaghelinhw "baby basket sitting on it creek"	tributary of the East Fork Northeast of Nikolai
89.	Mik'itsotɨ'zitone "baby basket sitting on it"	Babybasket Hill
90.	Ts'itontswh Mina'	lake one-half mile northeast of "Moose Hill"
91.	Ch'idrohtane "heart hill"	"Moose Hill"

92.	Ch'idrohtane Mina' "heart hill lake"	Dinagiemina Lake "Moose Lake"
93.	Ik'aleno'/K'aleno'	Jones Creek
94.	Notsetazditondi "trail goes across"	10 miles northeast of Nikolai
95.		"Charlie Wood" (East Fork)
96.	Tonełkwn' Mina' "clear lake"	Fishing Lake
97.	Mindighilmots'e' Mina' "round lake"	Round Lake "Halfway Lake"
98.	Netone'o Mina' "where water extends across lake"	"East Fork Slough Lake"
99.		"Dick McCarthy's Lake"
100.	T'ighis'udaz'o Mina' "cottonwood extends into the water lake"	Cottonwood Lake
101.	Mik'its'k'o'ts'eghetone "one trail goes on top of"	"Four Mile Lake"
102.	Nikotł' Mina' "salmonberry lake"	Salmonberry Lake
103.	Tł'och'isko' Mina' "floating up grass lake"	Reed Lake
104.	Notsetazditon Mina' "trail going across lake"	"Pete's Fire Lake"
105.	Toneł'ono' "water extends creek"	"Fish Creek"
106.	Tonilts'uno' Hwdochak'	Mouth of Little Tonzona River
107.	Nonoy'dolkwshdi	southwest of Nikolai
108.	Chi'dzułghashdi "fish spearing place"	salmon fence site on Little Tonzona River
109.	Tonilts'uno'	Little Tonzona River "Tonzona River"
110.	Nełghasdlindi "current flows together"	confluence of two Little Tonzona River tributaries

111.	Nełighasdlindi Mina' "current flows together lake"	Southeast of Nikolai
112.	Nenots'eshts'ilyashno' "where people left boats"	Place on the South Fork southeast of Nikolai
113.	K'eshye Ts'ighetondi "where trail goes in/among birch place"	South Fork-Salmon River portage
114.	Nints'ehliyahdochak "__________ mouth"	southeast of Nikolai
115.	T'asrnutoyono' Mina' "water flowing to charcoal island lake"	"Sandbar Lake"
116.	T'asrnungi "charcoal island"	South Fork Island
117.	Hotoleno'	Salmon River
118.	Ts'imaz'ono' "line of spruce trees creek"	Spruce-lined Creek "Timber Creek"
	119.	"Halfway Lake"
120.	Misdi "bluff"	"The Bluff"

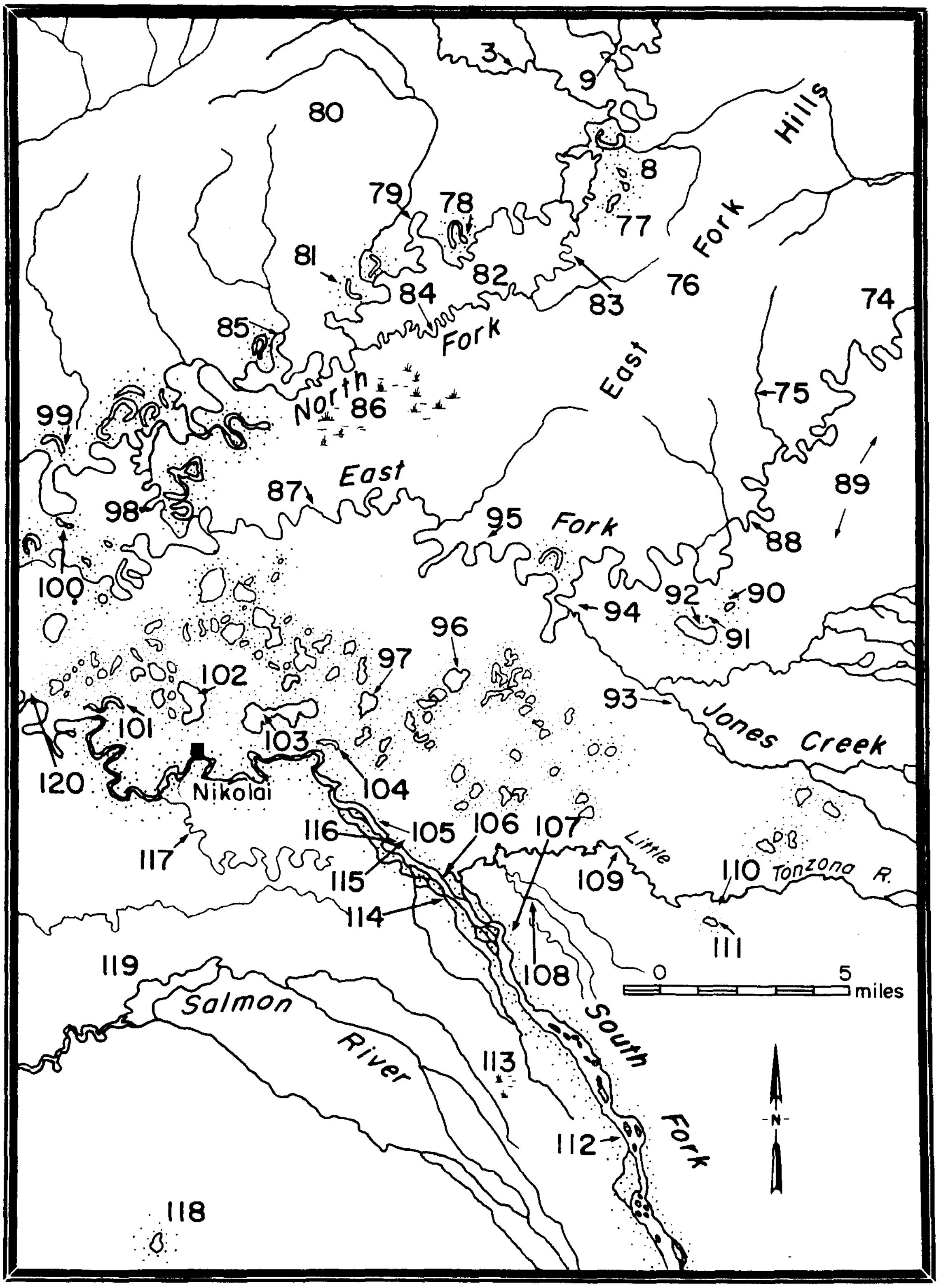

Fig. 55. Locations for places with Athabaskan or local English names, numbers 74-120.

PLACE NAMES--FIGURE 56

	Upper Kuskokwim Athabaskan	English Name or Description
121.	Nikotł' Mina' "salmonberry lake"	Salmonberry Lake
122.	Tohwdechohno' "wide water creek"	Middle Fork
123.		"Clem's Lake"
124.	Ts'ighelindi "place water runs across"	southwest of Nikolai
125.	Srihchak' Mina' "hook mouth lake"	"Jeff's camp"
126.	Srihchak' "gaff hook mouth"	tributary of "Jeff's camp"
127.		"Caribou Lake"
128.	Hidighidi Mina' "next to the next lake"	lake 15 miles east of McGrath
129.	łatsko' Mina' "mud lake"	lake 16 miles east of McGrath
130.	Iska Mina' "fish trap lake"	Coy Lake
131.	Totisdazchak' Mina' "mouth of portage lake"	"Phillip's Island Lake"
132.	Nełkadighelindi "where streams flow together"	mouth of Big River
133.	Tłodalechak	mouth of Blackwater Creek
134.		"Callighan's Lake"
135.		"Vanderpool's Lake"
136.	Toneł'ono' "where water extends"	"Lower Fish Creek"
137.	Toneł'ono' "where water extends"	"Upper Fish Creek"
138.	Ts'inotł'o'mina'	Guitar Lake

139.	Tutł'ohdochak' Mina' Ch'ihwghnets'inye	"Snaggy Point Lake"
140.	Tutł'ohidockak' Mina' Tonedr "_____ middle ______ lake"	"Upper Middle Fork Lake"
141.	Tutł'ohidockak' Mina' Ch'ihwghtsets'inye	"Lower Middle Fork Lake"
142.	Noghelnadi	"CAA Landing"
143.	Shirsmełtin "bear snare trail"	former portage between Big River and Middle Fork
144.	Nełkadighelindi Hidighelo' "where streams flow together"	"Big River Hill"
145.	K'isr Hidighelo' Mina' "alder hill lake"	south of Halfway Mountain
146.	K'isr Hidighelo' "alder hill"	Halfway Mountain
147.	Tsat'oh Mina' "lake under rocks"	"Katherine's Lake"
148.	Nutin "island trail"	"Big River Cut-off"
149.	Noghelnadi Dighelo' "_____ mountain"	hill southwest of Medfra
150.	Tsat'ohghelindi "current flows below rocks"	southwest of Medfra
151.	Dodzone Tohwt'an Mina' "loon lake"	"Loon Lake"
152.	Hwghnotohdanełnin Mina' "channel cuts off portage"	Morrison Lake
153.	Hit'itodghe'odi	southwest of Medfra
154.	Sojhwno' "old river"	"South Fork Slough"
155.	Tomo Mina' "swan lake"	"Swan Lake"
156.	Hwghdanelindi "where current flows"	East Fork Slough
157.	Sojhwno' Mina' "old river lake"	"Twin Lake" (one of the)

158.	Tonedrdits'dazdlo Mina' "log jam in the middle lake"	"Log Jam Lake"
159.	Nełjots'inmindazdlodi "the place where lakes are on both sides"	"The Twin Lakes"
160.	Dolmoya Mina' "goose lake"	"Twin Lake" (one of the)
161.	Edzeno'	South Fork Kuskokwim River
162.	Edzechak' Mina' "mouth of 'south fork' lake"	"Andrews's Lake"
163.	Tron'kayihmina' "shit house lake"	"Outhouse Lake", "Junior's Lake"
164.	Ch'idotł'ułchak' Mina' "crooked string river mouth lake"	"East Fork Lake"
165.	Nikayghotin "canoe trail"	Scow Harry Creek
166.	Mit'ikatsghłnine "we tripped over it"	Limestone Mountain
167.	Nikwsdaneł'an Mina'	"Lunch Lake"
168.		"Muskrat Swamp"

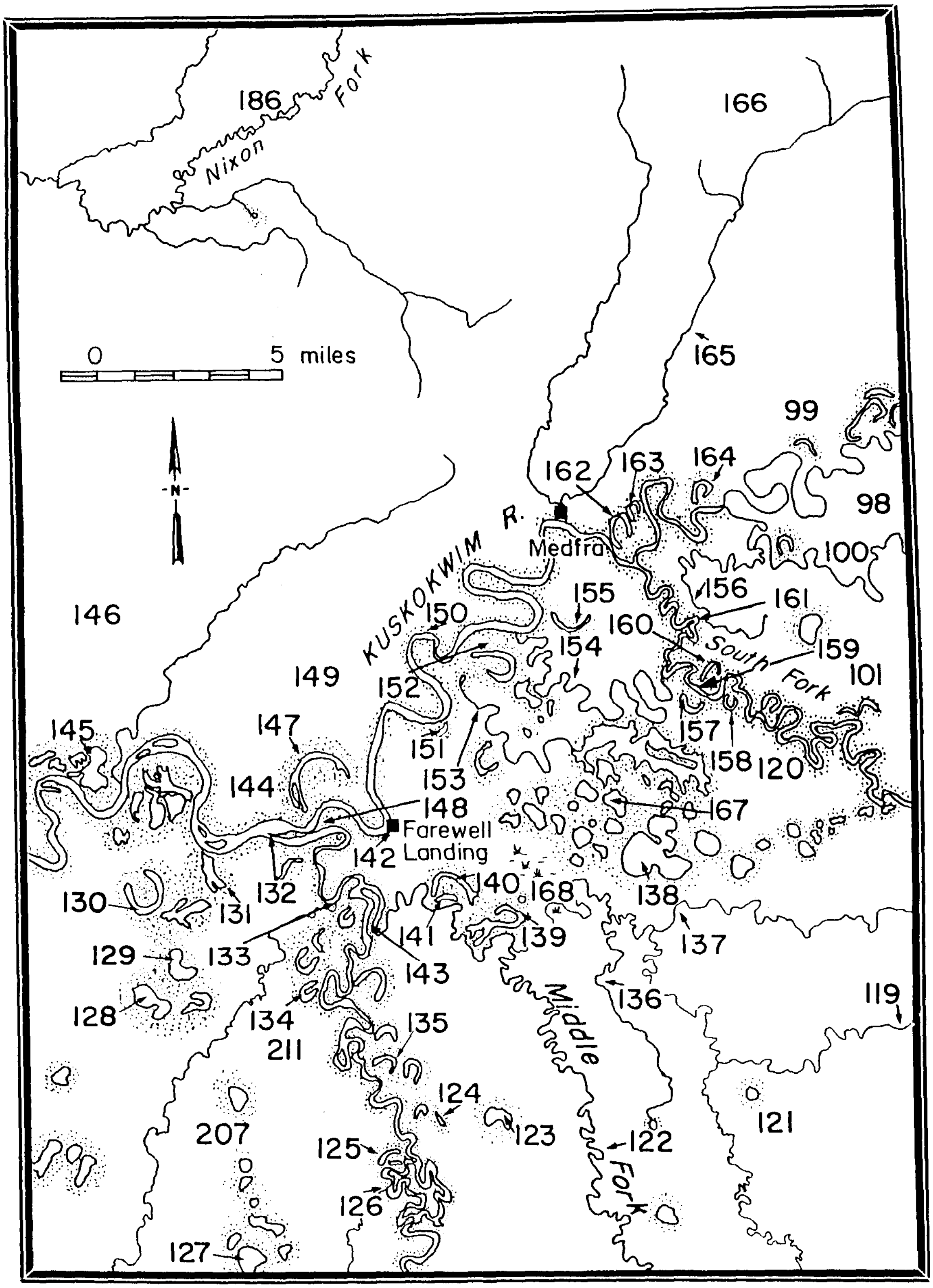

Fig. 56. Locations for places with Athabaskan or local English names, numbers 121-168.

	Upper Kuskokwim Athabaskan	English Name or Description
169.	Tsat'ohghelindi "current flows beneath the rock place"	
170.	Mits'ihwti'izre	hill east of McGrath
171.	Ts'idat'ana K'isno' "grayling creek outlet"	Grayling Creek
172.	Tsat'ohghelindi Mina' "current flows beneath rock lake"	lake east-northeast of McGrath
173.	Notozdlindi "river flows across place"	high water slough east of McGrath
174.	Isghontsek' "fish trap _______"	east of McGrath
175.	Ch'itlih Mina'	"Smitty's Lake"
176.	Ts'itishlish Hwda/Ts'itishgheł'odi "little ridge to river"	"Cranberry Ridge"
177.	Tsesh Mina' Nidaghelinhw "paint lake creek flowing"	creek flowing into #178 from the east
178.	Tsesh Mina' "paint lake"	lake south of McGrath
179.	Ts'imindoz'o Mina'	lake south of McGrath
180.	Mideline	Roundabout Mountain
181.	Tochak' "water mouth"	confluence of Takotna River with Kuskokwim (at McGrath)
182.		"Clam Lake"
183.	Nuch'ilo Mina' "point of island lake"	lake northeast of McGrath
184.		"Victoria Bar"
185.	Tocho'no' "open water"	Takotna River
186.	Nets'inhido "from the north"	Nixon Fork

187.	Imonoch'istoje	Appel Mountain
188.		"Blueberry Hill"
189.		"Burntop"

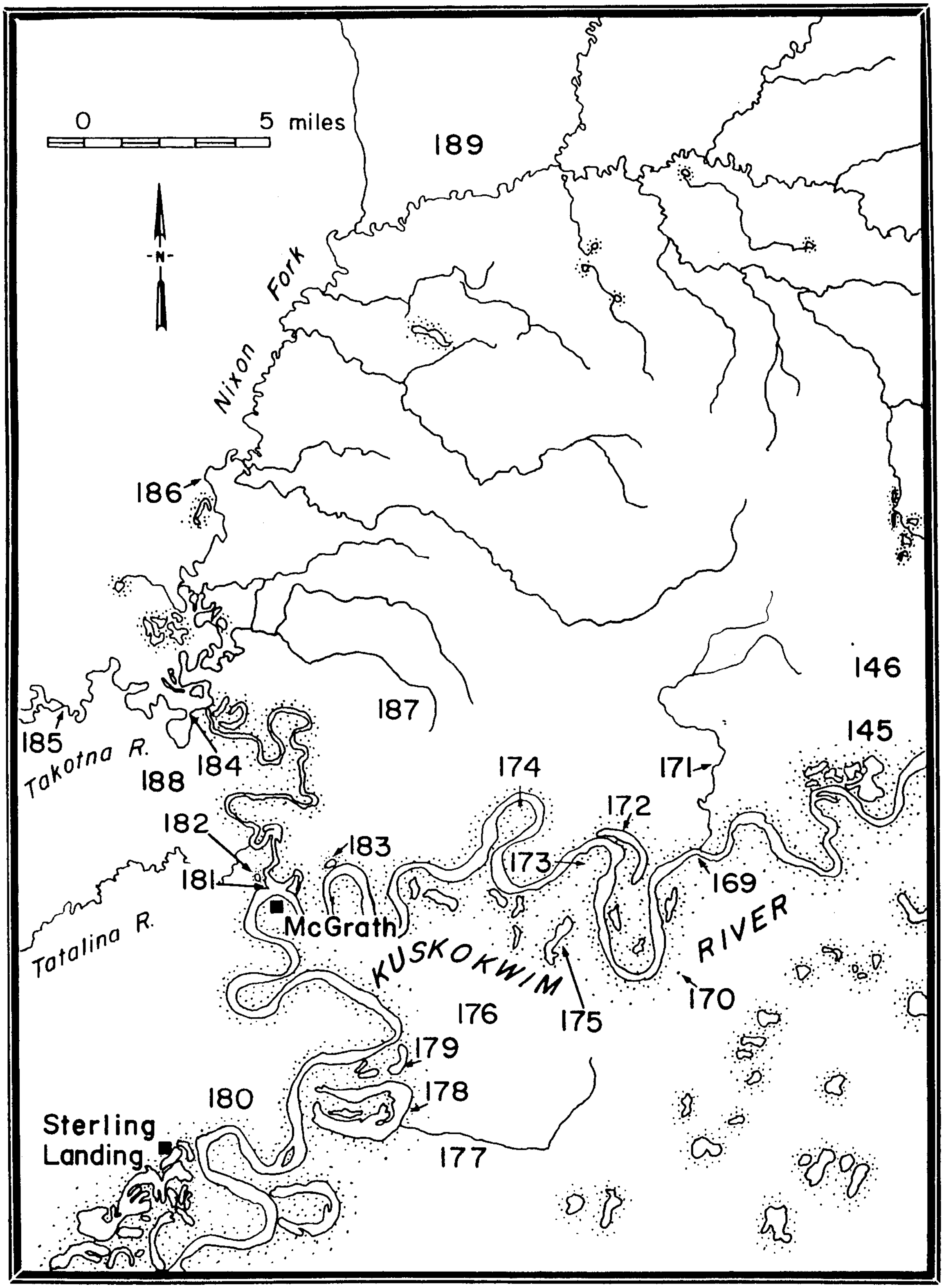

Fig. 57. Locations for places with Athabaskan or local English names, numbers 169-189.

PLACE NAMES--FIGURE 58

	Upper Kuskokwim Athabaskan	English Name or Description
190.	Nits'ize	Takotna Mountain "Tatalina Mountain"
191.	Nits'izeno'	Tatalina River "Tatalina Creek"

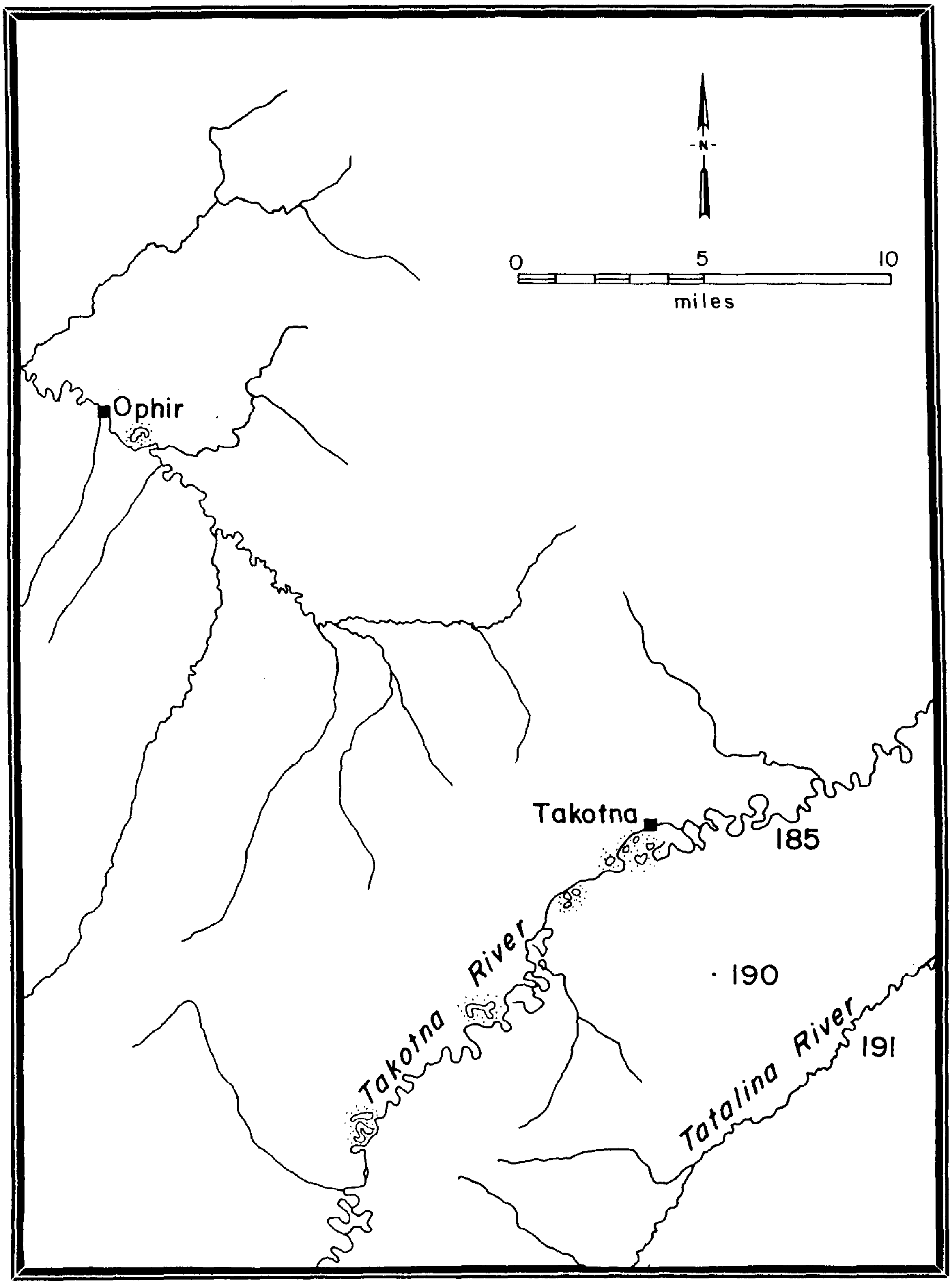

Fig. 58. Locations for places with Athabaskan or local English names, numbers 190-191.

PLACE NAMES--FIGURE 59

	Upper Kuskokwim Athabaskan	English Name or Description
192.	Toholtsitno'	Big Creek
193.	Toholtsidochak'	mouth of Big Creek
194.	Ch'idraya "heart"	hill southwest of Takotna
195.	Ts'etanetala'	hill southwest of Takotna
196.	Mik'ich'alyo	Tatalina Mountain
197.	Mik'ich'alyoze Ndaghelinno'	Carl Creek
198.	Dilots'uk' Ndaghelinna'	Katlitna River tributary
199.	Hiloyhwt'on' Mina'	horseshoe lake south of Wilson's Lake
200.	Minisale	Vinasale Mountain
201.	Hey'tsan'no' "grass creek"	Vinasale Lake tributary
202.	Minisale Mina'	Vinasale Lake
203.	Mitisjetł'uje	hill south-southeast of Vinasale Mountain
204.	Tsalatno' Tuts'intazdlinno'	Little Selatna River
205.	Tsalatno'dighelo'	Selatna Mountain
206.	Tsat'asrno' "black rock river"	Black River
207.	Ts'eshtin "canoe trail"	Beaver Creek

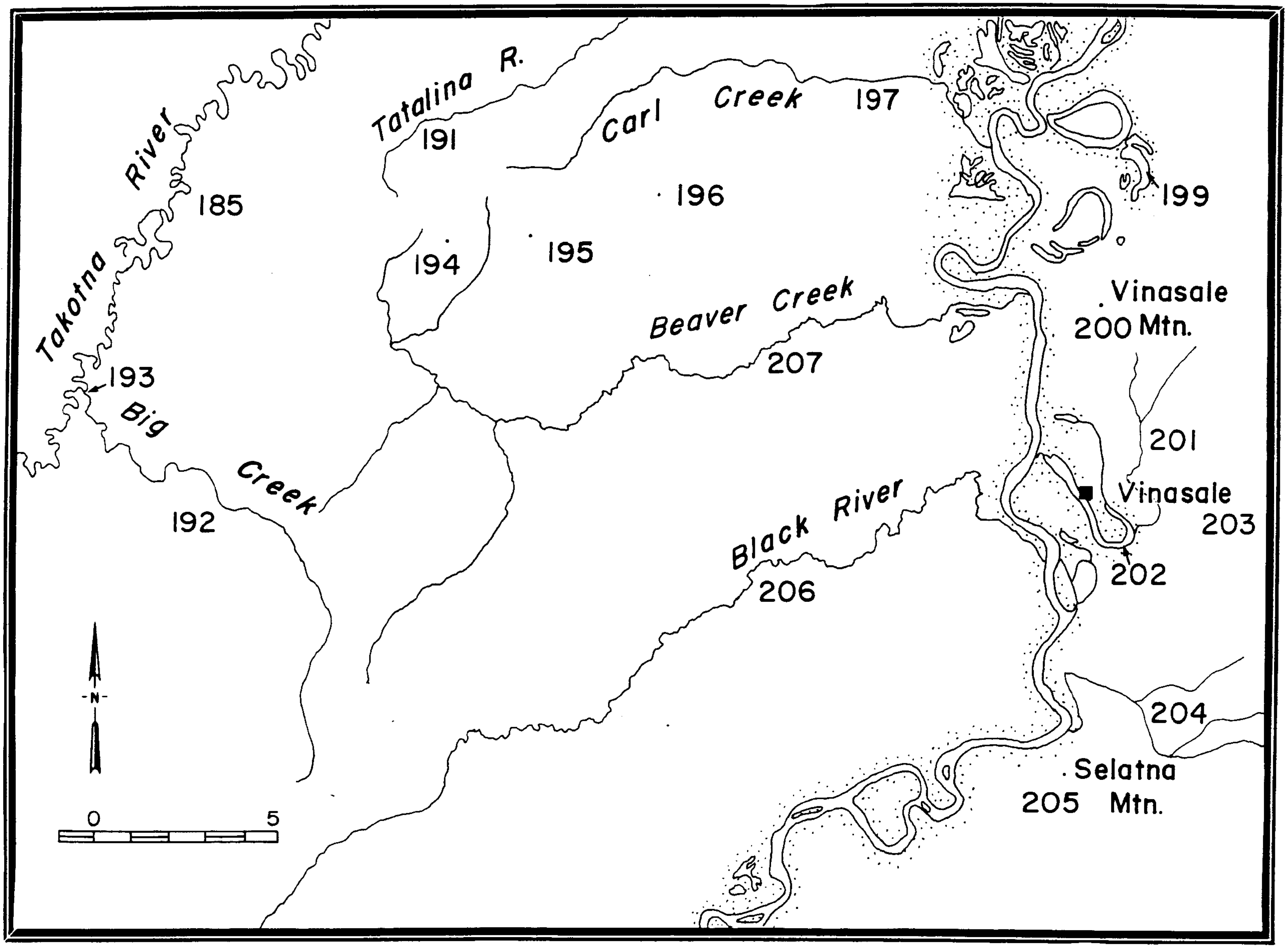

Fig. 59. Locations for places with Athabaskan or local English names, numbers 192-207.

PLACE NAMES--FIGURE 60

	Upper Kuskokwim Athabaskan	English Name or Description
208.	K'eshdzotno' "birch river"	Katlitna River
209.	Tets'achika'ts'izchin Mina' "snared dog foot lake"	lake 18 miles southeast of McGrath
210.	Tlodaleno'	Blackwater Creek
211.	Zidlaghe Zighashno' "sheefish harvest river"	Big River
212.	Nuchwhno' "big island creek"	tributary of Big River southwest of Nikolai
213.	Tameł Tana'ilyashno' "fish net setting creek"	"Otter Creek"
214.	Tameł Tana'ilyashhwdchak' Mina' "fish net setting creek mouth lake"	lake near "Otter Creek"
215.	Mik'its'hots'idile "the one we walk on top of"	Lone Mountain

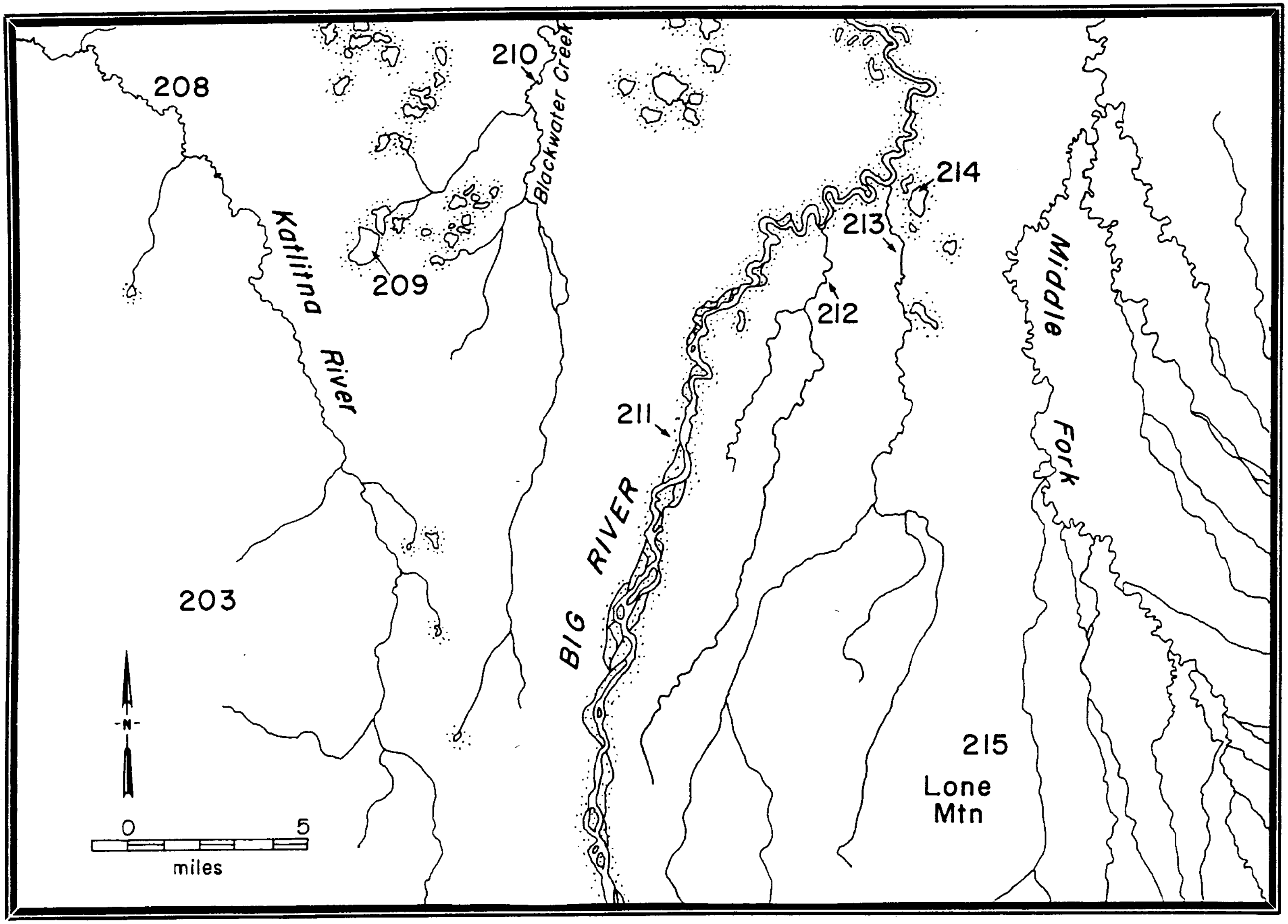

Fig. 60. Locations for places with Athabaskan or local English names, numbers 208-215.

PLACE NAMES--FIGURE 61

	Upper Kuskokwim Athabaskan	English Name or Description
216.	Hwtsahnek'	"Hard Luck Creek"
217.	Dzon Mogh "silty shore"	Middle Fork tributary
218.	Tahtso' Dil'ehw "place where water beetles are gathered"	Middle Fork tributary
219.	T'ighis Nungi "cottonwood slough"	"Fish Hole"
220.	Tł'whye Dighelno' "creek flowing through grass"	Middle Fork tributary
221.	Tohwdechohno' "wide water creek"	Windy Fork
222.	Nenots'eshts'ilyashno' "creek where people left boats"	Middle Fork tributary
223.	Maz'anek	Khuchaynik Creek
224.	Tseshno' "ochre creek"	Sheep Creek/Pitka Fork
225.	Tekonekan't'ogh "below the wolf den creek"	Sullivan Creek
226.	Hotołk'wtino' "spring creek"	Bear Creek

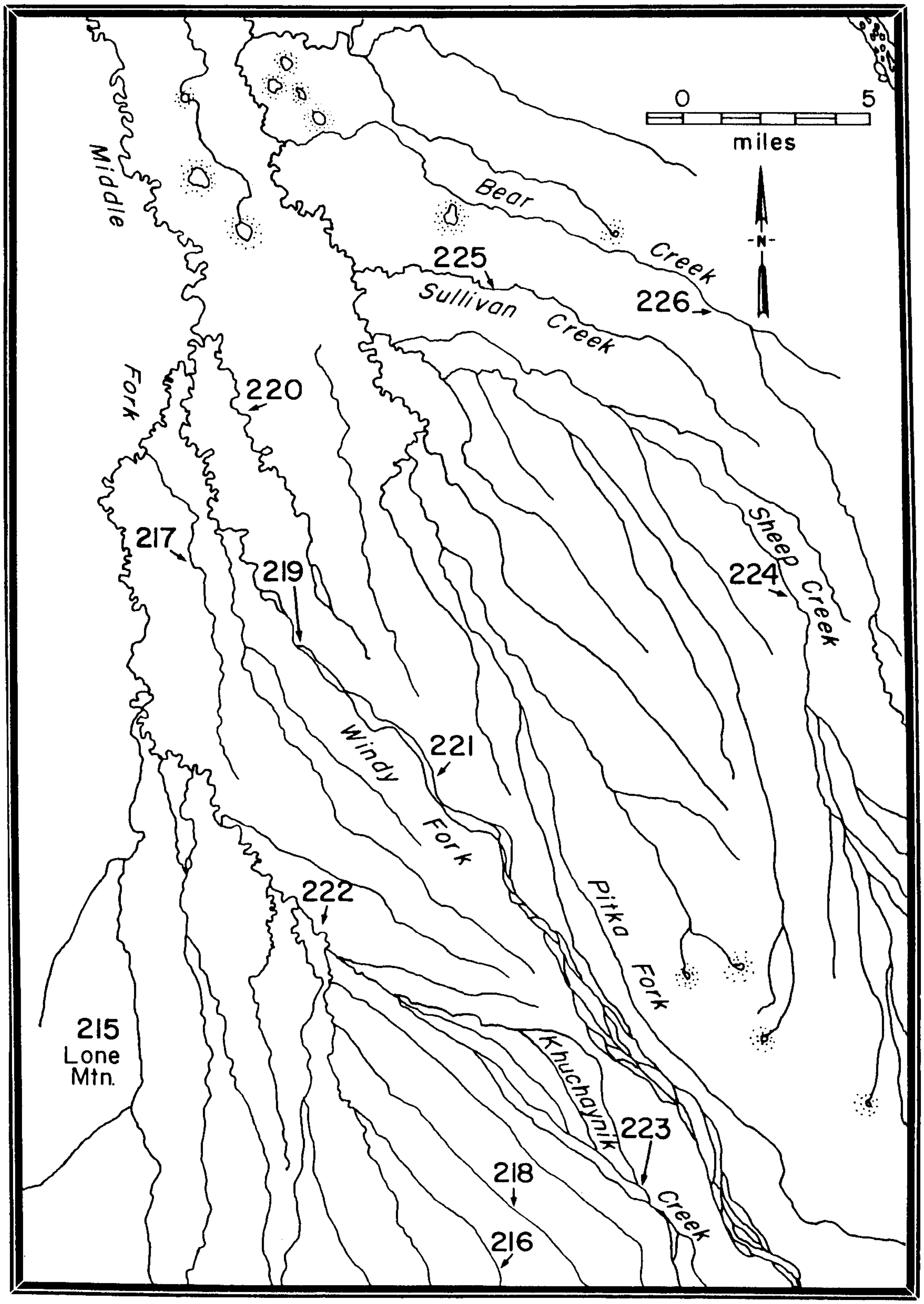

Fig. 61. Locations for places with Athabaskan or local English names, numbers 216-226.

PLACE NAMES--FIGURE 62

	Upper Kuskokwim Athabaskan	English Name or Description
227.	Nughoy "island end"	place on the South Fork southeast of Nikolai
228.	Ch'ihughtsets'in Tohwnaghe'odi "lower place ridge extends into water"	southeast of Nikolai
229.	Tish Zidlodi "place where hills are"	northwest of Farewell Lake
230.	Ch'ihughwhts'in Tohwnaghe'odi "upper place where ridge goes into water"	northwest of Farewell Lake
231.	Hwdaneɫtonno'	flats north of Farewell
232.	Ch'its'a Hwnots'e'editondi "trail between ridges"	"Four-Mile Hill"
233.	Ts'enan Noz'one	hill east of Dillinger River
234.	Tetno' Hwchwh "paint big"	Dillinger River
235.	Tetno' Higoya "paint little"	Jones River
236.	Todraya' "water heart"	Egypt Mountain
237.	Ts'enan Naz'one "lies straight across"	Farewell Mountain
238.	Todraya' Mina' "water heart lake"	Farewell Lake
239.	Dziɫyehwt'ana Kwnwh "mountain peoples ________"	St. John's Hill
240.	Mintsodi'oye "one with cache"	north of Farewell
241.	Mintsodi'oye Ts'adinalyoye "one with cache ________"	

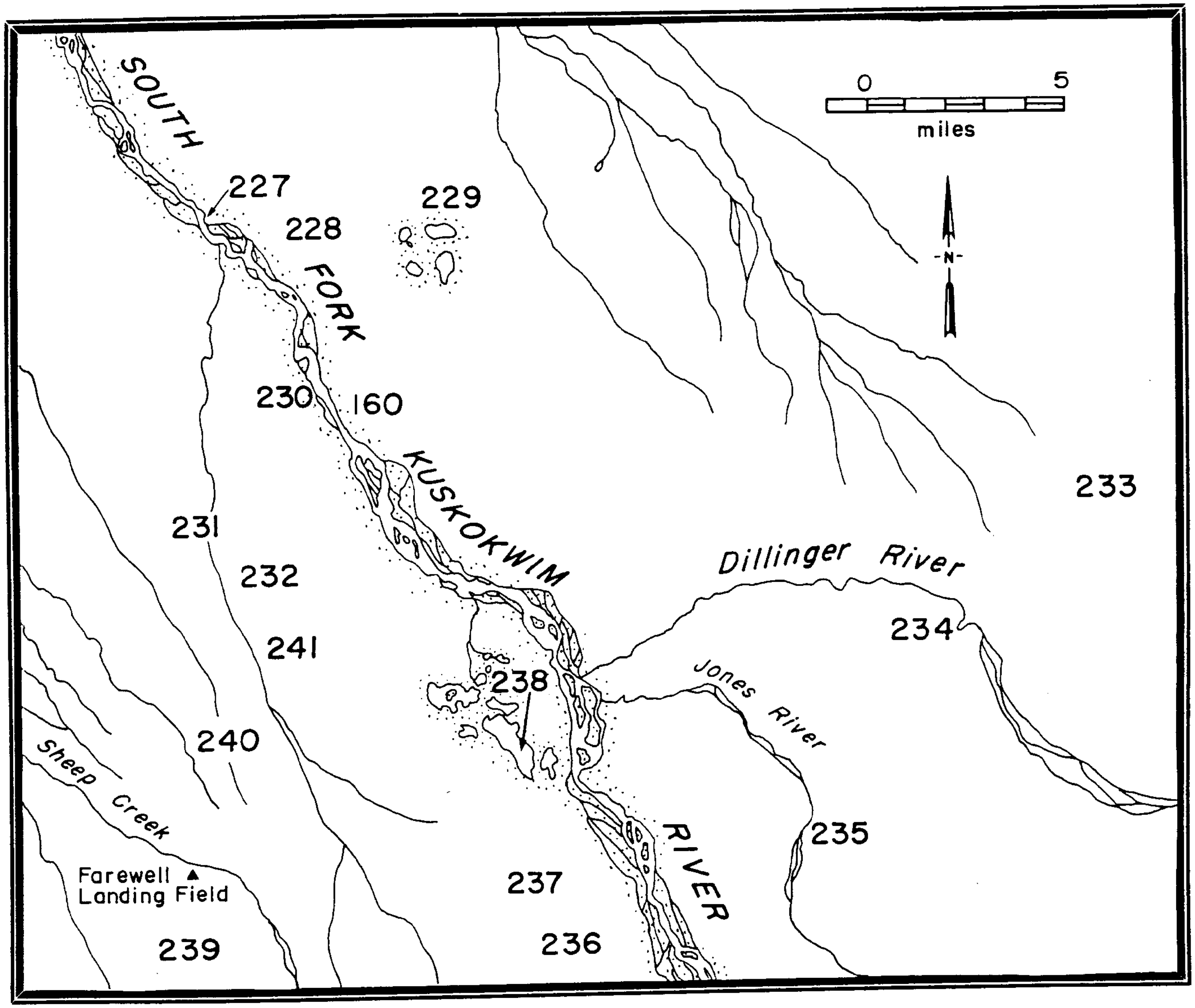

Fig. 62. Locations for places with Athabaskan or local English names, numbers 227-241.

PLACE NAMES--FIGURE 63

	Upper Kuskokwim Athabaskan	English Name or Description
242.	Diniltsejeno' "paint creek"	Red Paint Creek
243.	Tazdlin Mina'	Mystic Lakes; Amos Lakes
244.	Mistoghyih Ts'ahulyono' "from beneath the bluff creek"	tributary of Tonzona River

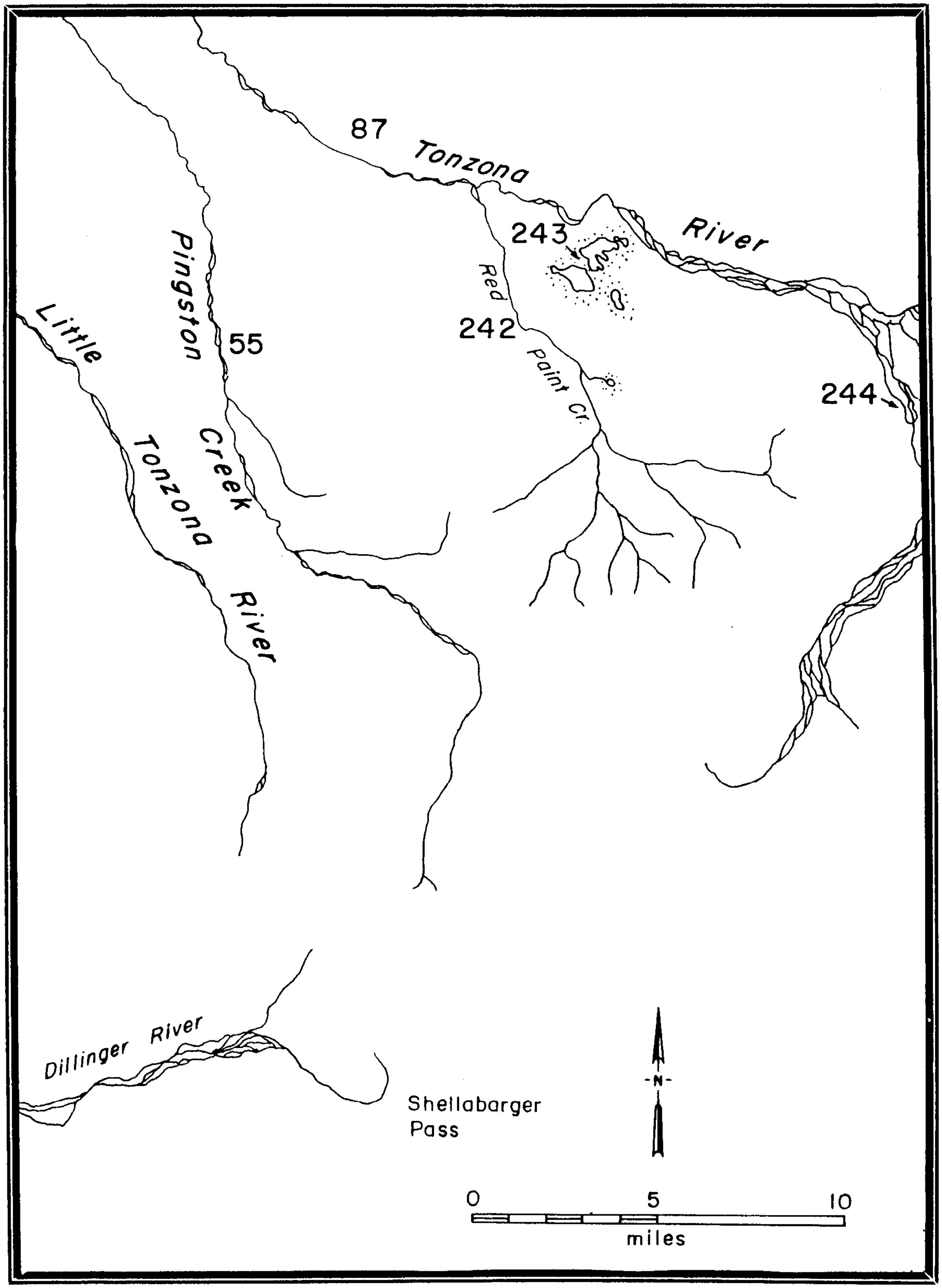

Fig. 63. Locations for places with Athabaskan or local English names, numbers 242-244.

PLACE NAMES--FIGURE 64

	Upper Kuskokwim Athabaskan	English Name or Description
245.	Nełdzin	Rainy Pass
246.	Nełdzinno'	Pass Creek
247.	Hwtal	Ptarmigan Valley
248.	Toy'draya Nohwts'in Ts'ahwdat'on "water heart ______________"	Tin Creek
249.	Dziłyehwt'ana Kayih "mountain people's house/village"	hill south of St. Johns Hill
250.	Dimindałtondi "high land lake"	Post Lake
251.		Post River

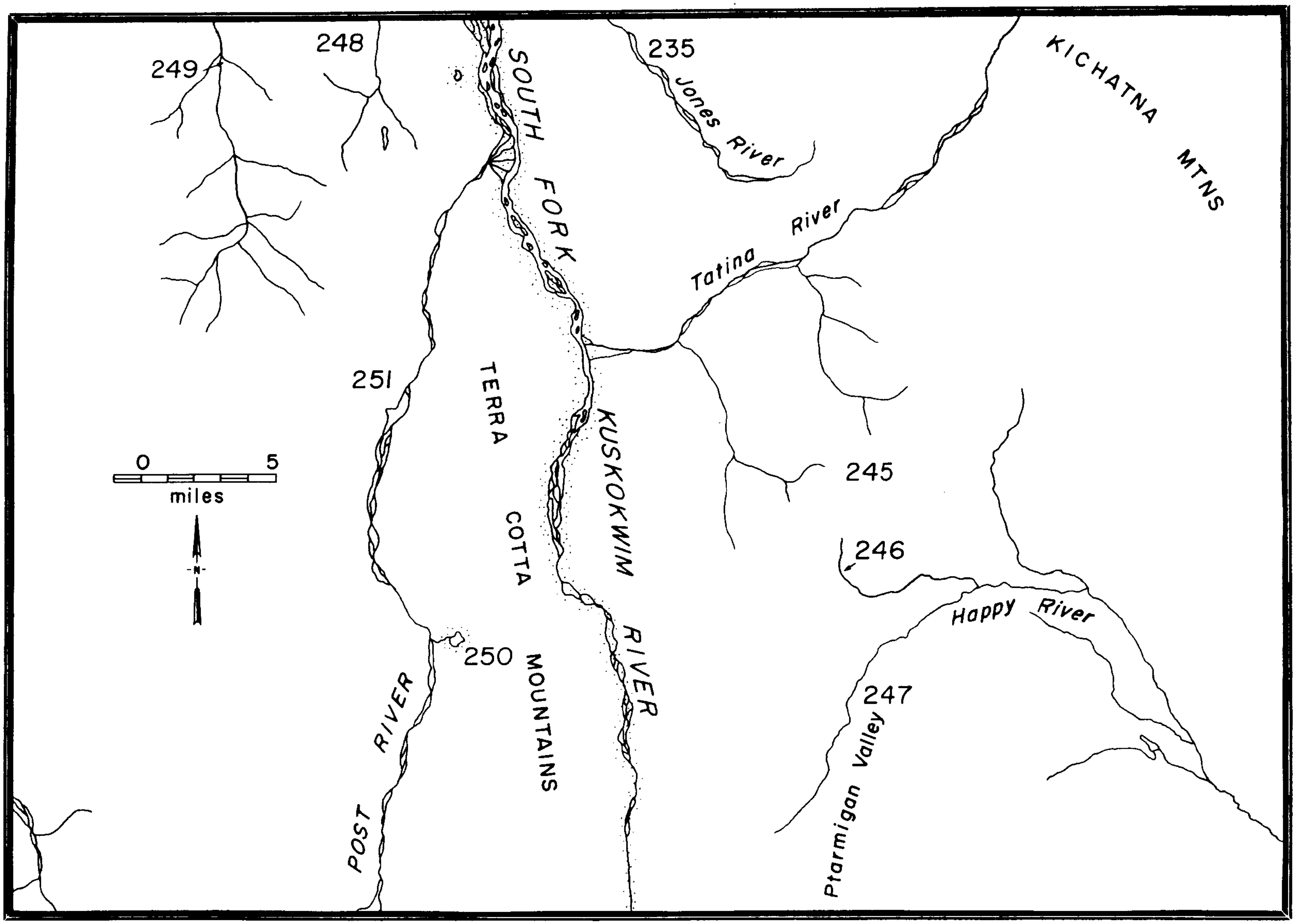

Fig. 64. Locations for places with Athabaskan or local English names, numbers 245-251.

PLACE NAMES--FIGURE 65

	Upper Kuskokwim Athabaskan	English Name or Description
252.	Ts'emo K'esh "lonely birch"	Trimokish Hills (North Peak)
253.	Sosh Nimo "white/grey sand"	White Mountain
254.	Tsalatno'	Selatna River
255.	Tsaltsadighelo' "highbush cranberry hill"	large hill south of Selatna River
256.	Tolghwtno'	Tatlawiksuk River

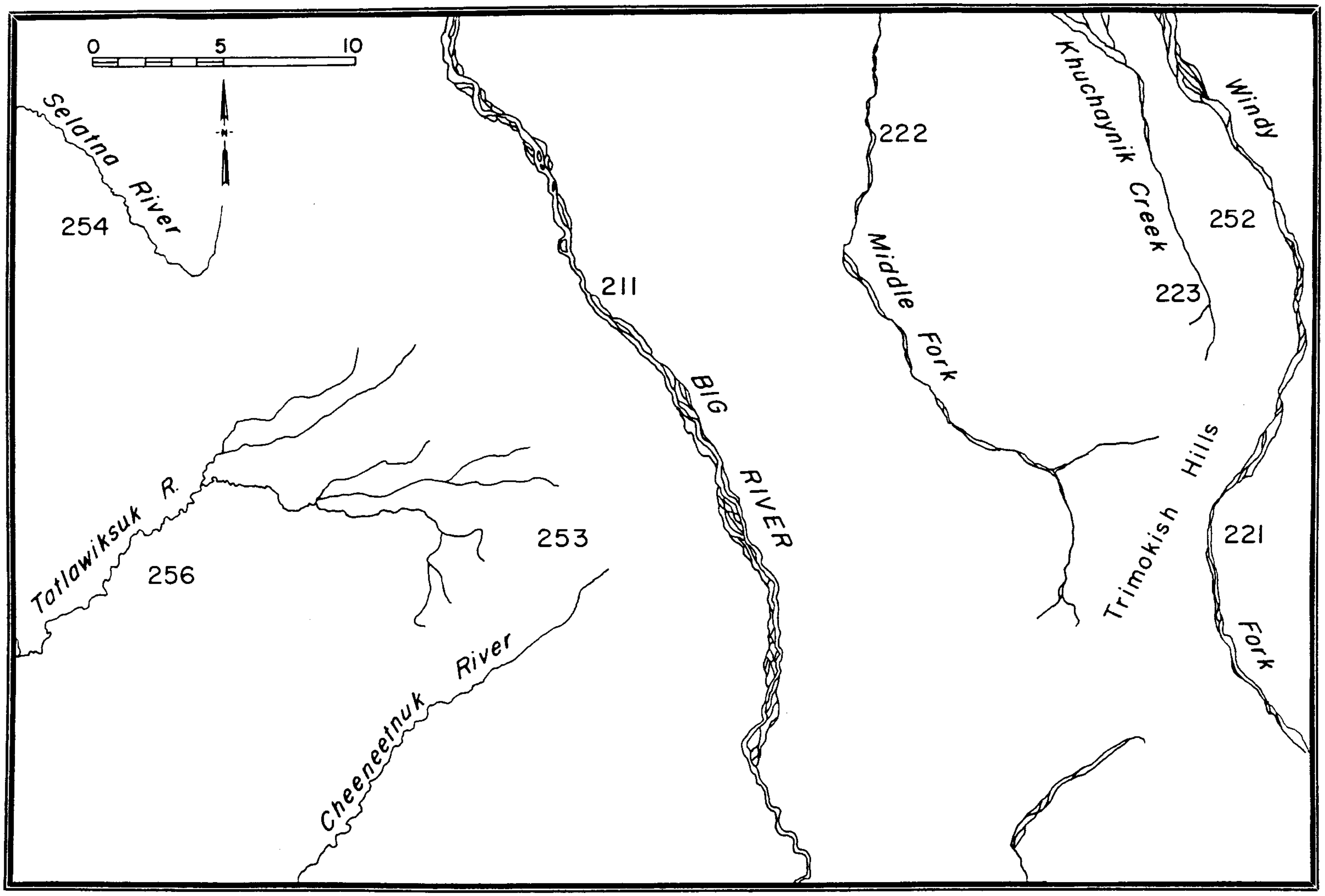

Fig. 65. Locations for places with Athabaskan or local English names, numbers 252-256.

PLACE NAMES--FIGURE 66

	Upper Kuskokwim Athabaskan	English Name or Description
257.	Nents'ididikdochak'	mouth of Nunsatuk River
258.	Nents'ididikno'	Nunsatuk River

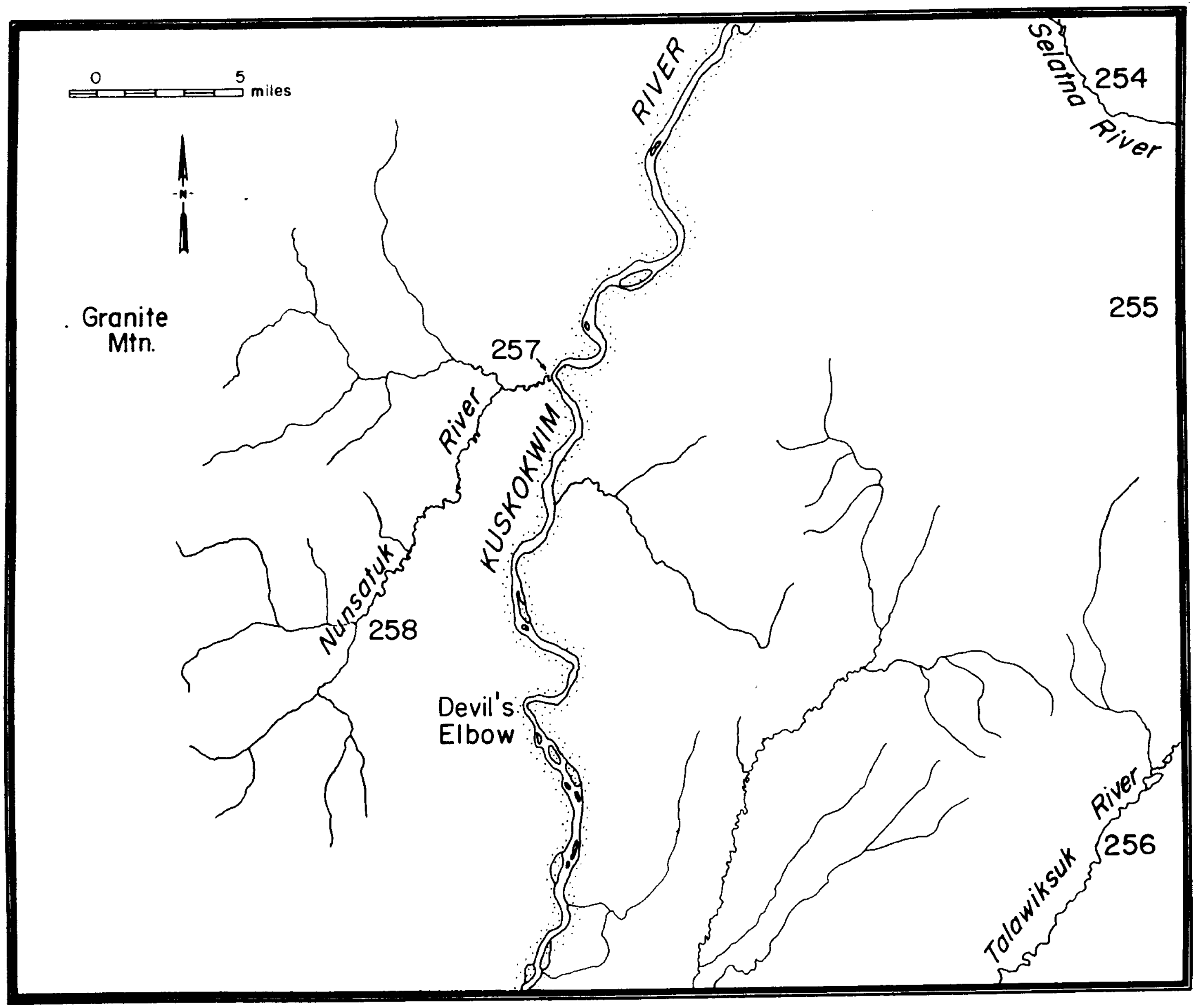

Fig. 66. Locations for places with Athabaskan or local English names, numbers 257-258.

PLACE NAMES NOT SHOWN ON MAP

	Upper Kuskokwim Athabaskan	English Name or Description
259.	Esdesliki	Susitna Station
260.	Yinatno'	Yetna River
261.	Yaghitno	Kenai Peninsula
262.	Denaze	Mt. McKinley
263.	Dishkaketchak' "spruce grouse river mouth"	Old Dishkaket Village
264.	Duɫchak'at	Nowitna River tributary
265.	Noghitna'	Nowitna River

APPENDIX 2

COMMON, UPPER KUSKOKWIM ATHABASKAN, AND SCIENTIFIC NAMES FOR SELECTED WILD RESOURCES IN THE UPPER KUSKOKWIM AREA AND SELECTED UPPER KUSKOKWIM ATHABASKAN NAMES FOR ANIMAL PARTS

This list of Upper Kuskokwim Athabaskan names was developed with the assistance of Nikolai and Telida residents and from Dinak'i: Upper Kuskokwim Athapaskan Dictionary by Raymond and Sally Collins (1966). Taxonomic identifications in the following list were derived from the Alaska Wildlife Notebook Series by the Alaska Department of Fish and Game, Field Guide to the Birds of North America by the National Geographic Society (1983), Alaska Trees and Shrubs by L. Viereck and E. Little (1972), and Wild Edible and Poisonous Plants of Alaska by the Cooperative Extension Service (1981).

Common/Local Name	Upper Kuskokwim Athabaskan Name	Scientific Name
	SELECTED ANIMALS (HWNEYE)	
beaver	tso'	Castor canadensis
bison/buffalo	(none)	Bison bison
black bear	shirs	Ursus americanus
caribou	midzish	Rangifer tarandus
Dall sheep	drodeya	Ovis dalli dalli
grizzly bear	tsone	Ursus arctos
land otter	mizreya'	Lutra canadensis
lynx	gwhchuh	Lynx canadensis
marten	suje	Martes americana
mink	tats'uts'a	Mustela vison
moose	dineje	Alces alces
muskrat	nitoɨtroda	Ondotra zibethica
porcupine	nune	Erethizon dorsatum
red fox	k'altsa	Vulpes vulpes

SELECTED ANIMALS (HWNEYE) (Cont.)

red squirrel	dilja	Tarniasciurus hudsonicus
snowshoe hare	gwh	Lepus americanus
wolf	tekone	Canis lupus
wolverine	niɨtresh	Gulo gulo

SELECTED BIRDS (DZEDZA)

Arctic loon/ common loon	dodzine	Gavia immer/ Gavia arctica
duck (generic)	tugaga'	---
bufflehead	tɨ'aɨtat	Bucephala albeola
golden eye	tsek'onya	Bucephala clangula
mallard	tsilhwghosh	Anas platyrhynchos
pintail	ch'inalzeya	Anas acuta
shoveler	dodozuga	Spatula clypeata
widgeon	mit'o'lik'wle	Mareca americana
goose (generic)	dolmoya	---
Canada	huh	Branta canadensis
snow	ch'ilorzna	Anser caerulescens
white-front	tokitsa	Anser albifrons
grouse		
sharptail	ch'iɨtwle	Pedioecetes phasianellus
spruce	dish	Canachites canadensis
ruffed ("willow")	trok'wda	Bonasa umbellus
ptarmigan	dilgima	
rock	k'ots'ima	Lagopus mutus
willow	dilgima	Lagopus lagopus
sandhill crane	daɨ	Grus canadensis
tundra swan	tomo	Cygnus columbianus

SELECTED FISH (ɫUK'A)

Arctic lamprey, ("eel")	tɨ'ighirs	Lampetra japonica
Arctic grayling	ts'odat'ana	Thymallus arcticus
blackfish	hozrighe	Dallia pectoralis
burbot ("lush")	ts'onya	Lota lota
clam (generic)	haɨts'oja	
Dolly Varden	hoch'ilmoya	Salvenlinus malma
longnose sucker	donts'oda	Catostomus catostomus
Northern pike	ch'ighilduda	Esox lucius

SELECTED FISH (ŁUK'A), (Cont.)

salmon		
chum ("dog")	srughat'aye	Oncorhynchus keta
chinook ("king")	gas	Oncorhynchus tshawytscha
coho ("silver,") ("red")	nosdlaghe	Oncorhynchus kisutcha
sheefish	zidlaghe	Stenodus leucichthys
whitefish	sajila	
broad ("lake")	tilaya	Coregonus nasus
common (cisco)	dilmije	Coregonus sardinella
humpback	tsenduda	Coregonus pidschian
round ("candlefish")	hwstin'	Prosopium cylindraceum

SELECTED PLANTS

alder (generic)	k'irs	Alnus (sp.)
bearberry	jezramoyanagha'	Arctostaphylos alpina
birch	k'esh	Betula (sp.)
blackberry	dziłnołt'ars	Empetrum nigrum
black currant	niłitnejija	Ribes hudsonianum
black spruce	--	Picea mariana
blueberry	jija	Vaccinium alaskaense
bog	tujija	Vaccinium uliginosum
cottonwood, aspen	t'ighis	Populus (sp.)
fireweed	tł'och'isko'	Epilobium angustifolium
lowbush cranberry	netł	Vaccinium vitisidaea
bog	dałnodinuts'a'	Vaccinium oxycoccus
highbush cranberry	tsoltso	Viburum edule
horsetail grass	--	Equisetum
Labrador tea	ch'ilok'wy'	Ledum palustre
moss (generic)	nan'	
mushroom (generic)	nin'modzigha'	
raspberry	dwhnikotł'	Rubus parviflorus
red currant	nodzihnighatł'una	Ribes triste
salmonberry	nikotł'	Rubus chamaemorus
tamarack	latighzya	Larix laricina
waterlily	kalt'ats'a	
white spruce	ts'ima	Picea glauca
wild carrots, ("Indian potatoes")	tsors	Hedysarum alpinum
wild celery	ok	Angelica lucida
wild rhubarb	gus	Polygonum alaskanum
willow (generic)	k'wy'	Salix (sp.)

ANIMAL PARTS

Virtually every major animal part has an Upper Kuskokwim Athabaskan name. While animal part names are generic or interchangeable between species, including humans, conversants are able to distinguish between each through the use of a precursor denoting the species. For example, animal ears are known as ch'idzigha', while midzish ch'idzigha' signifies caribou ears. To become even more specific, the speaker may choose instead to describe them as dakelane ch'idzigha', bull caribou ears. The following list includes some of the more commonly used terms for animal body parts.

Common Name	Upper Kuskokwim Athabaskan Name
antlers	ch'ida'
backbone	ch'iyena'
bladder	ch'ilusis
brain	ch'itseghon'
claws	ch'ikalgwna'
diaphragm	ch'inodolmidza'
ear	ch'idzigha'
eye	ch'inagha'
foot	ch'ika'
head	ch'itse
heart	ch'idraya'
hip	ch'i'ots'a'
hoof	ch'ikaltwtł
intestine fat	ch'utł
knee	ch'igwt'
kidney	ch'its'its'a'
leg	ch'idroda'
liver	ch'izit'
lower jaw	ch'iyats'ina'
lung	ch'ch'idzosk'a'
marrow (inside bones)	ch'iyegha'
neck	ch'ik'ws
nose	ch'intsesh
ribs	ch'ichok'a'

ANIMAL PARTS, (cont.)

shoulder blade	ch'igochina'
skin	ch'izis
sternum	ch'iyutsina'
stomachs	ch'idzeda'
stomachs	ch'imit'
stomachs	ch'itsozis
stomachs	ch'ituziza'
tail/tailbone	ch'icha'
teeth	ch'ighu'
windpipe	ch'izuł

APPENDIX 3. KING SALMON FISH FENCES IN THE UPPER KUSKOKWIM

Until the mid-1960s, the fish fence was the most effective and favored method for harvesting king salmon in the Upper Kuskokwim region. This harvest method pre-dates historic contact, according to the oral accounts of several older residents of the area. The physical remains of fish storage pits near some fence locations also attest to its antiquity. Discussions with Nikolai residents who had used fish fences as late as 1966, as well as non-local visitors to fence sites, yielded information on their placement, construction, and use.

Salmon fences were known to have been used in no less than four Upper Kuskokwim tributaries, including the Salmon River, Little Tonzona River, Takotna River, and Nixon Fork. Because of the ancient nature of this particular harvest technology, other sites probably were utilized by the then geographically dispersed ancestors of present-day Upper Kuskokwim Athabaskans. In virtually all instances, households limited their king salmon fishing activities to a single fence site; several elderly respondents noted never having visited a fence site other than the one their family utilized. While the fences were situated at locations distant from each other, discussions with individuals who actually used salmon fences to harvest fish indicate there were many common features in their operation construction, and use.

LOCATION

On the Salmon River, the main fish camp for people using the salmon fence was situated on a low hill approximately 100 yards downstream from the confluence of the North and South forks of the Salmon River (Figs. 27, 28, 67). Today this hill continues to be used as a camp by fishermen using contemporary harvest methods. Fences normally were built across both forks of this river, although generally only one of the fences featured a trap in conjunction with it. Thus, the fork opposite the one with the trap-fence was fenced to prevent fish from running or milling up it. Whether fish actually spawned up the fork opposite their origin is not clear, but in highwater the kings may have skirted the trap-fence because of the low ground, sloughs, and ditches that sometimes interconnect the two tributaries during periods of high water above their confluence. Generally, the South Fork of the Salmon River was the site of the trap fence where people harvested the king salmon. However, at times fishing took place at the North Fork fence, with either a trap or dipnet. Occasionally people fished both forks simultaneously. The choice of the South Fork over the North Fork for trap installation was apparently based on the larger run of salmon up this tributary and because of the site's proximity to the main fish camp below the mouth of the forks. One long-time resident recalled hearing that, at one time in the past, no king salmon spawned up the North Fork. At least once in the recent past people built a "super fence" that spanned the main river immediately below the forks (Fig. 67). This fence collapsed shortly after installation because of the greater depth and width of the river at this point, and the corresponding increased force of the current compared with upstream fence sites.

Another fence important in king salmon harvest activities was located in the Little Tonzona River. This fence was used by several closely-related households now residing in Nikolai. The Little Tonzona

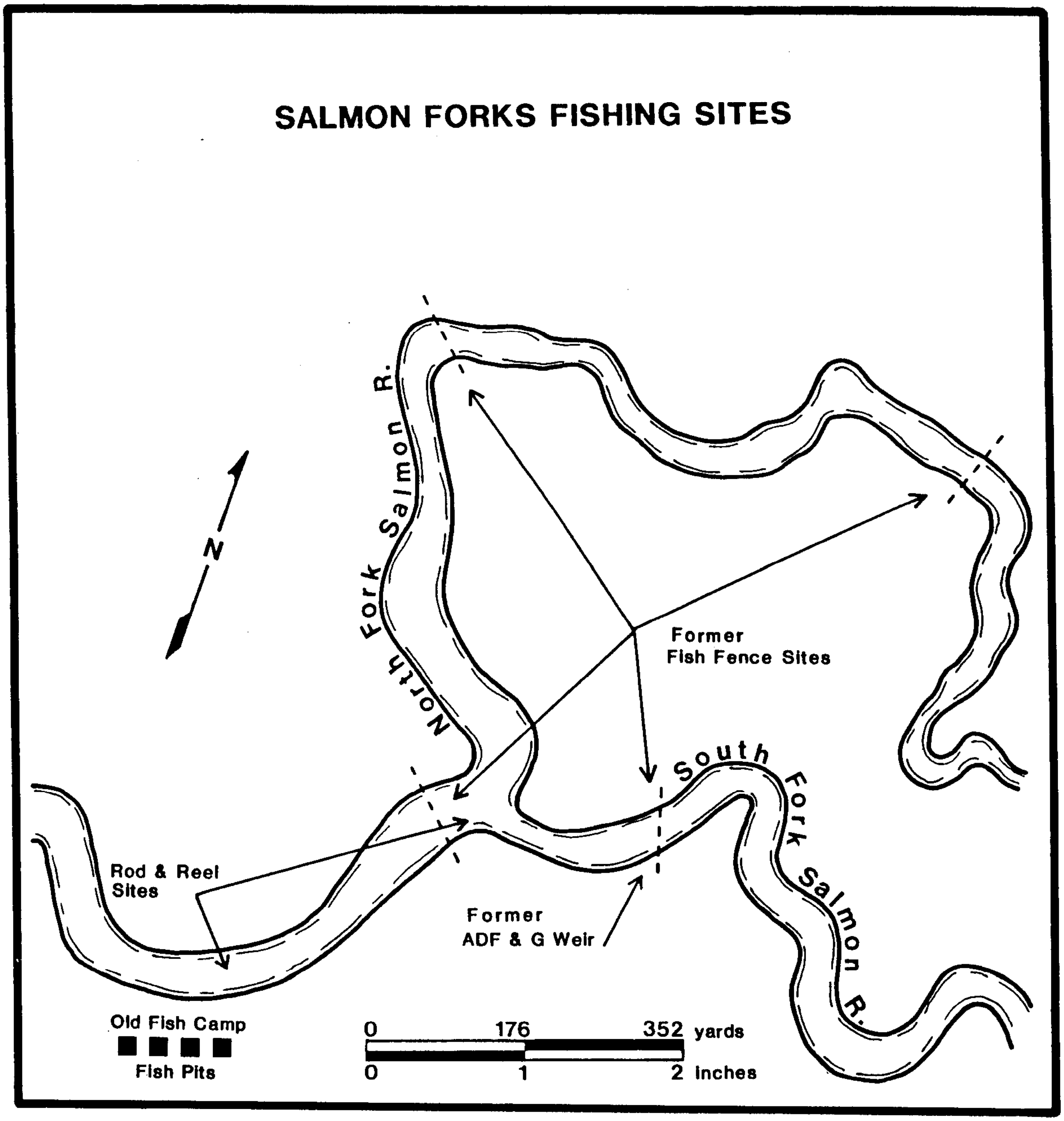

Fig. 67. Salmon River king salmon fence sites.

salmon fence was the last fence known to be operated in the Upper Kuskokwim, with use possibly continuing as late as 1968.

Fence sites apparently changed locations over the years in the Little Tonzona River, although according to one fisherman, they were usually situated below the confluence of the North and South forks on the right branch of the river (Fig. 67). Another knowledgeable individual states that, at one time, at least one fence was situated in the lower, turbid portion of the river. Turbidity in that area is a product of meandering intersecting sloughs from the South Fork of the Kuskokwim. It is not clear whether this site was developed and used in silt-laden water or whether a river change muddied a previously clear portion of the river. In any event, this is the only known instance of a salmon fence being used in silt-laden waters and serves to emphasize the importance of the Little Tonzona River for harvesting king salmon.

While comparatively little information is available, four additional salmon fence locations within the Takotna River Drainage are known to Nikolai residents. Abandoned no later than the mid-1920s, salmon fences on the upper Takotna and upper Nixon forks were important king salmon harvest sites for seasonal inhabitants of these areas. According to one elder who fished for salmon in the Nixon Fork, coalescence of the area's Athabaskan population and the presence of large numbers of prospectors and miners likely led to the demise of sites on these two rivers.

Three formerly-used fence sites have been identified by older Nikolai residents and were located in the Takotna River. These included a main-river location a short distance above the present-day community of Takotna, one near Big Creek, and a third near or within Fourth-of-

July Creek (Fig. 26). No doubt there were other sites in the Takotna River drainage since one knowledgeable Nikolai resident reports having heard about "lots" of fence locations. According to another individual, families from as far away as Vinasale and Big River sometimes traveled to the Takotna River to participate in this fishery.

The only known Nixon Fork fence site was near the mouth of the West Fork. This fence was last utilized around 1925 by one large household that wintered in the lower portions of that river. At that fence site, the river was fairly wide but was reportedly only, at the most, three feet in depth.

CONSTRUCTION

The Salmon River fish fence, like others, was a major endeavor requiring several households' participation in its construction, maintenance, and processing of the harvest. In the early summer, posts were driven with large wooden mallets into the river bottom at 2- to 3-foot intervals. Fence sections were built of wooden slats, approximately 1/2-inch by 3/4-inch, which were made from straight-grained spruce and placed in a parallel pattern about three inches apart (Figs. 68 and 69). The slats were sometimes prepared in the spring at Nikolai and transported in bundles to Salmon River for final assembly. Fence sections were up to 10 feet long and were of sufficient height, generally 7 to 10 feet, to extend from the bottom of the river to several feet above the surface of the water. They were then set against the upstream side of the driven posts and tied into position. Gravel was banked against the base of the sections from the upstream side using

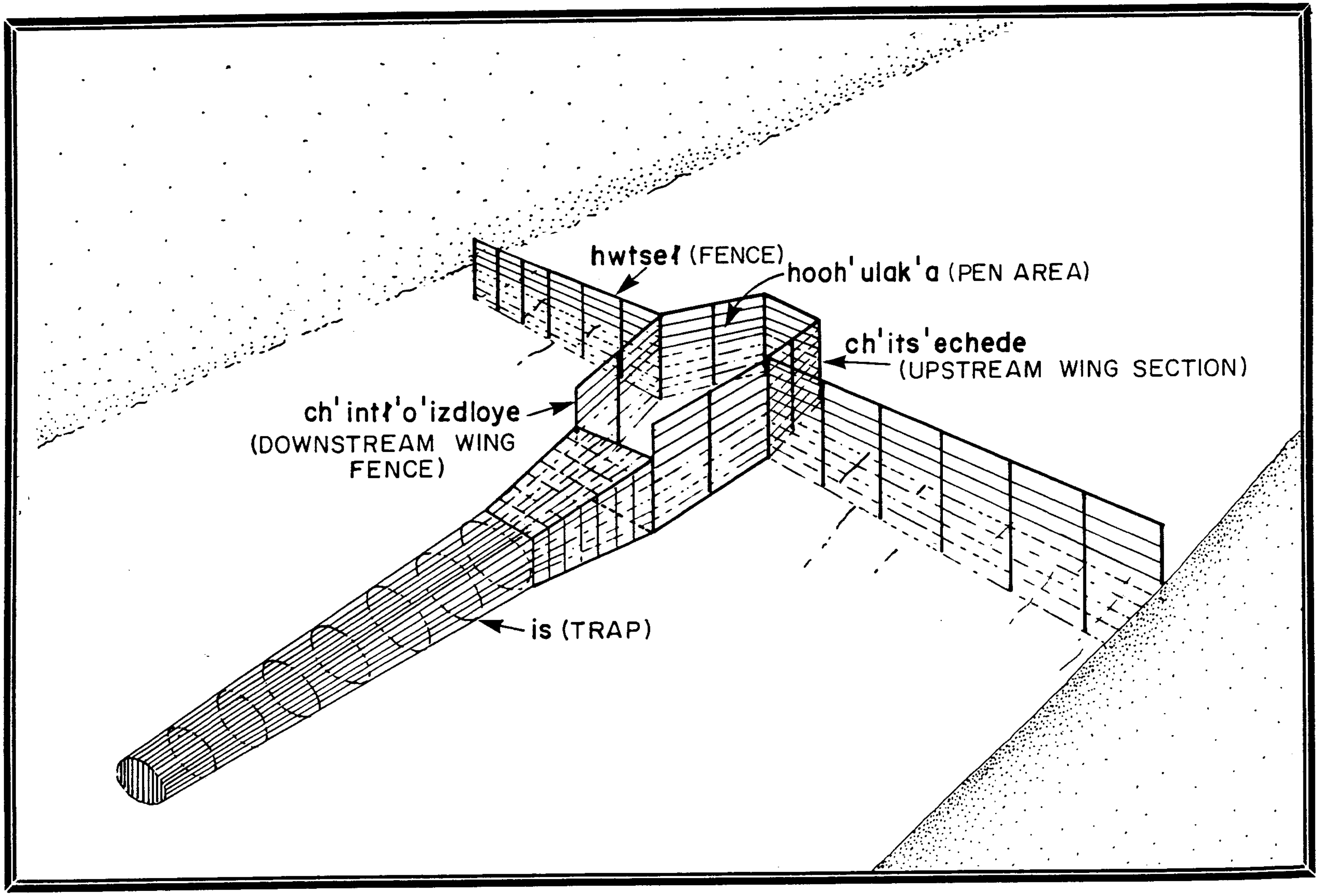

Fig. 68. Upper Kuskokwim fish fence with Athabaskan section names adapted from Dinak'i, Upper Kuskokwim Athabaskan Dictionary by R. and S. Collins 1966.

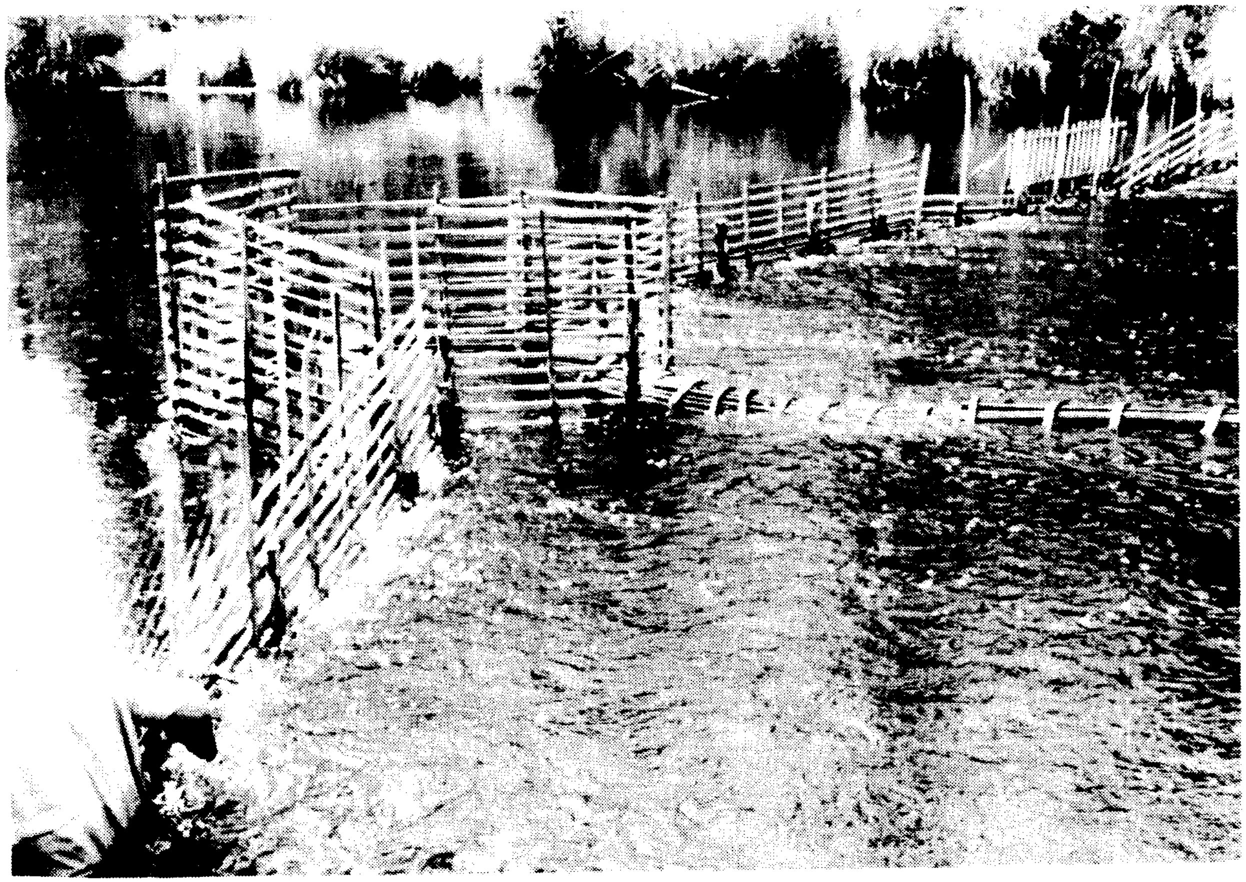

Fig. 69. Fish fence in place in the South Fork of the Salmon River -- mid-1960s (photo courtesy of Raymond Collins).

either one's foot or, in later years, a shovel. This banking prevented salmon from immediately escaping beneath the fence.

The trap was located near the middle and on the downstream side of it and was held in place by "wing fences" (Fig. 69). The trap was 18- to 30-feet long and constructed from straight-grained spruce running both lengthwise and cylindrically. Fish were removed through a small door which was located on top of the trap near its lower end. Overall, the trap was about 16 inches in diameter. and tapering only slightly, if at all, between the upper and lower ends, since this was apparently not significant in the principle of operation.

A separately built funnel fit into the upper end of the trap, although one individual noted that sometimes the trap and funnel were of one-piece construction. The funnel was constructed in a manner similar to the trap itself. The trap, complete with the funnel device, extended from a corral which was built mid-way along the fence. The dimensions of the corral varied. The width may have ranged from four to eight feet and was of similar length. A slatted section was sometimes sunk into position on the bottom of the corral or pen section to prevent fish from tunneling out, especially on the sides perpendicular to the current not easily banked with gravel.

In comparison to the Salmon River fence, the overall dimensions of the fence used in the Little Tonzona were proportionately smaller because of the more shallow water depth and narrow width of the river at the harvest site. Likewise, installation of the trap was less labor-intensive than that of the Salmon River trap due to the less inhibiting river characteristics. A single household could often install the fence in a day or two. One appreciable difference between the Little Tonzona and Salmon River fences was the material used for trap construction. Beginning shortly after World Was II, people report the Little Tonzona River fence and trap were partially fashioned from heavy gauge "chicken wire." Users note the acceptability of such material because of the reduced dimensions of the trap and fence and the smaller salmon run. Otherwise, all fences were built in a manner similar to that described above for the Salmon River fence and each usually featured a trap.

As salmon moved along the fence seeking an opening, the upper wing fences apparently created an illusion of passage upstream, luring salmon to enter the corral area through a narrow gap between the lower wing fence and main fence posts. The width of this gap was determined by the widest width of the builder's foot (approximately four inches) which was placed between the two posts as they were being driven. Salmon were confined in the pen area and, unable to locate an opening to escape upstream, would turn and swim back downstream, thereby entering the trap by way of the funnel. Once in the trap the salmon could not turn around and, after tiring, eventually drifted to the lower end of the trap. Fish were removed from the door in the free-floating end of the trap with spears or gaffs. Depending upon the length of the trap, up to 100 king salmon could be held at one time.

The fence and trap required daily maintenance and inspection to remove vegetative accumulation and to fill in holes beneath the fence where the river current or escaping salmon caused the gravel to wash out. Most individuals who had used the fence characterized it, at best, as only an inhibitor of the "single-minded" salmon. In addition to digging beneath the fence, salmon jumped over the top or chewed their way through the slats. According to some individuals, once the fence was breached, hundreds of salmon sometimes escaped prior to detection or repair of the hole. Each season, several fence sections required replacement because of salmon-induced damage. Additionally, the lower end of the trap was the focus of much salmon gnawing. It frequently and repeatedly had to be replaced.

Once fish began entering the trap, an intensive period of harvest-related activity began, usually lasting from ten days to three weeks. Nearly every member of fishing households was involved in performing tasks related to processing, preserving, and storing a year's supply of king salmon. These work days often stretched to 18 hours during peak fence production.

The quantity of king salmon harvested was limited to the available space of the drying structures. When these had been filled, fishing stopped, usually for the season. In years when users perceived the king salmon run to be somewhat smaller than usual, the fence was opened before optimum and usual harvest levels were obtained. This measure was reportedly taken to avoid damaging the salmon stock and to avoid harvesting the less desirable salmon that characterized the end of the run. When a decision had been made to end king salmon fishing for the season, the fence sections were removed and stacked on the bank for use the following year. Generally, the posts were left in place but eventually washed out or were carried away by river ice the following spring.

Once the fishing stopped and the fence was removed, additional time was necessary to preserve the catch. In late July or early August, most fishing households left the fishery to participate in the chum salmon harvest.

Because king salmon usually milled for a period of time once they encountered the fence, a wait of several weeks often was necessary before substantial harvest began. It was during this somewhat idle period that rods and reels were first used by fishing households on the Salmon River in the early 1960s (see Chapter 9). Several users characterized these early attempts at rod-and-reel fishing as being more amusing than productive.

Albeit on a diminished scale, the principle of operation of the Little Tonzona fence and trap was very similar to that described for the Salmon River. According to one person who used the fence, a trap was not used every year with the fence; dipnets were somewhat effective in capturing milling salmon below the fence in this comparatively shallower and narrower river.

Few harvest data are available from the period when fences were used on the Little Tonzona River, although one fisherman believes the average annual take numbered between 200 and 400 kings. According to the same respondent, the fence was usually removed from the stream "when they started catching old fish." Despite a harvest markedly lower than that of the Salmon River, the Little Tonzona salmon fence was of equal importance to those households which used it.

CONCLUSION

The importance of fish fences is evident in several ways. Technologically, the foremost demonstration of the importance, effort, and long-term use of this technique is shown by the refinement of the device itself. The fence was designed to withstand both the river current and the determination of the salmon to get upstream. Each component of the trap-fence had a specific purpose. The efficiency of these components and the fence as a whole is reaffirmed by its persistent use into the mid-1960s. Even after the availability of manufactured materials, the basic parts of the fence were still constructed with traditional materials and the design remained unchanged. Similarly, use of the fences also remained essentially the same. The factors associated with the curtailed use of the fish fence and trap are covered in the main report.

APPENDIX 4. CONSTRUCTION AND USE OF FISHWHEELS IN THE UPPER KUSKOKWIM

The basic principle of fishwheel operation is ingenious yet simple, and despite design and construction variation between individual builders, each wheel includes of the same basic components. Each Upper Kuskokwim fishwheel consists of a raft of four or more logs, an axle, or "shaft", two "dippers" or baskets, two paddles, one or two fish boxes, and two sets of upright posts or stanchions from which the axle is suspended (Fig. 70). The baskets are placed perpendicular to the axle opposite and inverted from each other. Two paddles are situated on the axle in a similar manner at 90-degree angles from the baskets, parallel to the "shaft." The water current pushes against the paddles and "dippers" causing the wheel to slowly revolve end over end on the axle. Slides affixed to the baskets with approximately 20- to 30-degree inclines guide any captured fish into the fish box as the basket approaches the apex of its revolution. From the slide, fish enter the fish box or boxes located on one or both sides of the raft. The fish-wheel is held in position by a shoreline which extends from the front (upriver end) of the raft to one or more trees or posts on the riverbank 100 or more feet upstream. This line or cable usually is attached to a tree at least 30 feet away from the riverbank in the event the bank collapses or caves in. Two "spars," up to 40 feet long, placed at the upper and lower ends of the raft, prevent the wheel from drifting into the bank. The spars permit relative wheel position adjustment for fluctuations in water depth by permitting the wheel to be either pushed out further into the river or drawn in closer to the bank.

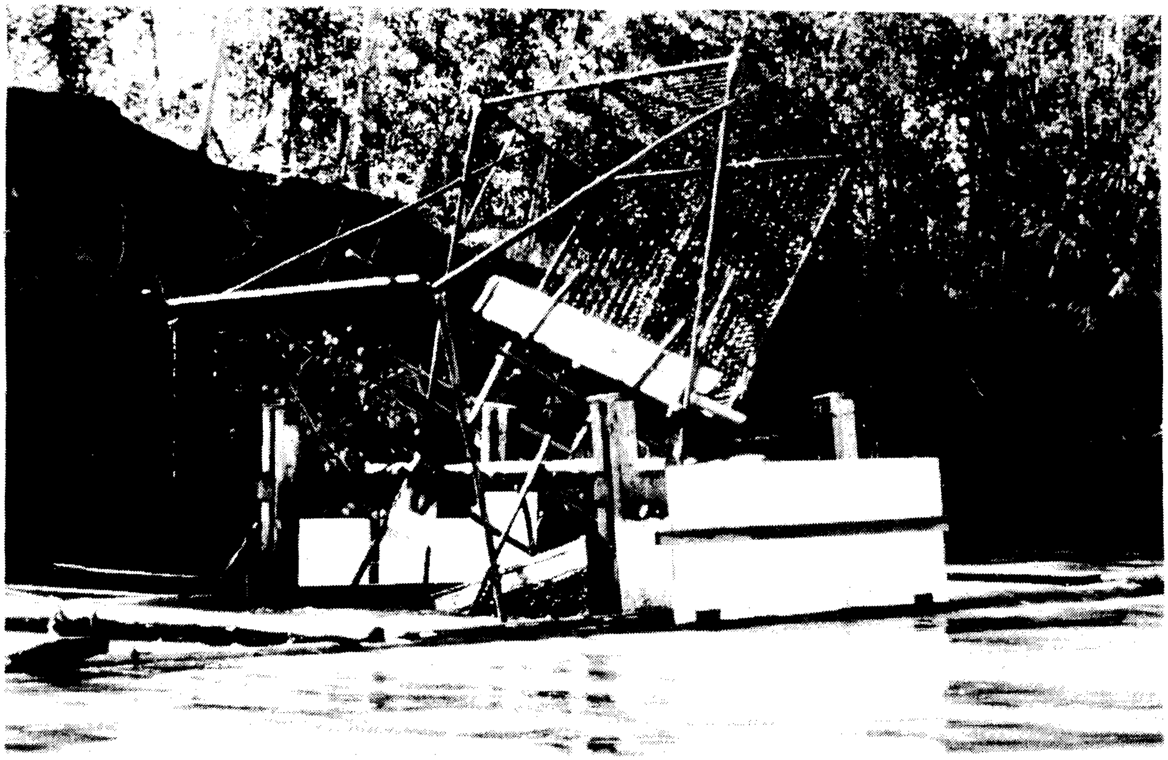

Fig. 70. Typical fishwheel in operation near McGrath.

CONSTRUCTION

The raft keeps the wheel afloat and provides structural integrity for the unit. While most logs will retain buoyancy for at least one season, dry spruce (with the bark attached), ranging between 12 and 24 inches in diameter, appears to be best suited for this purpose. Dry wood provides the most buoyancy, and the bark tends to slow the water-soaking process. It also provides better footing when wet. The anticipated weight of the completed wheel exclusive of the raft determines the number of logs used in the raft. Some people who build fishwheels add an extra log to the box side of the raft, offsetting the extra weight a box full of salmon will add. The two sides of the raft are held together with stout cross pieces at both the upriver and downriver ends of the raft. The length of logs used for rafts is determined, for the most part, by the size of the "dippers" or baskets. Additional logs can be added to the outside of the raft for added buoyancy at any time with relative ease.

Among area fishermen, the baskets are often the first component of the fishwheel to be constructed. Their construction varies both structurally and dimensionally between communities and among builders. Generally, peeled, white spruce poles, between 1-1/2 and 3 inches in diameter, are used for the basket framework. In Nikolai, the poles are laid out and cut partway through at the point where the bottom and end of the basket intersect. Then the poles are bent over at this notch forming a single bottom and end piece that is stronger than two-piece construction. The number of these long poles varies, depending on the width of the basket, expected strength of the wire mesh, and preference of the builder. Additional shorter poles are placed crossways at the intersection of the bottom end, across the top of the end section, and possibly diagonally on the end piece (Fig. 71). While there are considerable variations in basket construction, the objective is to build a durable device capable of withstanding the pressures from river current and struggling salmon for several seasons of use.

Water depth dictates the dimensions of a fishwheel. In the comparatively shallow South Fork, the baskets are seldom more than seven feet long, while main Kuskokwim River fishing conditions near McGrath allow baskets of over 12 feet in length to be used. Basket width

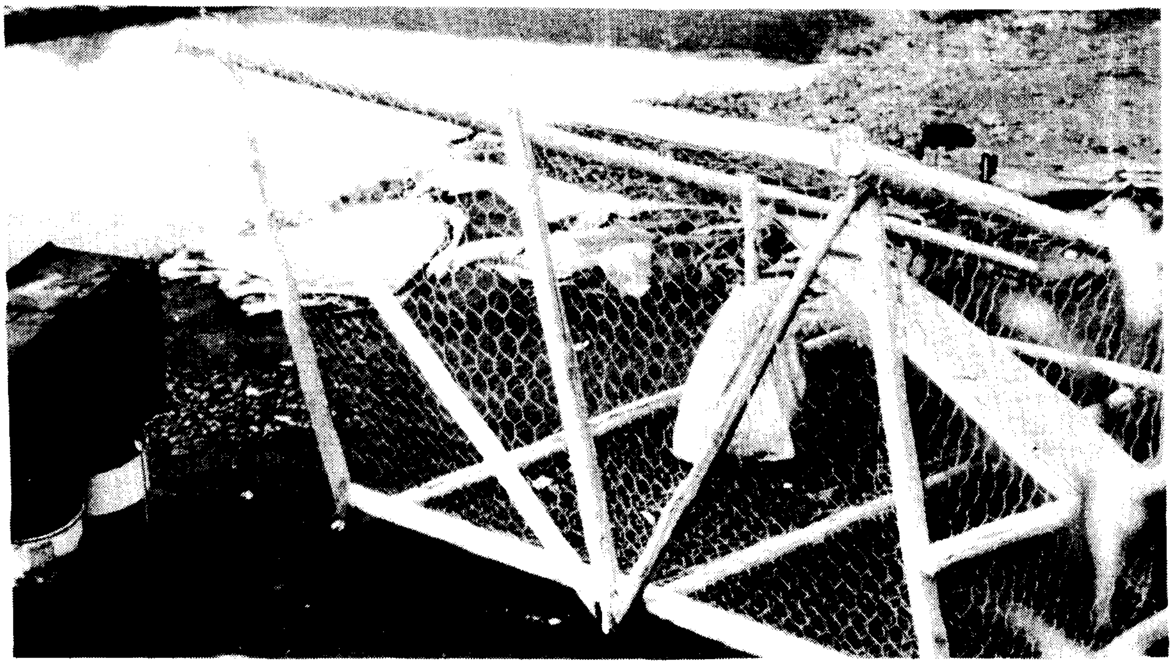

Fig. 71. Fishwheel basket under contruction at Nikolai.

likewise is determined by river conditions. In upper river locations, the salmon run follows relatively narrow passages or channels, making dippers more than eight feet across unnecessary. However, the wider river channels in the vicinity of McGrath often necessitate proportionately wider baskets.

Wire is placed over the pole frame of the basket. The wire used for the baskets varies among builders and the species of salmon which the wheel is intended to intercept. Heavy-gauge "chicken wire" with 1 to 1-1/2-inch mesh is considered acceptable for use on salmon wheels intended to harvest salmon and whitefish. Square or rectangular welded wire ranging from 2 inch to 3 inch mesh is also suitable, although smaller whitefish are seldom caught when this material is used. Drawbacks to using the smaller mesh wire include a tendency to collect greater amounts of vegetative flotsam such as moss. In either case, the wire sometimes is doubled at points of high stress, depending on the gauge used. The wire is usually attached to the inside of the basket framework with either baling wire or heavy staples (Fig. 71).

Slides are placed on the basket frame diagonally (Fig. 71, 72) either before or after the wire, depending on the builder. For wheels which will have a single fish box, both slides are designed to empty to one side of the raft. Slides for double boxes can be designed in one of two ways. One dipper slide feeds one box while the opposite guides fish to the other box. One individual who used to build fishwheels noted in the past some wheels featured a v-shaped split slide. This style allowed fish to enter either box, depending on their position in the basket as it neared the vertical position. Slides are built from scrap plywood, 1-inch thick dimensional lumber, aluminum roofing, or peeled spruce poles placed closely together.

The axle is a straight spruce pole five to eight inches in diameter. Dry spruce is favored for this component because of its light weight and strength. The shaft is sometimes partially "squared off" along its middle portions with an axe to facilitate a better fit between the paddle, basket, and bracing poles. The axle is suspended atop bearing blocks between two sets of upright lumbers. The most common method of upright construction is to drill a series of 2-inch diameter holes at one-foot intervals through a 6- to 8-inch log of heavy lumber (Fig. 72). The log is then split or ripped lengthwise leaving two halves with holes centered in each one. These holes are for wooden pins that support the bearing or "saddle blocks." The uprights are thinned down on the lower end and wedged in notches cut into the middle raft

Fig. 72. Axle details for a fishwheel.

log. For additional strength, the uprights may be toe-nailed to the raft log as well. A short piece of wood is affixed across the top of the uprights for additional strength.

The bearing or saddle usually consists of a block of spruce which has been rounded out to conform with the end of the axle (Fig. 72). These supporting blocks are sometimes fitted with metal or plastic sleeves made of metal cans, plastic sled runner material, or can lids to reduce wear on the blocks. These bearings require regular greasing to reduce wear and minimize noise and vibrations which fish may detect.

The fish boxes are constructed on the raft around the uprights. Their dimensions vary, but most are four to six feet long, two to three feet wide, and two to four feet deep. At times, two boxes are located on opposite sides of the raft. The use of two boxes enables greater capacity for fish and better distribution of the weight of the harvested fish. However, it can be difficult to remove fish from the bank-side box from a boat in high water as the angle of the spar poles may prevent access. Consequently, most Upper Kuskokwim fishwheels feature a single box on the outside raft. In previous years, many fishwheels had a single box on the bank side, which permitted access to fish from the shore via a "catwalk." This was particularly practical when the wheel was situated immediately in front of the fish camp.

The paddles are usually attached across two or three poles which extend away from the shaft at 90-degree angles from the baskets (Fig. 70). Nikolai fishermen make the paddles one to three feet shorter than the baskets to avoid sweeping away or "spooking" salmon approaching the baskets. The speed of rotation of the wheel is determined by paddle size. During the fall, when river stages are low and current speeds generally decrease, additional paddles may be added to maintain desired rates of rotation. A fishwheel which turns too slowly may allow fish to reverse direction and escape from the basket before it breaks the water. Baskets on a rapidly rotating wheel are not in the water long enough to permit fish to enter, and salmon that are captured may not reach the box before being dumped from the slide. Faster turning wheels also tend to wear out faster.

OPERATION

The selection of a fishing site probably is the most critical factor in determining the success of the harvest. It is important that the river bottom is clear of obstructions, both beneath where the wheel will be situated as well as immediately upstream and downstream of the wheel site. Obstructions include sunken logs, stumps, and brush. Moderate current and the abundance of anchor points for the shoreline also are considerations. Some fishermen clear trees and large brush from the bank upstream of the fishwheel site to minimize the potential for creating obstructions to the river bottom immediately above or even beneath the wheel. Many, although not all successful sites are on the outside of a river bend. It is preferred that the river bottom consist of gravel rather than sand or silt. People also avoid placing a fishwheel where flotsam is a problem during moderate river stages because taking in such objects can severly damage the gear. When placing a wheel at a new site, it usually has to be moved up or downstream short distances to determine the best locations. Not all sites are productive at all times. Higher water levels may enhance or reduce harvest levels. For example, one McGrath fisherman observed pronounced increases in his king salmon harvest when the wind was blowing down the river at this fishwheel location.

Optimum wheel operation occurs when the "reach" of the dippers comes within a few inches of the river bottom. Ideally, the baskets dig out a slight cavity in the river bottom allowing the baskets to actually come around beneath the river bottom surface. Baskets repeatedly striking the bottom tend to frighten away fish, and after a period of time may breakdown, while operation in water deeper than the reach of the dippers may permit salmon swimming along the bottom to pass beneath the wheel. Adjustments to wheel depth can be facilitated by either raising or lowering the axle and bearing blocks or by moving the wheel closer or further from the bank with the spar poles.

In terms of maintenance during the summer, the axle is periodically greased and the dipper position altered according to water depths. During periods of particularly high water, the wheel is often pulled in tightly against the bank to avoid drift logs and trees. At times drift trees do enter the wheel, which may require removal of a paddle or dipper to free the wheel. Usually wheels are not operated during these periods of high river stages because few fish are taken and because a turning wheel is subject to greater damage by drift logs.

Fishwheels are stopped by placing a small pole diagonally between the raft and front (upriver) crosspiece, which allows the basket to rest on this pole. Some people extend a "boom" across the front of the wheel which is set at an angle upstream from the outside front of the raft to the bank. These booms deflect most approaching trees. Sometimes fishwheels are stopped for short periods of time to allow accumulations of vegetative material to dry. These accumulations then can be removed easily either by hand or by the wind.

Winter storage of fishwheels varies. Some wheels are left in place at the fishing site for the winter and most fishermen raise the axle to a higher point between the uprights. One disadvantage of leaving the wheel in place is the potential of loss or damage during early winter ice settling and spring ice break-up. The major forces of break-up are avoided by moving and storing the wheel in a slough, creek, or eddy. Wheels left frozen in the ice along either the main river or in a backwater area require loosening of the shore line after freeze-up to prevent the raft from being pulled apart as the ice settles. As spring approaches, spreading ashes, sand, or even shoveling away the snow in a half circle around the wheel weakens the ice between the wheel and main river and helps to minimize damage induced by break-up to wheels frozen into the ice. Some fishermen raise the baskets to the highest point between the uprights and beach the wheel before the ice starts running in the fall. This method allows the raft logs to dry somewhat. However, this means of storage sometimes requires the owner to wait for higher river stages in the early summer to refloat the wheel to the place it will be operated.

Scavenging birds sometimes present a problem during summer wheel use. Ribbons are sometimes attached to the wheel to discourage birds from picking on fish in the box. Fish scraps placed on a sandbar a short distance away also help to divert attention away from the wheel. Shooting the birds is usually an effective way of dealing with this problem if other solutions fail. Bears infrequently attempt to feed out of a fish box. Sluicing the box occasionally is effective to diminish this attraction. Again, scrap piles are another effective method of diverting attention away from the fishwheel.

The use of fishwheels is often a cooperative venture between two or more individuals. However, in most cooperative arrangements between individuals of separate households, one person in usually recognized as the primary owner/user. These cooperative arrangements may arise through shared labor, purchase of materials, or shared maintenance responsibilities. These arrangements permit lesser partners to participate in the harvest surplus to the owner's requirements or capabilities. Other fishermen often have access to fish from the wheel when the primary user is unable to process the catch and, at times, the owner of the wheel turns over full responsibility to someone else if he has elected to not fish for the season. Many households often receive fish from a single wheel over the course of a summer, either as their primary source or supplemental to set net catches. For example, during the 1982 chum salmon season in Nikolai, two fishwheels were operational. Harvest summaries for that year indicate that 13 of the 19 fishing households derived all or a portion of their catch from these two wheels.

SUMMARY

Fishwheels are ingenious devices particularly well-suited for harvesting large quantities of salmon in the turbid rivers of the region. While each wheel differs slightly from the next, the principle of operation is the same. The construction of fishwheels requires time, money, and a moderate level of skill on the part of the builder, however, a single summer's yield more than offsets these initial investments. With reasonable care, fishwheels can last three or four seasons. They are primarily used to target chum and coho salmon, and most catch more fish than the owner can process. Consequently many households typically benefit from a single fishwheel's operation.